Exhibit A

James E. Yurgealitis

SUMMARY:

Self employed as a Legal and Public Policy Consultant providing Technical Firearms and Forensic Consulting, Testing and Policy Research / Training Services to Corporations, Legal Counsel and the Public Sector

EDUCATION:

B.A., Political Science and Psychology, St. John Fisher University, Rochester, New York – May 1985

PROFESSIONAL EXPERIENCE:

December 2012 to Present: Independent Legal and Policy Consultant / Subject Matter Expert

Currently provide independent consulting services to Corporations, Legal Counsel and Governmental entities in regard to Public Policy and Technical matters relating to Firearms, Firearms Policy, Forensics and Law Enforcement. Current and former clients include the Office of the District Attorney for Cook County Illinois, The City of Sunnyvale, California, The City of Highland Park, Illinois, The Office of the Attorney General for the Commonwealth of Massachusetts and the Center for American Progress, Washington D.C. I have provided sound policy and technical assistance for my clients to include expert testimony which successfully endured the opposition's legal appeals to the U.S. Circuit Court of Appeals and the U.S. Supreme Court.

December 2003 to December 2012: Senior Special Agent / Program Manager for Forensic Services ATF National Laboratory Center (NLC), Beltsville, Maryland. U. S Department of Justice, Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)

Directed the administration and management of ATF's Forensic Training Programs to include the National Firearms Examiner Academy (NFEA) a 12-month training program for State and Local Forensic Firearm Examiner Trainees. Also managed two additional forensic training programs. Administered a $1M + budget in accordance with strict ATF and National Institute of Justice (NIJ) guidelines and reporting requirements. Responsible for oversight of all Forensic Firearms related research at the NLC. Supervised a full and part time cadre of fifty-two (52) instructors and administrative personnel. Maintained liaison with commercial firearms and ammunition manufacturers and subject matter experts and ensure that lesson plans and curriculum reflected the latest technical developments in firearms manufacture, forensics and their application to federal and state law. Applied for, received and managed in excess of $2M in external grants to facilitate uninterrupted delivery of training during internal budget shortfalls. Detailed to the Department of Homeland Security Command Center in 2005 with overall responsibility to coordinate and direct Federal, State and Local Law Enforcement assets during and following Hurricanes "Irene" and "Katrina" and again in 2010 for "Andrew" and "Danielle".

June 1997 - December 2003: Special Agent / Violent Crime Coordinator, ATF Baltimore Field Division, Baltimore, Maryland

Responsible for management of ATF's "Project Disarm", a joint law enforcement initiative between ATF, The United States Attorney's office for the District of Maryland (USAO), the Baltimore City Police Department, the Baltimore City States Attorney's Office and the Maryland State Police. Duties included reviewing over 400 state and local firearms related arrests annually for subsequent referral to the USAO and Federal Prosecution. Managed a caseload of 75 – 100 criminal cases annually. Responsible for selection, referral, follow - up investigation and subsequent indictment and prosecution of armed career criminals. Testified in front of Federal Grand Juries in excess of 75 times annually. Was recognized, and testified, as an expert witness in the Identification, Operability and origin of Firearms and Ammunition in three Federal Judicial Districts. Toured over 25 firearms and ammunition manufacturing facilities in Europe and the United States. Temporarily assigned in 2001 for three months to the 9-11 Task Force investigation in conjunction with FBI Assets. Temporarily assigned to the D.C. Sniper Task Force Intelligence Group in 2002 for two months.

<u>June 1990 – June 1997:</u>
Special Agent, ATF Baltimore Field Division, Baltimore, Maryland

Served in various capacities as a street-level Special Agent. Acted as Group Supervisor and Assistant Special Agent in Charge on numerous occasions. Served on the Washington – Baltimore High Intensity Drug Trafficking Area (HIDTA) task force from 1995 – 1999. Investigated armed narcotics trafficking organizations, seized assets, authored and executed Federal and state search and arrest warrants, conducted surveillance, interviews / interrogations, testified in Federal and state courts as a fact witness, purchased firearms, explosives and narcotics while in an undercover capacity, investigated fatal bombings and arsons, firearms trafficking, alcohol and tobacco trafficking, homicide, fraud and gun store burglaries. Also while detailed for 8 months as the Public Information Officer authored press releases, provided interviews to local and national print and television media outlets and made presentations to local and national public and special interest groups and associations.

<u>April 1989 – June 1990 and July 1986 – March 1987:</u> Special Agent, United States Department of State, Diplomatic Security Service (DSS), Washington Field Office, Rossyln, VA

Conducted investigations of violations of Federal Law under the department's purview to include Passport and Visa Fraud, Illegal trafficking of restricted firearms and war materials to prohibited countries, human trafficking, seized assets, authored and executed State, local and Federal Arrest and Search Warrants, testified in Federal Court as a fact witness, detailed on an as needed basis to the Dignitary Protection Division as Agent in Charge of multiple protective details for visiting and resident foreign dignitaries, temporarily assigned to support Physical and Personal Protective Security in various U.S. Embassies overseas on an as needed basis, detailed to the Secretary of State Protective Division on an as needed basis to supervise agents assigned to augment the permanent protective detail.

<u>March 1987-February 1989:</u> Special Agent, DSS, Secretary of State Protective Division, Washington, DC

Served in various capacities as Acting Agent in Charge, Acting Shift Leader, Lead Advance Agent and Shift Agent. Responsibilities included close personal protection of the Secretary of State both domestically and overseas, extensive foreign travel to facilitate and prepare security arrangements for overseas visits to include Presidential Summit meetings, liaison with foreign host government officials to plan and solicit assistance with security arrangements, supervision of agents temporarily assigned to augment the detail, liaison with U.S Government Intelligence Agencies and other Federal, State and Local Law Enforcement Agencies to identify and protect against potential threats to the Secretary of State.

CLEARANCES: Top Secret March 1986 valid through February 2015. Numerous prior SCI Clearances.

TEACHING EXPERIENCE:

- Instructed at the Federal Law Enforcement Training Center (FLETC), for ATF and other Federal Law Enforcement Agencies
- Instructed at the International Law Enforcement Academy (ILEA) in Budapest, Hungary
- Instructed for numerous State, local and / or regional law enforcement agencies both in the United States, Canada and Central America

LINKEDIN PROFILE AND ENDORSEMENTS:

https://www.linkedin.com/in/james-jim-yurgealitis-68618464?trk=nav_responsive_tab_profile_pic

REFERENCES:

Available upon request

Exhibit B

Professional Qualifications of James E. Yurgealitis
Independent Legal, Public Policy and Forensic Consultant

I, James E. Yurgealitis, being duly sworn, depose and state:

1.) That I was previously employed as a Senior Special Agent / Program Manager with the Bureau of Alcohol, Tobacco Firearms & Explosives, (ATF) United States Department of Justice, and had been so employed since 1990. Prior to 1990 I was employed as a Special Agent with the Bureau of Diplomatic Security, (DSS) United States Department of State and had been so employed since 1986.

2.) I have a Bachelor of Arts Degree in Political Science and Psychology from St. John Fisher College, Rochester, New York.

3.) I am a graduate of the Federal Law Enforcement Training Center, Glynco, Georgia, the Criminal Investigator Training Program, Bureau of Diplomatic Security New Agent Training, and the Bureau of ATF New Agent Training Program.

4.) I have completed the Firearms Interstate Nexus Training Program conducted by the Firearms Technology Branch, ATF Headquarters, Washington, D.C.

5.) I have completed both Advanced Interstate and European Nexus Training conducted by ATF in conjunction with several domestic and European firearm manufacturers.

6.) I have testified in excess of 200 times before Federal Grand Juries regarding the classification, operability, and commerce of firearms and / or ammunition.

7.) I have previously qualified as an expert witness regarding the origin, operability / classification and interstate movement of firearms and ammunition in U.S. District Court for the District of Maryland, U.S. District Court for the District of Delaware and the Circuit Court For Baltimore City, Maryland.

8.) I have conducted regular training for local, state and federal law enforcement agencies both domestically and overseas regarding firearms classification, operability and firearms statutes.

9.) I maintain a personal library of books, printed material and documents that relate to the field of firearms, ammunition, and firearms classification, attend local and national trade shows and professional association meetings, and regularly review periodicals relating to firearms and ammunition.

10.) I attend trade shows, maintain contact with, and regularly consult with other persons, to include published authors and recognized experts in the origin, identification and classification of firearms and ammunition.

11.) I have, during my tenure with ATF, personally examined in excess of five thousand firearms to determine their origin and classification and operability, and to facilitate the tracing of those firearms.

I have toured production facilities for numerous firearms and ammunition manufacturers. The tours were conducted by corporate historians, corporate officers, or production engineering personnel.

Domestic Firearm Manufacturers:
Bushmaster Firearms, Ilion, NY, USA
Colt, New Haven CT, USA (4x)
H&R 1871 Inc., Chicopee, MA, USA (2x)
Marlin, North Haven CT, USA (4x)
O.F. Mossberg & Sons, North Haven, CT, USA (4x)
Remington Firearms, Ilion, NY, USA
Savage Arms Inc., Westfield, MA, USA (4x)
Sig-Sauer / SIGARMS Inc., Exeter, NH, USA (3x)
Smith and Wesson, Springfield, MA, USA (4x)
Sturm Ruger, Newport, NH, USA (4x)
Yankee Hill Machining, Florence, MA, USA

Foreign Firearm Manufacturers:
Carl Walther GmbH, Ulm, Germany
Ceska Zbrojovka (CZ), Uhersky Brod, Czech Republic
Fegarmy (FEG), Budapest, Hungary
F.N Herstal S.A., Herstal, Belgium
Glock GmbH, Deutsch-Wagram, Austria
Heckler & Koch GmbH, Oberndorf au Neckar, Germany
J.P. Sauer & Sohn GmbH, Eckernforde, Germany

Domestic Ammunition Manufacturers:
Fiocchi Ammunition, Ozark, MO, USA
PMC, Boulder City, NV, USA
Remington, Lonoke, AR, USA (4x)
Sierra, Sedalia, MO, USA
Starline Brass, Sedalia, MO, USA

European Proof Houses
Beschussamt Ulm, (Ulm Proofhouse) Ulm, Germany
Beschusstelle Eckernforde, (Eckernforde Proofhouse) Eckernforde, Germany
Czech Republic Proofhouse, Uhersky Brod, Czech Republic
Liege Proofhouse, Liege, Belgium

Qualifications Of James E. Yurgealitis contd.

I have been allowed regular access to the following reference collections:
Bureau of Alcohol, Tobacco Firearms and Explosives Reference Collection, Martinsburg, West Virginia, USA consisting of 5,000+ firearms

Liege Proofhouse, Liege, Belgium consisting of 1,000+ ammunition cartridges

Springfield Armory National Historic Site Firearms Collection, Springfield, MA, USA consisting of 10,000+ Firearms

Smithsonian Institution (Museum of American History) Firearms Reference Collection Washington, DC, USA, consisting of 4000+ firearms

Wertechnische Studiensammlung des BWB, (Federal Defense Procurement Bureau Museum) Koblenz, Germany consisting of 10,000+ Firearms

I have toured the following museums:
Heeresgeschichtliches Museum, (Museum of Military History), Vienna, Austria
Hungarian Military Museum, Budapest, Hungary
Springfield Armory National Historic Site, Springfield, MA, USA
United States Air Force Museum, Dayton, OH, USA
United States Army Ordnance Museum, Aberdeen Proving Ground, Aberdeen, MD, USA
United States Military Academy Museum, West Point, NY, USA
United States Naval Academy Museum, Annapolis, MD, USA
Wertechnische Studiensammlung des BWB, (Federal Defense Procurement Bureau Museum) Koblenz, Germany

Membership in Professional Organizations:

Member, International Ammunition Association (IAA)
Technical Advisor (pending approval), Association of Firearm and Toolmark Examiners (AFTE)
Member, Federal Law Enforcement Officers Association (FLEOA)

Exhibit C

Ultimate 20th Century Reference Edition

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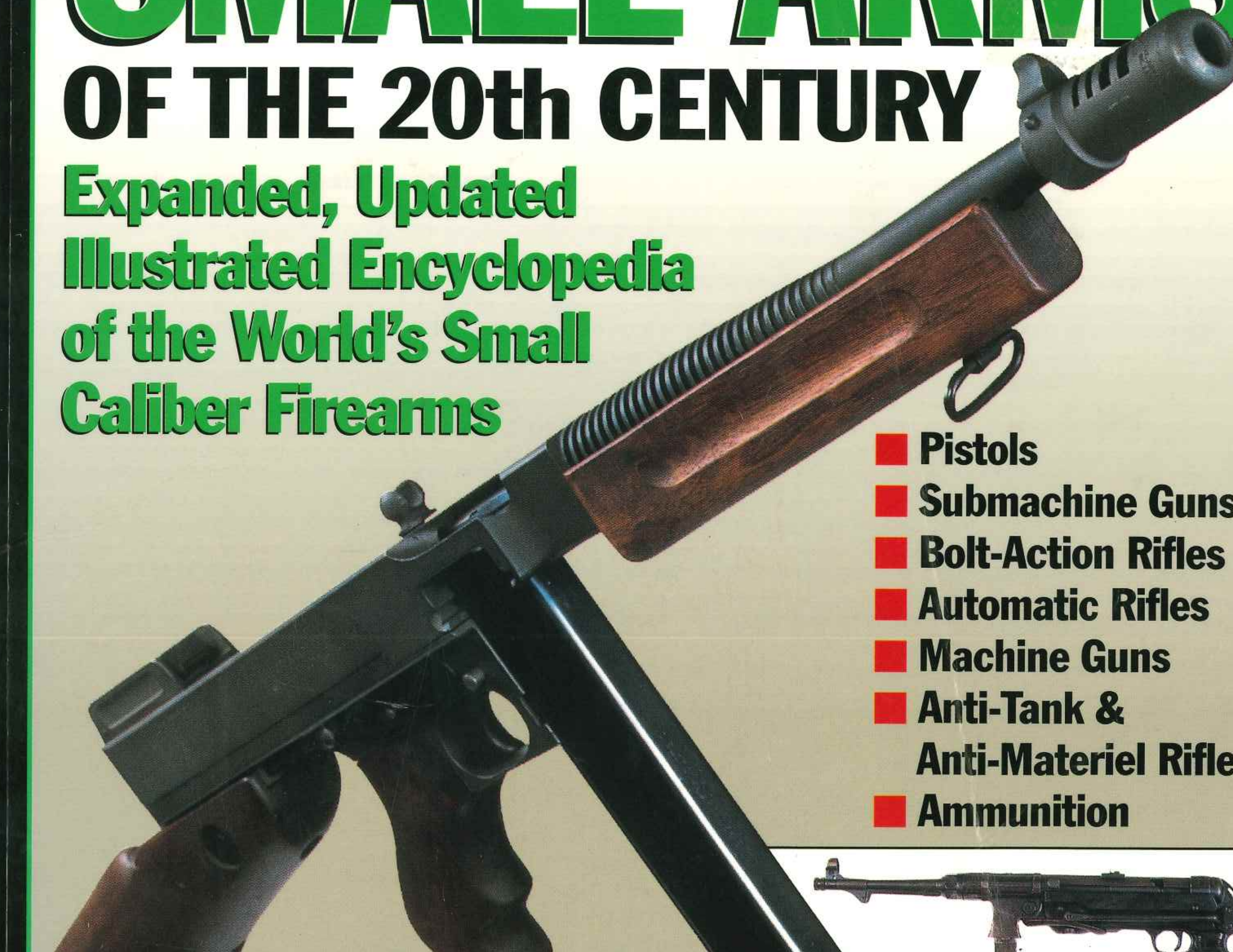
7th Edition

Expanded, Updated Illustrated Encyclopedia of the World's Small Caliber Firearms



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Ian V. Hogg & John S. Weeks

MILITARY SMALL ARMS

OF THE 20th CENTURY

7th Edition

Ian V. Hogg & John S. Weeks

About Our Covers.....

Front Cover - The Thompson submachine gun, in several models, served the U.S. military and the military arms of other nations. Below, the German MP40 submachine gun and Colt's new M4 carbine.

Back Cover - Legendary U.S. arms of the WWII era. Top, the Browning Automatic Rifle (BAR); M1 Garand rifle; Thompson submachine gun and the M3 submachine gun, also known as the "Grease Gun".

These illustrations were made possible through the generous assistance of Charles Justmann, Bob Pucci, Ray Farrell and Colt's Manufacturing Company, Inc. -- and we thank them.

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Printed in the United States of America


Steyr 7.65mm M1909, based on Pieper's patents.

• Steyr Model 1908

Osterreichische Waffenfabrik-Gesellschaft, Steyr

7.65mm automatic pistol (32 ACP)

This peculiar weapon was designed by the Pieper company of Liege, who also manufactured a small number under their own name, but the principal manufacture was done at Steyr and the gun was issued in some numbers to the Austrian police. Some later saw emergency service in World War I.

It appears to be a highly ingenious design until careful thought robs the unusual features of some of their attraction. In the first place, the gun has a thumb-catch on the left side which, when pressed, allows the barrel to hinge forward so that a cartridge can be loaded directly into the chamber. This movement also disconnects the above-barrel recoil spring from the breechblock so that the block can be drawn back and pushed forward to cock the internal hammer—but this should only be done when the magazine is either empty or withdrawn, otherwise the action feeds the top round out of the magazine and on to the ground. There is no extractor fitted as the design relies on residual gas pressure to blow out the spent case as it drives the breechblock back, until the ejector deflects the case through the side port. This means that ammunition malfunctions—especially misfires or stuck cases—cannot be cleared by operating the slide since this will only try to load a fresh round and compound the mischief. Pieper had a habit of coming up with odd designs, but it is a little surprising to find that Steyr should bother producing one of them.

Length: 6.38in (162mm). **Weight unloaded:** 1lb 6oz (620g). **Barrel:** 3.63in (92mm), 6 grooves, right-hand twist. **Magazine:** 7-round detachable box. **Muzzle velocity:** c.900 ft/sec (274 m/sec).

• Steyr M12 ('Steyr-Hahn,)

Osterreichische Waffenfabrik-Gesellschaft, Steyr

9x23mm Steyr M12; 9mm Parabellum

This became the Austro-Hungarian side-arm for elements other than cavalry in 1912. Like the Roth-Steyr, it used a rotating barrel to lock the breech, but the system was much simpler, using a conventional type of slide. Barrel and slide recoiled together for a short distance, during which lugs on the barrel engaged in cam grooves on the frame to turn the barrel through 20 degrees. This disengaged an upper lug from a groove in the slide, so that the barrel halted and the slide was free to recoil. The motion was reversed on the return of the slide. As with other Steyr designs the magazine is an integral box, loaded by means of a charger, and the cartridge is a unique and powerful 9mm cartridge. The 'Steyr-Hahn' (Steyr with hammer—since it used an external hammer instead of the striker of the earlier design) was made in considerable numbers between 1911 and 1918, and was adopted in Romania and Chile as well as being sold commercially. It remained the standard Austrian pistol after 1918, and when the Austrian Army was absorbed into the Wehrmacht in 1938 some 200,000 or so were re-barreled to 9mm Parabellum so as to standardize with the German Army ammunition system. These are marked 'P-08' on the left side of the slide. Although the grip is somewhat square to the frame, the Model 1912 is an excellent pistol, strong and reliable, and it is possible that had it been made originally in a more common caliber it would have achieved greater success.

Length: 8.50in (216mm). **Weight unloaded:** 2lb 3oz (990g). **Barrel:** 5.10in (128mm), 4 grooves, right-hand twist. **Magazine:** 8-round fixed. **Muzzle velocity:** c.1100 ft/sec (335 m/sec).

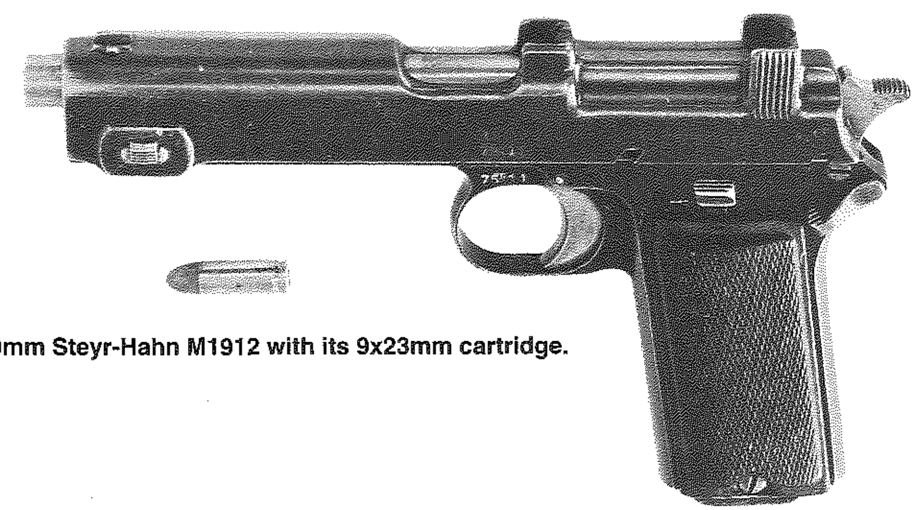
• Steyr GB

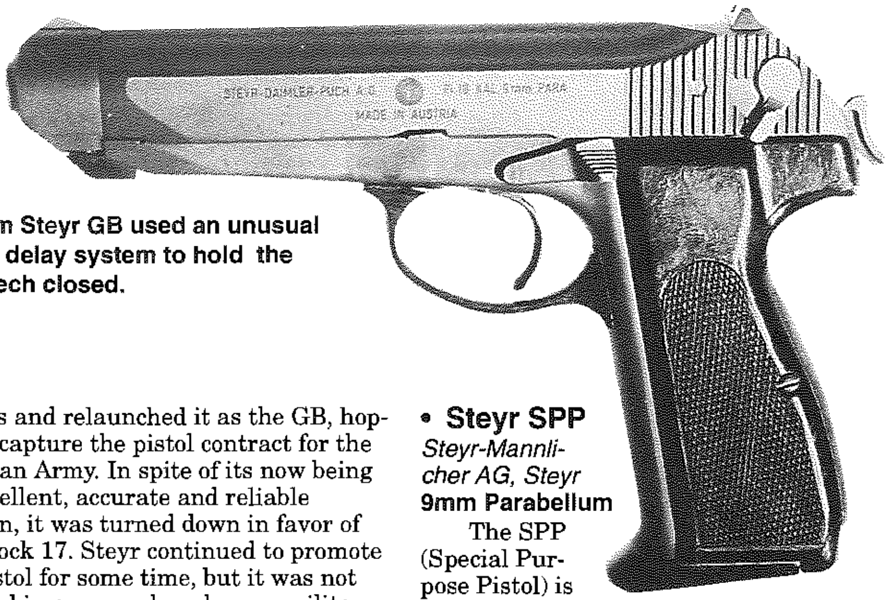
Steyr-Daimler-Puch AG, Steyr Austria

9mm Parabellum

The Steyr GB was a delayed blowback pistol, the delay being obtained by tapping a small amount of gas from the chamber and leading it to the interior of the slide, where it entered an annular expansion chamber formed by the slide surrounding the barrel. Here the pressure built up resisted the opening action of the slide for a long enough period to allow the bullet to clear the barrel and the breech pressure to drop to a safe level. The system is akin to that pioneered by Barnitske of Gustloff-werke in the VG1-5 Volksturmgewehr and in the Volkspistole. The trigger mechanism was double action, using an external hammer, and the barrel was rifled in the polygonal form, which is also that used by Heckler & Koch in their P9 pistol.

Developed in the mid-1970s and originally known as the Pi 18, this pistol was first developed with the option of automatic fire; used with a stock and a 36-round extended magazine it could function as a form of submachine-gun. This option, however, was soon dropped. It was then made under license in the USA by Rogac Inc., and sold as the LES P-18. Unfortunately the quality control was poor, the pistol acquired a reputation for malfunction, and the license was rescinded. Steyr then made some modifi-


9mm Steyr-Hahn M1912 with its 9x23mm cartridge.



9mm Steyr GB used an unusual gas delay system to hold the breech closed.

cations and relaunched it as the GB, hoping to capture the pistol contract for the Austrian Army. In spite of its now being an excellent, accurate and reliable weapon, it was turned down in favor of the Glock 17. Steyr continued to promote the pistol for some time, but it was not adopted in any numbers by any military force and production ended in 1989.

Length: 8.5in (216mm). **Weight unloaded:** 1lb 14oz (840g). **Barrel.** 5.35in (136mm), 4 grooves, right-hand twist, polygonal. **Magazine:** 18-round detachable box. **Muzzle velocity:** c.1275 ft/sec (388 m/sec).

• Steyr SPP

Steyr-Mannlicher AG, Steyr
9mm Parabellum

The SPP (Special Purpose Pistol) is a semi-automatic version of the TMP (Tactical Machine Pistol) submachine gun. It uses the same synthetic frame and receiver and operates in the same delayed blowback mode by means of a rotating barrel. The principal difference is that the pistol has no forward handgrip and a slightly greater length of exposed barrel and jacket in front of the receiver.

Length: 12.68in (322mm). **Weight unloaded:** 2lb 14oz (1300g). **Barrel:** 5.12in (130mm); 6 grooves, right-hand twist. **Magazine:** 15- or 30-round detachable box. **Muzzle velocity:** c.1246 ft/sec (380 m/sec).

• Glock Model 17 Pistol

Glock GmbH, Deutsch Wagram,
9mm Parabellum

This pistol was adopted by the Austrian Army in 1983, 25,000 being ordered. It is a recoil-operated semi-automatic, using a cam-controlled dropping barrel to lock slide and barrel together. Firing is by means of a striker controlled by the trigger; the first 5mm of trigger travel cocks the striker and releases the firing pin lock, and the next 2.5mm of travel releases the striker. The pressure required to actuate the trigger can be adjusted. There is no manual safety catch since the integral firing pin lock will prevent the pistol firing unless the trigger is properly operated. The Glock 17 is of simple design, there being only 32 components including the magazine.

The **Model 17L** is similar to the basic Model 17 but has a longer barrel, for target shooting. The **Model 17C** is also similar to the Model 17 but has an integrated muzzle compensator which is claimed to reduce muzzle climb by up to 30 percent.

Length: 7.40in (188mm). **Weight unloaded:** 1lb 7oz (625g). **Barrel:** 4.49in (114mm); 6 grooves, polygonal, right-hand twist. **Magazine:** 17-round detachable box. **Muzzle velocity:** c.1263 ft/sec (385 m/sec).

• Glock 18 and 18C

Glock GmbH, Deutsche Wagram
9mm Parabellum

The Glock Model 18 was basically the same as the Model 17 but with a selective fire capability, allowing automatic fire or single shots, and an enlarged magazine. For obvious reasons the principal mechanical components of the Models 17 and 18 are not interchangeable, and its sale is restricted to official bodies.

The Model 18 was replaced in production by the Model 18C; this is exactly the same but for the provision of a muzzle compensator. Four slots in the muzzle and a slot in the slide allow an upward escape of gas and thus helps to keep the weapon stable, particularly when firing in the automatic mode.

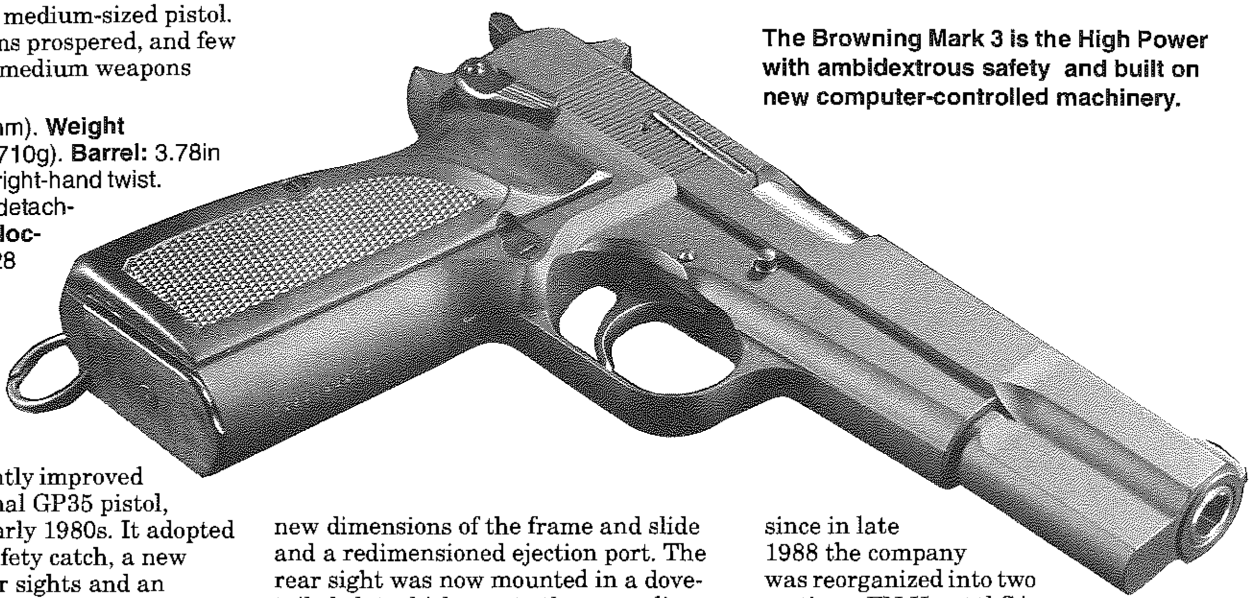
Length: 7.32in (186mm). **Weight unloaded:** 1lb 5oz (586g). **Barrel:** 4.49in (114mm); 6 grooves, polygonal, right-hand twist. **Magazine:** 17- or 19-round detachable box. **Muzzle velocity:** c.1115 ft/sec (340 m/sec).

The Steyr Special Purpose Pistol.

The Glock Model 17L, showing the safety spur on the trigger.

frame, to produce a medium-sized pistol. None of these designs prospered, and few of the compact and medium weapons were ever made.

Length: 6.8in (173mm). **Weight unloaded:** 1lb 9oz (710g). **Barrel:** 3.78in (96mm), 4 grooves, right-hand twist. **Magazine:** 7-round detachable box. **Muzzle velocity:** c.1000 ft/sec (328 m/sec).



The Browning Mark 3 is the High Power with ambidextrous safety and built on new computer-controlled machinery.

• Browning Mk 2

Fabrique Nationale, Herstal-lez-Liege
9mm Parabellum

This was a slightly improved version of the original GP35 pistol, introduced in the early 1980s. It adopted an ambidextrous safety catch, a new design of grip, wider sights and an anti-glare finish. It was purchased by a number of military forces, but in relatively small numbers and in the face of very strong competition from more modern designs. There were also complaints of failures from some quarters, which led FN to withdraw it in 1987 and set about retooling their production line and developing the Mark 3 (below). The dimensions and data are exactly the same as those for the GP35.

• Browning Mk 3 and 3S

FN Herstal SA (Mk 3)
Browning SA (Mk 3S)
9mm Parabellum

These pistols were introduced in January 1989 and were essentially the Browning Mk 2 but manufactured to a higher standard, using new computer-controlled machinery, and with new dimensions of the frame and slide and a redimensioned ejection port. The rear sight was now mounted in a dovetailed slot which was to the same dimensions as that of the Target GP35, so that owners wishing to improve the sights could easily have the target sights fitted. There were also recesses for the addition of Tritium night sighting spots alongside the rear sight and in the front sight blade. The safety catch was ambidextrous and the grips were newly designed to a better anatomical shape. The Mark 3 was the standard single-action weapon; the Mark 3S was a special version produced for police use and incorporated an automatic firing pin safety system in which the firing pin is positively locked against any movement except during the final pressure of the trigger. A mechanism linked to the sear bar then releases the firing pin in time for it to be struck by the falling hammer. The Mark 3S was produced under the Browning name, since in late 1988 the company was reorganized into two sections: FN Herstal SA dealt with military business, while Browning SA attended to police and commercial sales. Within six months of its announcement, 25,000 of the Mark 3S had been sold to European police forces.

The Browning Mark 2 reverted to single action and was simply an up-to-date M1935.

• FN BDA 9

FN Herstal SA
9mm Parabellum

The BDA 9 is a further development of the High-Power and functions in the same way, differing in having a double-action trigger and a hammer decocking lever in place of the safety catch. The decocking lever is duplicated on both sides of the frame and can thus be used with either hand. The magazine release is normally fitted for right-hand use but can easily be removed and reversed to suit left-handed use. The pistol is loaded in the usual manner by pulling back and releasing the slide. It can then be fired or, by pressing the de-cocking lever, the hammer can be lowered. Operation of the lever inserts a safety device between the hammer and the firing pin, and a braking lever slows down the hammer's fall. There is also an automatic firing pin safety system which keeps the firing pin securely locked except during the final movement of the trigger when firing. Once the hammer has been lowered the pistol can be carried with a round in the chamber in perfect safety and can be instantly fired by simply pulling the trigger through.

Length: 7.87In (200mm). **Weight empty:** 1lb 15oz (905g). **Barrel:** 4.65in (118mm), 6 grooves, right-hand twist. **Magazine:** 14-shot detachable box. **Muzzle velocity:** 1,148 ft/sec (350 m/sec).

The BDA9 is the High Power updated to double action.

• FN BDAO

FN Herstal SA

9mm Parabellum

The BDAO is the same as the BDA9 except that it is self-cocking only (or double-action only, as you prefer) and for that reason there is no cocking spur on the hammer. As the slide goes forward after cocking, and after each shot, so the hammer follows it but is arrested before it can strike the firing pin. An automatic firing pin safety system ensures that the pistol cannot fire unless the trigger is pulled completely through to the full-cock position, so that accidental discharges are practically impossible.

Length: 7.87In (200mm). **Weight empty:** 1lb 14oz (870g). **Barrel:** 4.65in (118mm), 6 grooves, right-hand twist. **Magazine:** 14-shot detachable box. **Muzzle velocity:** 1,148 ft/sec (350 m/sec).

• FN Five-seveN

FN Herstal SA, Liege.

5.7x28mm

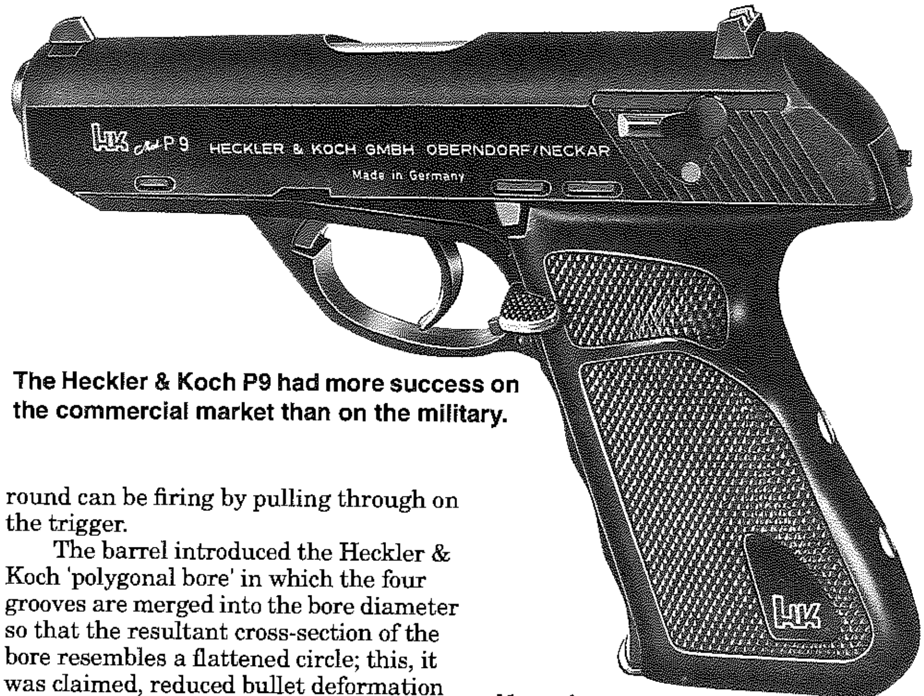
This is a self-cocking semi-automatic firing the same cartridge as the P-90 personal defense weapon (described in the Submachine Gun section). The trigger action is rather unusual in that pressure on the trigger first loads the firing pin spring and then releases the firing pin. Unless the trigger is pressed, the firing pin is never under any sort of pressure, and thus there is no safety catch of the normal type.

The Five-seveN field-stripped; don't be fooled by the lug, this is a delayed blowback pistol.

The FN Five-seveN fires a new high-velocity cartridge to give long range and superior penetration.

The FN Five-seveN with silencer fitted.

Surprisingly, for a weapon of such power, the Five-seveN operates on the delayed blowback principle. The slide carries two notches on its under-surface. Set into the frame is a cross-shaft carrying two connected lugs. The barrel is a loose fit in the slide, and when the barrel and slide are assembled to the frame, a slotted lug beneath the chamber is so placed that the slot lines up with the cross-shaft. On firing, the pressure in the chamber forces the bullet up the barrel, and the friction and torque of the bullet's movement tends to thrust the barrel forward. At the same time the gas pressure forces the cartridge case back and puts pressure on the slide to move to the rear. Barrel and slide move rearward together about 3mm, at which point the slide



The Heckler & Koch P9 had more success on the commercial market than on the military.

round can be firing by pulling through on the trigger.

The barrel introduced the Heckler & Koch 'polygonal bore' in which the four grooves are merged into the bore diameter so that the resultant cross-section of the bore resembles a flattened circle; this, it was claimed, reduced bullet deformation and improved velocity by offering less resistance to the passage of the bullet.

While the P9 and P9S were basically conceived as military pistols, and were taken into use by the German Border Police and other police forces, it was also offered as a potential competition pistol. Alternative barrel lengths of 5 and 5.5-inch were available, together with muzzle balance weights, adjustable sights, a trigger stop and fine adjustment of the trigger travel.

Length: 7.56in (192mm). **Weight unloaded:** 2lb 0oz (950g). **Barrel:** 4.0in (102mm), 4 grooves, right-hand, polygonal. **Magazine:** 9-round detachable box (7.65mm = 8 rounds). **Muzzle velocity:** c. 1150 ft/sec (350 m/sec) (7.65: 1200/370).

• Heckler & Koch VP-70

Heckler & Koch GmbH, Oberndorf-am-Neckar
9mm Parabellum

This is a blowback pistol with some unusual features. The magazine, in the butt, carries the remarkable number of 18 rounds, and the pistol can only be fired in the self-cocking mode, by means of a striker. Pulling the trigger first cocks and then releases the striker, and the trigger movement gives a distinct 'first pressure' as the cocking action takes place, where upon further pressure fires the cartridge. This system removes most of the objection to double-action-only systems since it allows a steady aim to be taken and the minimum disturbance of aim at the point of striker release. Since this self-cocking system allows the pistol to be carried loaded quite safely, a safety catch is not normally fitted, but one could be provided (a push-button behind the trigger) if the purchaser so desired.

A holster-stock unit could be fitted; once this was done, a connection with the lockwork allowed the firing of single shots or three-round bursts for each operation of the trigger. This burst facility, another innovative idea, removed the principal objections to the conversion of a pistol into a submachine gun; in such cases only the first few rounds normally have any effect on the target, after which the gun climbs uncontrollably. The Heckler & Koch burst facility ensured that the first few rounds of the burst were the only ones, so that accuracy in automatic fire was guaranteed.

The VP-70 is also of interest in that it used the most modern approach to manufacturing; the receiver is of plastic, with a molded-in barrel support, a construction which is easy to make, resistant to damage, and demanding the minimum maintenance in the field.

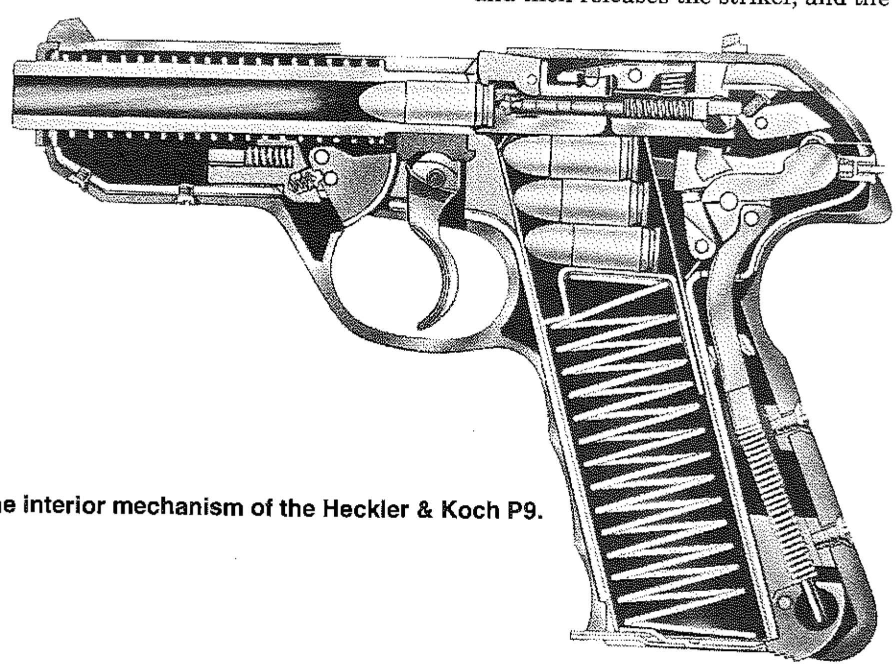
The pistol enjoyed commercial sales to African and Asian countries and was adopted by a few military forces, but it was never as successful as the company had hoped and production ceased in the mid-1980s.

Length: 8.03in (204mm). **Weight unloaded:** 1lb 13oz (920g). **Barrel:** 4.57in (116mm). **Magazine:** 18-round detachable box. **Muzzle velocity:** c.1180 ft/sec (360 m/sec).

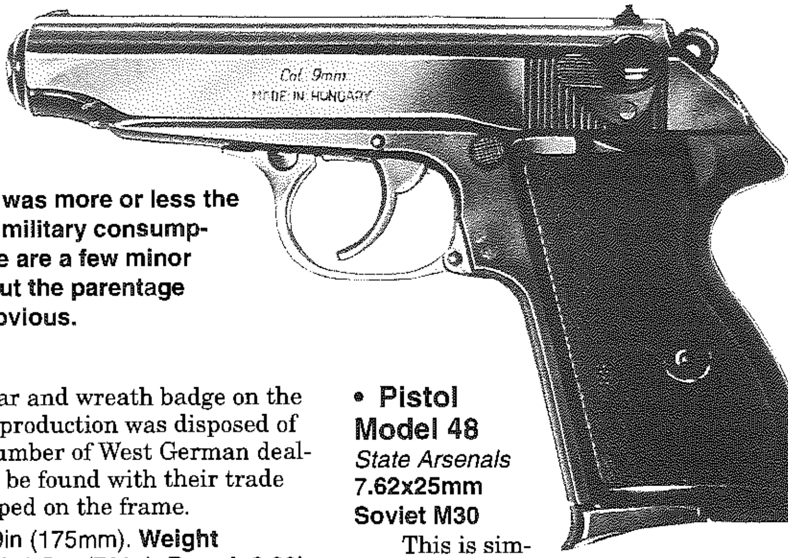
• Heckler & Koch P7

Heckler & Koch GmbH, Oberndorf-am-Neckar
9mm Parabellum

The P7 family was developed to satisfy a demand from the Federal German Police for a pistol which would be entirely safe to carry loaded but which could be brought into action with the minimum delay. This requirement has been satisfied by the adoption of a cocking lever which forms the front edge of the grip. Assuming the pistol to be empty, with the slide held open after the last shot, on inserting the magazine and squeezing the grip, the slide is released to run forward and chamber a round. Squeezing the grip will now cock the firing pin and pulling the trigger will release the firing pin and fire a shot.



The interior mechanism of the Heckler & Koch P9.



The PA-63 was more or less the Walam for military consumption. There are a few minor changes but the parentage remains obvious.

an ornate star and wreath badge on the grips. Later production was disposed of through a number of West German dealers and may be found with their trade names stamped on the frame.

Length: 6.89in (175mm). **Weight unloaded:** 1lb 8.5oz (700g). **Barrel:** 3.90in (100mm), 6 grooves, right-hand twist. **Magazine:** 8-round detachable box. **Muzzle velocity:** c.965 ft/sec (295 m/sec).

• Pistol PA-63

State Arsenals
9x18mm Makarov

This is another copy of the Walther PP, developed for the Hungarian Army in the late 1950s. The dimensions differ slightly, and the weapon is lighter than the Walther due to extensive use of light alloy in the construction. It is also manufactured in 7.65mm caliber, probably for police use.

Length: 6.89in (175mm). **Weight unloaded:** 1lb 5oz (595g). **Barrel:** 3.94in (100mm), 6 grooves, right-hand twist. **Magazine:** 7-round detachable box. **Muzzle velocity:** c.965 ft/sec (295 m/sec).

• Pistol Model 48

State Arsenals
7.62x25mm Soviet M30

This is simply the standard Soviet TT33 Tokarev pistol made under license in Hungary. The Hungarian version can be distinguished by the crest on the grip (a star, wheatsheaf and hammer surrounded by a wreath) and by the vertical finger-grip cuts on the slide which are narrower and more uniform than those on Soviet weapons. Dimensions, etc., are exactly as for the Tokarev.

ISRAEL

• Uzi Pistol

Israel Military Industries, Ramat Hasharon
9x19mm Parabellum

The Uzi pistol is simply a shortened, lightened and simplified version of the Uzi submachine gun. It has the same general outline, with the magazine housing in the pistol grip at the center of balance and with the cocking handle on top of the receiver, but it has no automatic fire capability and is so designed that attempting to convert it to automatic fire would be virtually impossible. It may look cumbersome, but the weight sits well in the hand and makes the weapon very stable when fired. It is, of course, a blowback weapon, firing from a closed breech, and was originally proposed commercially as a weapon for home defense use, but it has obvious military and security applications and has been seen in the hands of such forces and also fitted with silencers and laser sights.

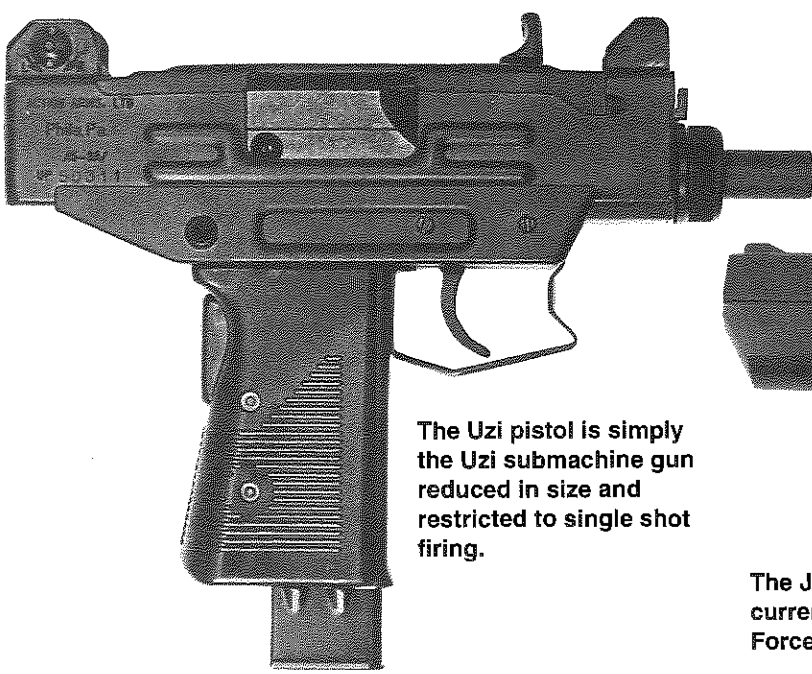
Length: 9.45in (240mm). **Weight unloaded:** 3lb 12oz (1700g). **Barrel:** 4.53in (115mm), 4 grooves, right-hand twist. **Magazine:** 20-, 25- or 30-round detachable box. **Muzzle velocity:** c.1132 ft/sec (345 m/sec).

• Jericho 941

Israel Military Industries, Ramat Hasharon
9x19mm Parabellum and others

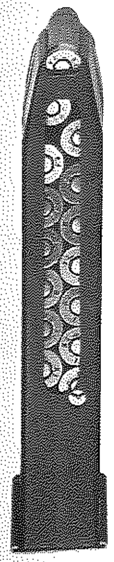
The Jericho is a conventional locked-breech pistol using a dropping barrel which locks into the ejection opening in the slide. Hammer-fired and double action, the slide runs on internal frame rails, improving the accuracy. The pistol is normally in 9mm caliber but by replacing the barrel, return spring and magazine it can be made to fire 40 Smith & Wesson or 41 Action Express cartridges. It is also available with various options such as single-action only or double-action only, ambidextrous safety catch, and a butt-mounted safety lock. A compact model is also made. It has been adopted by various Israeli police and security agencies.

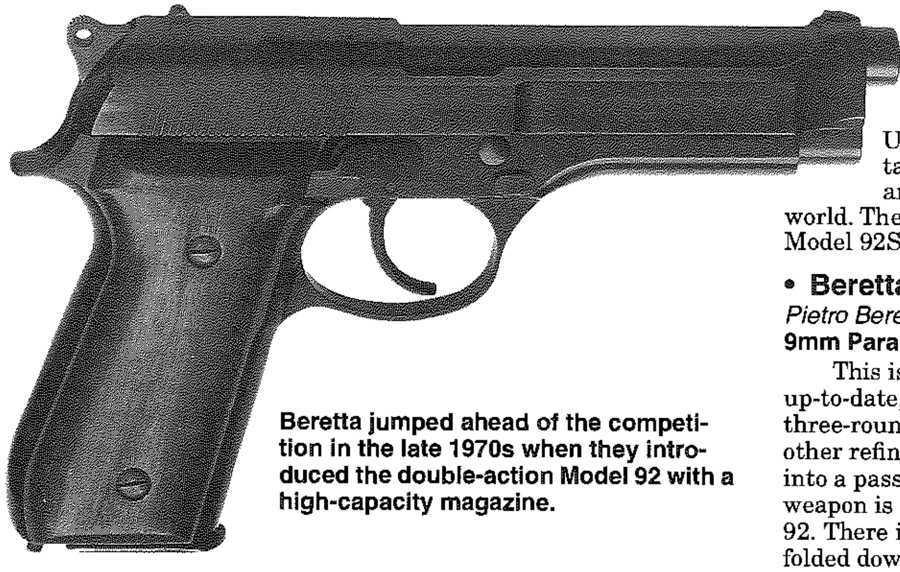
Length: 8.14in (207mm). **Weight unloaded:** 2lb 6oz (1090g). **Barrel:** 4.72in (120mm), 6 grooves, polygonal, right-hand twist. **Magazine:** 16-round detachable box. **Muzzle velocity:** c.1132 ft/sec (360 m/sec).



The Uzi pistol is simply the Uzi submachine gun reduced in size and restricted to single shot firing.

The Jericho, a simple and elegant design currently in use by the Israeli Defense Force.





Beretta jumped ahead of the competition in the late 1970s when they introduced the double-action Model 92 with a high-capacity magazine.

Length: 8.54in (217mm). **Weight unloaded:** 2lb 2oz (950g). **Barrel:** 4.92in (125mm), 6 grooves, right-hand twist. **Magazine:** 15-round detachable box. **Muzzle velocity:** c.1280 ft/sec (390 m/sec).

• Beretta Model 92SB

Pietro Beretta SpA, Gardone Val Trompia
9mm Parabellum

In 1980 the US Army began trials to find a pistol to replace the Colt M1911A1, and Beretta modified their Model 92 to suit the US specification, resulting in the Model 92SB. It differed from the 92 in having a safety catch on both sides of the slide, a magazine catch behind the triggerguard, where it can be moved to either side as desired, and a new system of safeties including an automatic firing pin lock. The hammer was given a half-cock notch, and the butt is grooved at the rear to improve grip. The dimensions, etc., are exactly as for the Model 92, except that the weight is now 2lb 3oz (980g).

• Beretta Model 92F

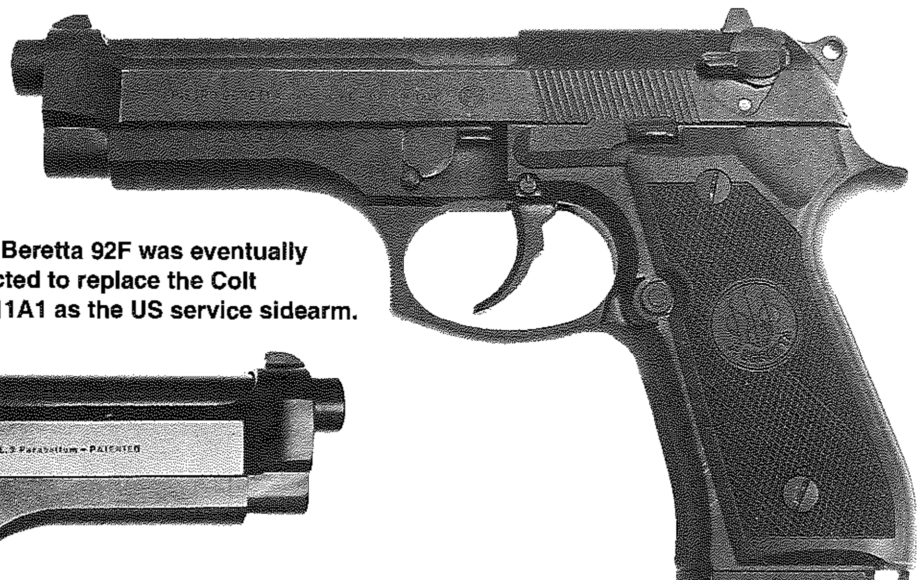
Pietro Beretta SpA, Gardone Val Trompia
9mm Parabellum

The Model 92SB walked away with the US trials, but the Army required some minor changes before accepting it as the Pistol M9. The triggerguard was reshaped to suit the two-handed grip, the magazine had its base extended to improve the grip and the butt front edge was curved at the toe, new grip plates and lanyard ring were fitted. The barrel is chromed internally and the external finish is 'Bruniton', a Teflon-type material. After adoption by the US Army the Model 92F was taken into use by many military and police forces throughout the world. The dimensions, etc., are as for the Model 92SB.

• Beretta Model 93R

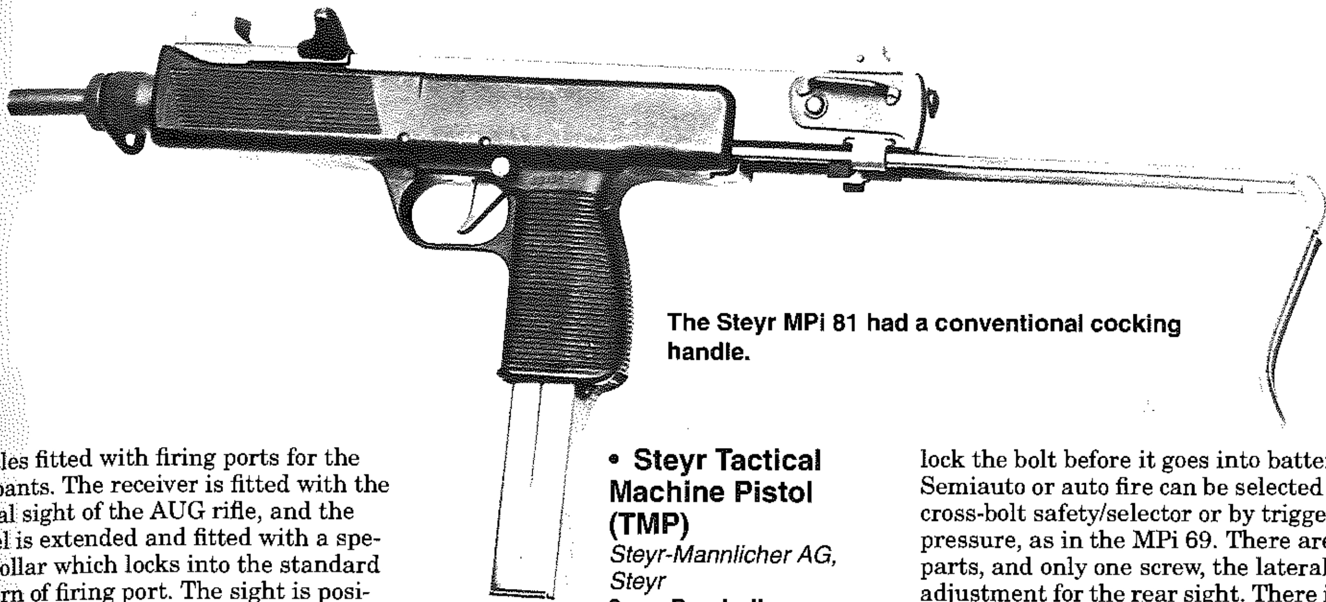
Pietro Beretta SpA, Gardone Val Trompia
9mm Parabellum

This is really the 951R brought up-to-date, a selective-fire pistol with a three-round burst facility and several other refinements aimed at turning it into a passable machine pistol. The basic weapon is almost identical to the Model 92. There is a front grip which can be folded down to be grasped by the firer's free hand, giving better support than the fashionable two-handed grip usually used. For more deliberate work a folding stock can be attached to the butt. A fire selector lever on the left side of the frame allows selection of single shots or three-round bursts, and this facility is best used with the stock in place. Another accessory is an extended 20-shot magazine, useful when the burst-fire facility is used. A muzzle brake adds to



This Beretta 92F was eventually selected to replace the Colt M1911A1 as the US service sidearm.

The Beretta lent itself to a wide range of variations; this is the 92SB, specifically designed to meet the US specification for a new service pistol.



The Steyr MPi 81 had a conventional cocking handle.

vehicles fitted with firing ports for the occupants. The receiver is fitted with the optical sight of the AUG rifle, and the barrel is extended and fitted with a special collar which locks into the standard pattern of firing port. The sight is positioned, by a special bracket, so that it can be used with the vision blocks fitted above the firing ports.

• Steyr AUG 9mm Para

Steyr-Mannlicher AG, Steyr, Austria
9mm Parabellum

This is a submachine gun version of the standard AUG assault rifle. It uses the existing butt and receiver units of the rifle, with carrying handle and optical sight, but is fitted with a 9mm caliber barrel, a special blowback bolt group, a magazine adapter and a magazine. The adapter fits into the normal 5.56mm magazine housing in the stock, and the 9mm magazine then fits into the adapter.

Length: 26.18in (665mm). **Weight unloaded:** 7lb 11oz (3.5kg). **Barrel:** 16.54in (420mm), 6 grooves, right-hand twist. **Magazine:** 25- or 32-round box magazine. **Rate of fire:** 670-770 rds/min. **Muzzle velocity:** c.1312 ft/sec (400 m/sec).

• Steyr Tactical Machine Pistol (TMP)

Steyr-Mannlicher AG, Steyr
9mm Parabellum

This weapon, introduced in 1989, consists of a synthetic butt and frame, synthetic receiver top, and a steel barrel and breechblock combination. It is hammer-fired, the firing mechanism being modified from that of the AUG rifle. The weapon works on the delayed blowback principle, the delay being performed by a rotating barrel which owes a good deal to the Steyr 1912 pistol. The barrel lies inside a casing which fits into the top cover and acts as a guide for the bolt. On firing, bolt and barrel recoil 10-12mm or so and then a lug on the barrel, having moved down a slot, hits a cam surface and rotates the barrel about 45° clockwise. This unlocks the bolt, the barrel stops and the bolt goes rearwards. A spring drives the bolt back to collect a fresh round and chamber it and then drives the bolt into the barrel and the barrel forward again, rotating it so as to lock the bolt before it goes into battery. Semiauto or auto fire can be selected by a cross-bolt safety/selector or by trigger pressure, as in the MPi 69. There are 41 parts, and only one screw, the lateral adjustment for the rear sight. There is no stock, but a grip in front of the trigger-guard can be folded down to give a two-handed hold.

Length: 11.10in (282mm). **Weight unloaded:** 2lb 14oz (1.30kg). **Barrel:** 5.12in (130mm), 6 grooves, right-hand twist. **Magazine:** 15- or 30-round box magazine. **Rate of fire:** 900 rds/min. **Muzzle velocity:** c.1247 ft/sec (380 m/sec).

BELGIUM

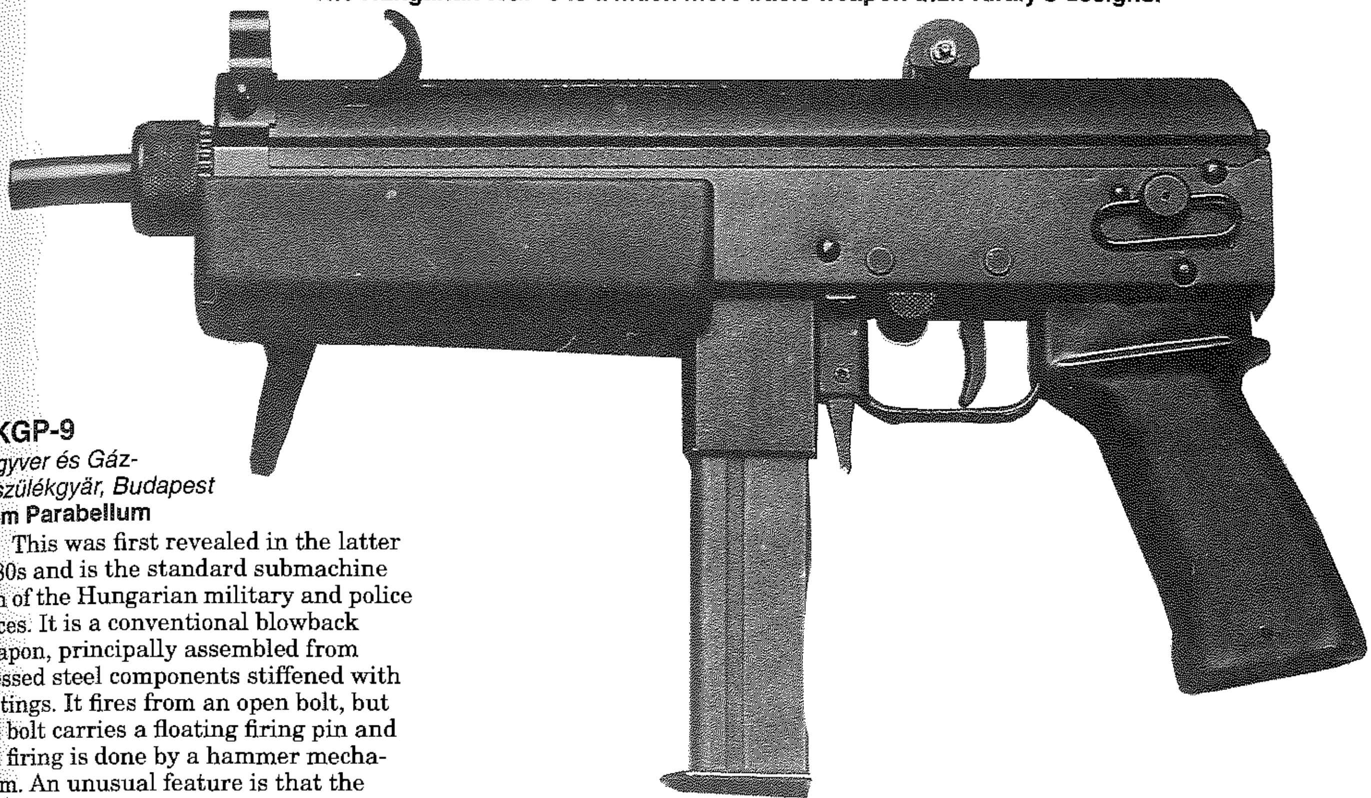
• Mitraillette RAN

Société Anonyme Belge Répousemetal, Brussels
9mm Parabellum

The RAN was never taken into military service in any country, although it was offered to any interested buyer in the early and middle 1950s. It had, however, several unusual features and illustrates a line of thought which although not suc-

The Steyr Tactical Machine Pistol.

The Hungarian KGP-9 is a much more basic weapon than Kiraly's designs.



• KGP-9

Fegyver és Gáz-készülékgyär, Budapest
9mm Parabellum

This was first revealed in the latter 1980s and is the standard submachine gun of the Hungarian military and police forces. It is a conventional blowback weapon, principally assembled from pressed steel components stiffened with castings. It fires from an open bolt, but the bolt carries a floating firing pin and the firing is done by a hammer mechanism. An unusual feature is that the standard barrel can be removed and replaced by a longer one, presumably to convert the weapon into a form of carbine with a longer range.

Length, butt extended: 24.21in (615mm). **Length,** butt folded: 13.97in (355mm). **Weight unloaded:** 6lb 1oz (2.75kg). **Barrel:** 7.48in (190mm), 6 grooves, right-hand twist (250mm optional). **Magazine:** 25-round detachable box. **Cyclic rate:** 900 rds/min. **Muzzle velocity:** c.1280 ft/sec (390 m/sec).

ISRAEL

• Submachine Gun 9mm Uzi

Israel Military Industries, Ramat Ha Sharon, and Fabrique Nationale d'Armes de Guerre, Herstal-lez-Liége, Belgium
9mm Parabellum

First designed in the early 1950s and based on the Czech 23 series, the Uzi is one of the best and most satisfactory submachine guns in service today. As soon as Israel became independent in 1948 urgent steps were taken to develop a national arms industry and the Uzi was one of the first products. It has been extensively used in the border clashes between Israel and her neighbors, as well as in the various desert wars. It is an extremely compact weapon, achieving its short length by having the bolt recessed to take the face of the breech and so having the main mass of the bolt forward of the breech; the idea was not entirely novel when the Uzi was designed, but it was among the first guns to use the principle so successfully. The magazine housing forms the pistol grip and the whole gun balances so well that single-handed firing is perfectly possible. There is a fire selector switch and safety catch above the pistol grip, and a grip safety let into its rear edge. Early models had a wooden butt, but all of current production are fitted with a neat and strong folding butt which enables the gun to be carried by vehicle crews. West Germany adopted the Uzi (as did the Netherlands) and it was made in Belgium under license by Fabrique Nationale d'Armes de Guerre of Herstal, who supplied them to many South American armies. The weapon is also in wide use by police and security forces throughout the world.

The original Uzi, with wooden butt.

The Uzi with folding butt.

Length, butt extended: 25.00in (635mm); butt folded: 17.00in (432mm). **Weight unloaded:** 7lb 10oz (3.46kg). **Barrel:** 10.25in (260mm), 4 grooves, right-hand twist. **Magazine:** 25-, 32- or 40-round detachable box. **Cyclic rate:** 600 rds/min. **Muzzle velocity:** c.1250 ft/sec (381 m/sec).

• Submachine Gun 9mm Mini-Uzi

Israel Military Industries, Ramat Ha Sharon
9mm Parabellum

This was developed in response to a request for a smaller weapon. In all respects it is identical with the Uzi except that it is smaller and, due to this, has different ballistic characteristics. The muzzle has compensating ports cut into its upper surface in order to assist control of the weapon. A special 20-round magazine is provided, but it will also accept the normal 25- and 32-round Uzi magazines.

Length, butt extended: 23.6in (600mm); butt folded: 14.2in (360mm). **Weight unloaded:** 5lb 15oz (2.70kg). **Barrel:** 7.75in (197mm), 4 grooves, right-hand twist. **Magazine:** 20-, 25- or 32-round detachable box. **Cyclic rate:** 950 rds/min. **Muzzle velocity:** c.1150 ft/sec (350 m/sec).

• Micro-Uzi

Israel Military Industries, Ramat Ha Sharon
9mm Parabellum

This is an even smaller version of the Uzi, the design reduced to its absolute minimum. It is marginally larger than a heavy pistol, and in an attempt to keep the rate of fire down to a practical figure, the bolt has been given a tungsten insert in order to increase the mass. The folding stock is a much simpler pattern than that of the larger weapons, and folds sideways so that the shoulder piece can act as a front grip when firing from the hip. This model is also available in 45 ACP caliber, with a special 16-shot magazine.

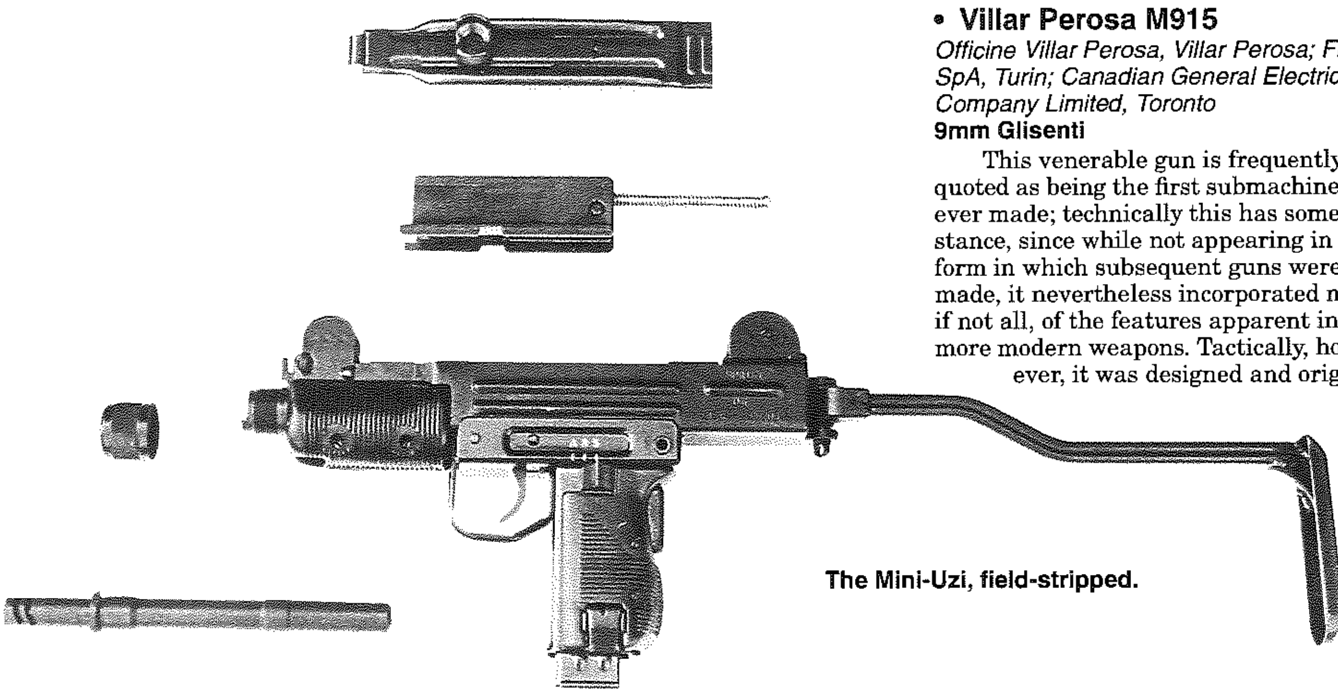
Length, butt extended: 18.11in (460mm); butt folded: 9.84in (250mm). **Weight unloaded:** 4lb 5oz (1.95kg). **Barrel:** 4.61in (117mm), 4 grooves, right-hand twist. **Magazine:** 20-round detachable box. **Cyclic rate:** 1250 rds/min. **Muzzle velocity:** c.1150 ft/sec (350 m/sec).

ITALY

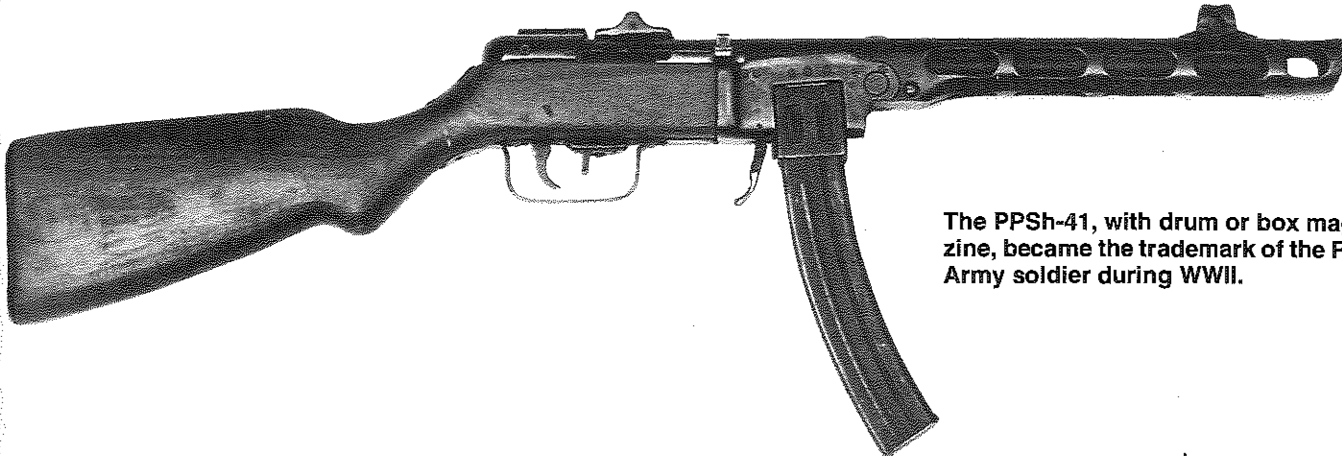
• Villar Perosa M915

Officine Villar Perosa, Villar Perosa; FIAT SpA, Turin; Canadian General Electric Company Limited, Toronto
9mm Glisenti

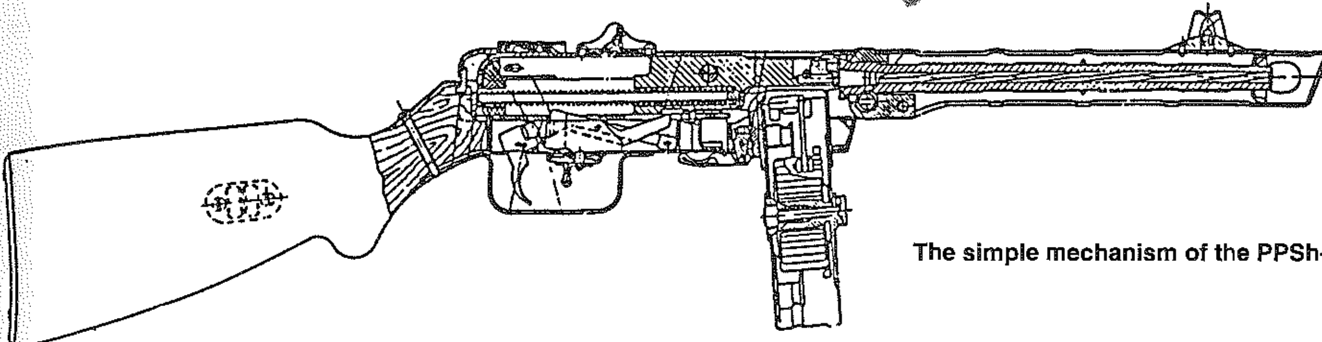
This venerable gun is frequently quoted as being the first submachine gun ever made; technically this has some substance, since while not appearing in the form in which subsequent guns were made, it nevertheless incorporated most, if not all, of the features apparent in more modern weapons. Tactically, however, it was designed and origi-



The Mini-Uzi, field-stripped.



The PPSh-41, with drum or box magazine, became the trademark of the Red Army soldier during WWII.



The simple mechanism of the PPSh-41.

stock, the form of the safety catch and in the barrel jacket (which, in the first model, had a vertical joint in front of the magazine housing). In all, about one million of the PPS were made, and they continued in service for a few years after the war.

Unusually for a Soviet gun, the PPS used a box magazine holding 35 rounds and it was never adapted to take the more popular drum, Despite its extreme simplicity bordering on crudity, the PPS was highly effective. It has now disappeared, having been rarely offered to other Communist countries, though it was widely used by the Chinese forces in Korea in 1951-52. The Finnish m/44 and m/44-46 series, and the Spanish/German DUX guns, were derived from the PPS design. It is generally believed that the virtual suppression of the PPS in post-war years was due to a political decision by Stalin; the siege of Leningrad became something of a national legend of heroism and the leaders of that siege appeared to be gaining too much political influence in post-war years; they were all replaced, and the gun that reminded everyone of the siege was removed from public view.

(PPS42)

Length, butt extended: 35.31in (897mm); butt folded: 24.88in (632mm). **Weigh unloaded:** 6lb 7oz (2.93kg). **Barrel:** 10.75in (273mm), 4 grooves, right-hand twist. **Magazine:** 35-round detachable box. **Cyclic rate:** 700 rds/min. **Muzzle velocity:** c.1600 ft/sec (488 m/sec).

(PPS43)

Length: butt extended 31.81in (808mm); butt folded: 23.85in (606mm). **Weight unloaded:** 7lb 5oz (3.33kg). **Barrel:** 10.00in (254mm), 4 grooves, right-hand twist. **Magazine:** 35-round detachable box. **Cyclic rate:** 700 rds/min. **Muzzle velocity:** c.1600 ft/sec (488 m/sec).

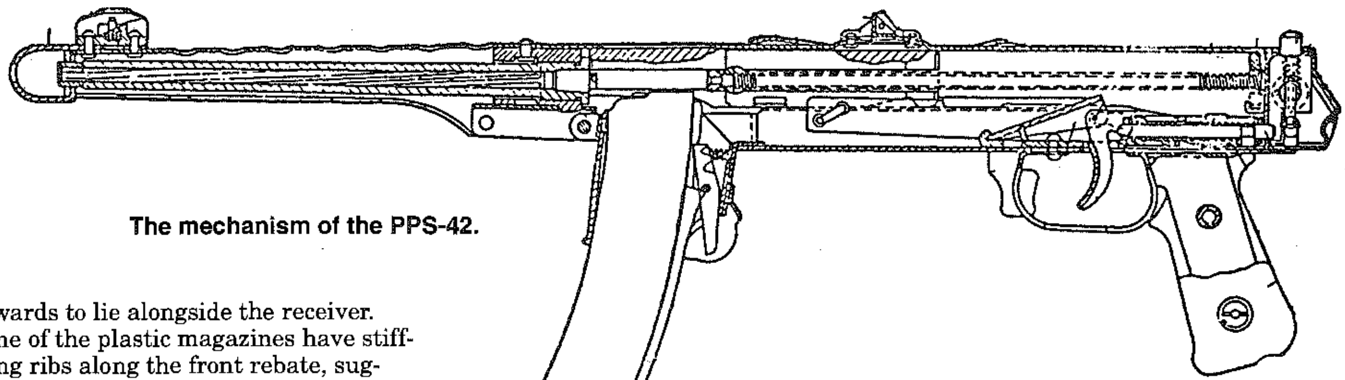
• AKS-74U

State Arsenals

5.45x39.5mm Soviet M1974

This weapon was first reported from Afghanistan late in 1983 and is a shortened version of the AKS 5.45mm assault rifle. The barrel and gas tube are much shorter and in order to reduce the violence of the gas action there is a cylindrical expansion chamber attached to the muzzle and fitted with a bell-shaped flash hider. The receiver top is slightly different from that of the normal AK series in that it is hinged at the front end and lifts forward on opening. There is a steel butt-stock which folds sideways and

The PPS-42, born in the siege of Leningrad.



The mechanism of the PPS-42.

forwards to lie alongside the receiver. Some of the plastic magazines have stiffening ribs along the front rebate, suggesting that the original AKS design was insufficiently strong.

Length, butt extended: 28.74in (730mm); butt folded: 19.29in (490mm). **Weight unloaded:** 5lbs 14oz (2.70kg). **Barrel:** 8.15in (207mm). **Magazine:** 30-round detachable box. **Cyclic rate:** 700 rds/min. **Muzzle velocity:** 2410 ft/sec (735 m/sec)

SOUTH AFRICA

• Sanna 77

Dan Pienaar Enterprise (Pty) Ltd, Johannesburg.

9mm Parabellum

This was actually the Czech vz/25 (qv) sold in South Africa as the 'Sanna'. It is not entirely clear whether this weapon was bought in from Czechoslovakia, assembled in South Africa from Czech-supplied parts, or completely made in South Africa. It had the automatic fire capability removed, so that it could only fire single shots, and in the late 1970s was offered for sale to farmers, police and similar security organizations. For data, see Czech section under Samopal CZ 48 but note that only the 40-round box magazine was offered.

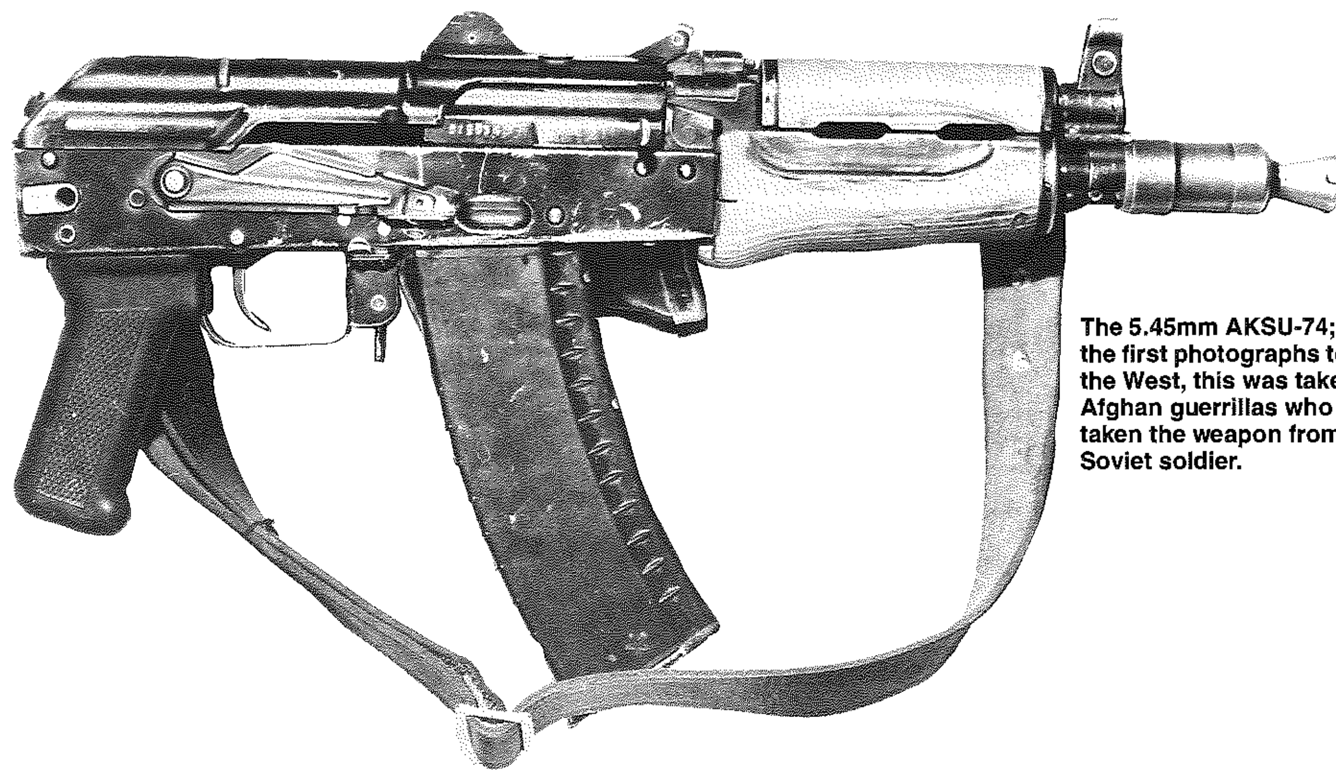
• BXP

Mechem, Silverton

9mm Parabellum

Developed in the early 1980s, this is a simple but effective weapon, built from stainless steel stampings and precision castings. It is very compact and with the butt folded can be fired one-handed like a pistol. The bolt is of the telescoped type, surrounding the rear end of the barrel when closed, and when forward it effectively seals all the apertures in the body, so preventing ingress of dirt and dust. The perforated barrel nut carries a screw-thread which will accept a compensator or a silencer which works well with standard or subsonic ammunition. There is a change-lever/safety catch on both sides of the receiver, and there is an extra notch on the bolt which will engage the sear should the weapon be dropped, so preventing accidental firing. The metal stock folds beneath the body with the shoulder pad acting as a forward hand grip and heat deflector. The exterior surfaces are coated with a rust-resistant finish which also acts as a life-long dry lubricant. The rate of fire is high, but the weapon is well-balanced and can be controlled quite easily.

Length, butt extended: 23.90in (607mm); butt folded: 15.24in (387mm). **Weight unloaded:** 5lb 11oz (2.60kg). **Barrel:** 8.19in (208mm), 6 grooves, right-hand twist. **Magazine:** 32-round detachable box. **Cyclic rate:** c.800 rds/min. **Muzzle velocity:** 1250 ft/sec (380 m/sec) (9mm Parabellum).



The 5.45mm AKSU-74; one of the first photographs to reach the West, this was taken by Afghan guerrillas who had taken the weapon from a Soviet soldier.

5.56x45mm cartridge for their new rifle, the M16. This eventually led to general down-sizing of cartridges, with the Soviets adopting a 5.45mm round. The arguments advanced were much the same as those advanced by the Germans for the 7mm Short round and by the British for their 7mm Medium round—lighter ammunition, less recoil, shorter combat ranges and so forth. But to a good number of soldiers, this was a step too far, it being generally considered that the 5.56mm bullet simply does not deliver the same effect on the target as did the 7.62mm bullet. But ballistics have very little to do with it. The simple fact is that today's soldier had rather more than a rifle and a spade to think about. He (or she) has to be trained in anti-tank rocket launchers, anti-aircraft missiles, rifle grenades, hand grenade, light and medium machine guns, mortars, driving tracked vehicles ..... not to mention attending racial discrimination lectures, AIDS symposiums, drugs discussions... there simply isn't time to waste on an old-fashioned thing like a rifle. Make it light to carry, make it simple to use, make it painless to shoot, give it an expensive optical sight so that he can't miss; but don't waste time on rifle ranges. Besides, the neighbors are complaining about the noise.

The final rifle achievement of the century was the successful production of a rifle to fire a caseless cartridge. A design of caseless cartridge was discovered in Germany after the war, but no information about a suitable weapon was ever discovered. But in about 1970 the German army, taking the long view, decided that they would require a rifle with an exceedingly high first round hit probability, and issued a broad specification. It was soon obvious that the only way to obtain the desired performance was to loose off a burst of three rounds at such a high rate of fire—around 2000 rds/minute—that one of the three was bound to hit the aiming point. But such a rate with conventional ammunition and rifle design was impossible. Heckler & Koch therefore developed a rifle firing a caseless cartridge; by removing two functions from the operating cycle—extracting and ejecting the empty case—it was possible to speed things up and achieve the desired three-round burst rate. The rifle was perfected after almost 20 years of work, but at the last moment the reunification of Germany took financial priority and the contract was canceled.

In the mid-1980s the US Army mounted an expensive project known as the Advanced Combat Rifle. This left the design of the rifle entirely open, stipulating only that it should not exceed a certain weight, but must improve upon the hit probability of the existing M16A1 rifle by a specified amount. Several gunmakers were circularized, a number made proposals, and four actually produced weapons for a most extensive (and expensive) series of trials. After the expenditure of something in the order of $350 million, the conclusion was that none of the competing designs offered sufficient improvement of performance over the M16A1 as to warrant their manufacture.

And there we rest at the century's end; on a plateau of excellence in rifle design which it is going to be very expensive to advance from and the returns, in improved performance, will not be worth the price paid. It is no longer a question of "Where do we go from here?" but of "Where can we go from here?"

ARGENTINA

• FARA 83

Fabrica Militar de Armas Portatiles Domingo Matheu, Rosario

5.56x45mm

This was a fairly simple and uncomplicated gas-operated rifle using a gas cylinder above the barrel to contain a piston attached to a bolt carrier holding a two-lug rotating bolt. The cocking handle was forward and to the right, apparently influenced by the Heckler & Koch pattern, and the plastic butt was hinged to fold around to the right side of the receiver. On removing a lock pin at the bottom rear of the receiver, the pistol grip and butt could be hinged down, allowing the bolt and piston to be withdrawn from the rear of the receiver.

The rifle went into production late in 1983 but after about 1200 had been issued to the Argentine Army a financial crisis caused the issue to be stopped, and apart from a small batch made as demonstrators for sales purposes, no more have been made since about 1986.

Length, stock extended: 39.37in (1000mm); stock folded: 29.33in (745mm). **Weight unloaded:** 8lb 11oz (3.95kg). **Barrel:** 17.79in (452mm); 6 grooves, right-hand twist. **Magazine:** 30-round detachable box. **Cyclic rate:** c.750rpm. **Muzzle velocity:** 3166 ft/sec (965 m/sec).

AUSTRIA

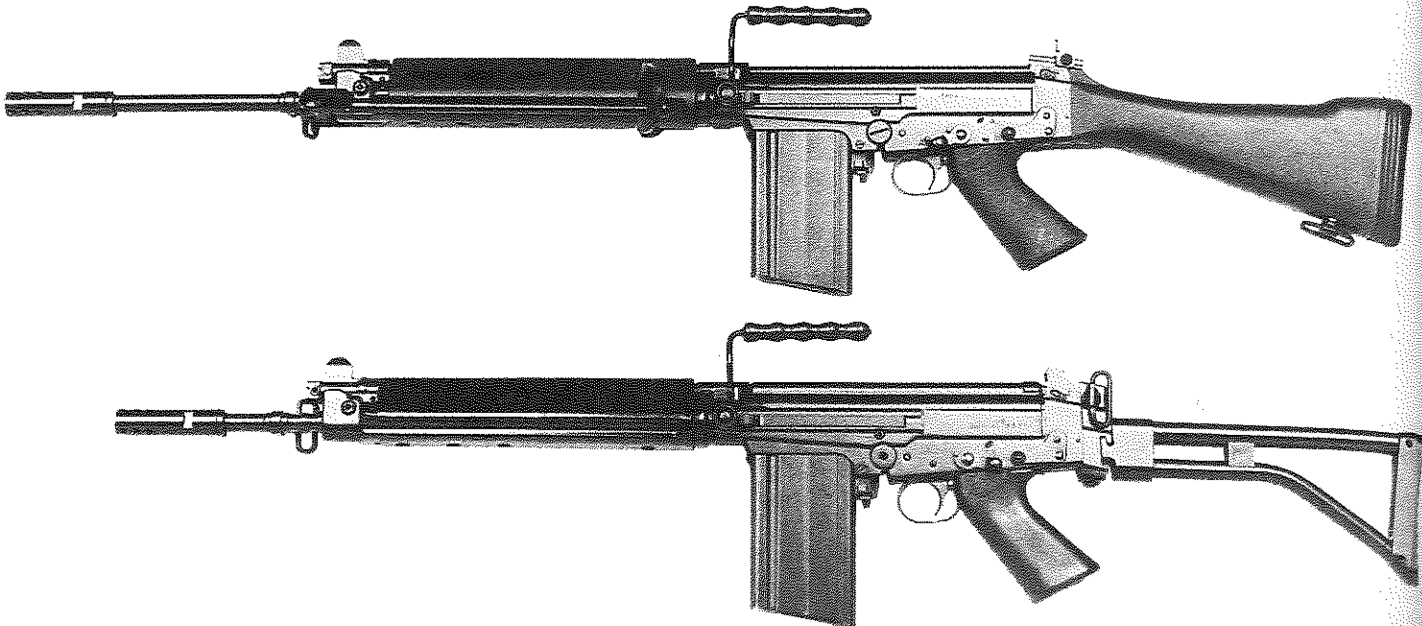
• Steyr AUG (1978)

Steyr-Mannlicher AG, Steyr

5.5x45mm

The Steyr 'Armee Universal Gewehr' is so called since it can function as a submachine gun, a carbine, an assault rifle, or a heavy-barreled automatic rifle (HBAR) for use in the squad automatic role. The difference between these models is simply the length of the barrel and the addition of a bipod for the HBAR version. Further details of the HBAR model can be found in the Machine Gun section. All models are normally equipped with an optical sight in the carrying handle; but by substitution of the receiver casting this can be changed to a mounting rail capable of accepting any telescope or night vision sight. The AUG is in use in the Australian, Austrian, Irish, New Zealand, Tunisian and Omani Armies and innumerable security agencies.

The AUG is a 'bullpup' of somewhat futuristic appearance and its construction is unusual. A basic structure of high-quality plastic supports the receiver, which is an aluminum casting with steel inserts for the barrel lugs and bolt guides. The sight bracket-cum-carrying handle is an integral part of this casting. The steel barrel, with chromed chamber, locks into the receiver by means of an interrupted thread, and the barrel carries a short sleeve containing the gas port, and cylinder and the front hand grip. A flash suppresser is fitted to the muzzle, and this is internally threaded to take a blank-firing attachment. The hand grip folds, and is also used to rotate and remove the barrel when necessary. The magazine is transparent, allowing the firer an instant check of its contents, and slots into the butt behind the hand grip. There is a cross-bolt safety catch above the grip, which can be set to 'fire' by a quick movement of the thumb. No selector lever is fitted; selection of single shots or automatic is done by varying the pressure on the trigger: the first pressure on the trigger allows single shots, but pulling past this position allows automatic fire. The rifle can be adjusted for right-or left-handed firers by exchanging the bolt and blanking off one of the two ejection ports.



Instead of the LAPA, the Brazilian army preferred these locally-manufactured versions of the FN FAL: the Imbel LAR.

round. If more precision was required the selector could be set to 'SA' (single action'), when the trigger mechanism operated in the conventional manner. Double or single action could be selected for either single shots or automatic fire. Prototype models used the M16 magazine, but it was intended that production models would use a plastic magazine.

Length: 29.65in (738mm). **Weight unloaded:** 7lb 10oz (3.48kg). **Barrel:** 19.25in (489mm), 6 grooves, right-hand twist. **Magazine:** 20-, 30- or 40-round detachable box. **Cyclic rate:** 650-700rpm. **Muzzle velocity:** 3280 ft/sec (1000 m/sec).

• Imbel LAR

Industria de Material Belico do Brasil, Vila Estrela
7.62x51mm NATO

The Light Automatic Rifle is simply the well-known FN-FAL manufactured in Brazil under license. It is produced in two forms, a standard model with a fixed butt and a Paratroop model with short barrel and a side-folding butt. Except for some very small dimensional changes it is exactly the same as the original Belgian weapon.

Length: 43.30in (1100mm); Para: 38.97in (990mm). **Weight unloaded:** 9lb 15oz (4.50kg); Para: 9lb 10oz (4.37kg). **Barrel:** 20.98in (533mm); Para: 17.20in (437mm); 4 grooves, right-hand twist. **Magazine:** 20-round detachable box. **Cyclic rate:** 650-750rpm. **Muzzle velocity:** 2805 ft/sec (855 m/sec).

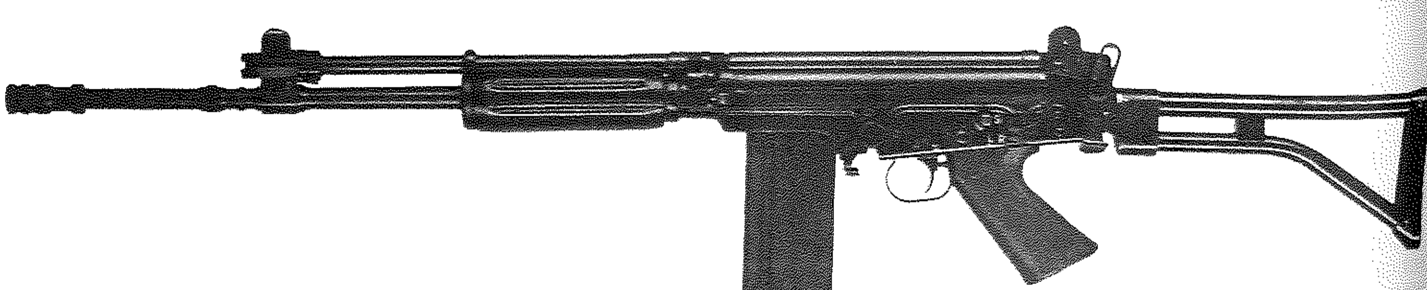
• Imbel MD2 (1985)

Industria de Material Belico do Brasil, Vila Estrela
5.56x45mm

The MD2 is a 5.56mm version of the LAR (above), suitably scaled down. Development began in about 1982, with the intention of capitalizing on the experience gained in manufacturing the LAR and, wherever possible, using existing components of that weapon. The first prototype, the MD1, appeared in 1983 and after extensive troop trials, modifications were made which produced the MD2, which went into service with the Brazilian army and police forces in the late 1980s.

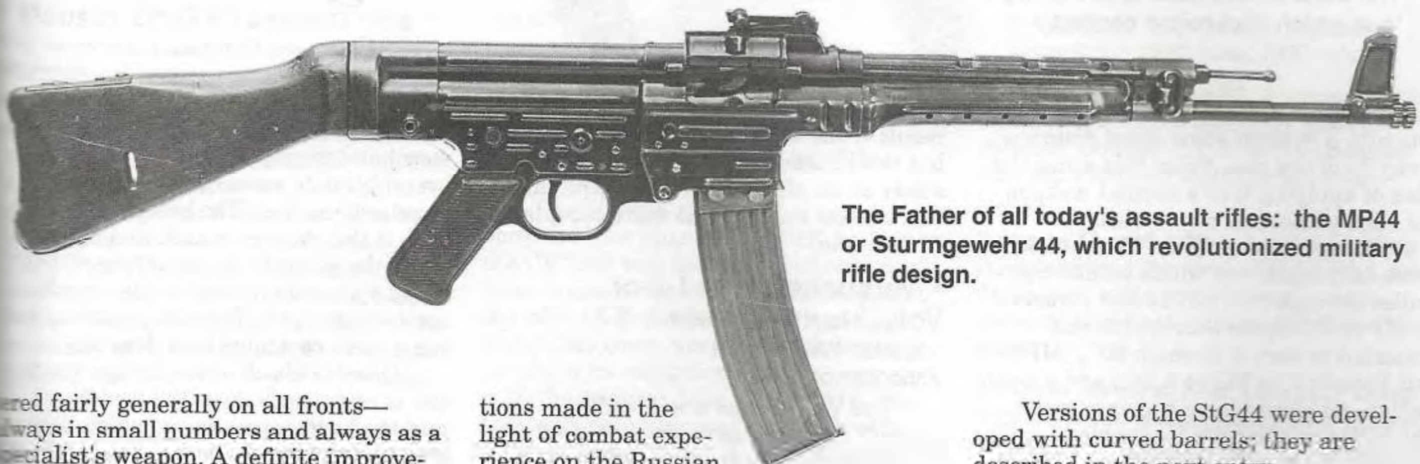
Although using a certain amount of common parts and having a similar general outline, there is little other relationship between the LAR and the MD2. The MD2 is gas operated, using the now-familiar bolt carrier and rotating bolt; you could almost say it is an M16 in FAL clothing. It uses a 20-round magazine but the interface will accept the standard 30-round M16 magazine if required. A light bipod is available and may be attached to the forend, and the standard construction used a folding tubular butt. The result is rather heavier than the average 5.56mm rifle but it produces a very accurate and steady weapon which is perhaps easier to control in automatic fire.

There are a number of variations on the basic model. The MD2 is the standard, with long barrel and folding butt and providing selective fire. The MD3 is the same weapon but with a fixed plastic butt. The MD2A1 and MD3A1 are the same as the MD2 and MD3 but are engineered so as to provide only single-shot fire, and they are principally intended for police use.



The Imbel MD2 is simply a scaled-down FN FAL firing the 5.56mm cartridge.

Also by Walther, and a year later, the Gewehr 43 reverted to the traditional wooden furniture and rifle shape.



The Father of all today's assault rifles: the MP44 or Sturmgewehr 44, which revolutionized military rifle design.

…ered fairly generally on all fronts—always in small numbers and always as a …ecialist's weapon. A definite improve…nt on the Gew 41(W), the Gew 43 was …ch easier to make; most were found …h laminated wooden furniture, but …ards the end of the war plastic was … used. Owing to the economic situa… there was ultimately a further sim…ication of manufacture which gives …e of the remaining models a very …gh external appearance.

The Gew 43 remained in production …il the end of the war and, after 1945, … adopted in small numbers by the …h Army as a sniper's rifle. The Kara…er 43 differed from the Gewehr 43 …y in the substitution of a large trigger…rd, although it was also some 2 inches …mm) shorter.

…ew 43)

…gth: 44.00in (1117mm). **Weight …oaded:** 9lb 9oz (4.33kg). **Barrel:** …0in (558mm), 4 grooves, right-hand … **Magazine:** 10-round detachable box. **…zzle velocity:** c.2450 ft/sec …8 m/sec).

…aschinenpistole 43, …schinenpistole 43/1, …schinenpistole 44, …rmgewehr 44 (MP43, MP43/1, …44, StG44)

… Haenel Waffen- und Fahrradfabrik … Suhl; Erfurter Maschinenfabrik B Gei… …mbH, Erfurt; Mauser-Werke AG, …dorf-am-Neckar, and an unidentified …pany.

…33mm Kurz

The MP43 was the developed version … MKb42(H) with certain modifications made in the light of combat experience on the Russian Front; the first deliveries of the weapon were made in July 1943 and production continued until the first months of 1945. In late 1943, a variation of the basic MP43 was manufactured, under the designation MP43/1 in which the clamp-on grenade launcher was replaced by one of screw-on pattern: a short threaded section appeared at the muzzle of the MP43/1 to allow the grenade launcher to be attached. A mounting bracket for optical sights was also fitted, something which never appeared on the original MP43.

In April 1944, the nomenclature was advanced—for some undetermined reason—to MP44, which was otherwise identical with the MP43 although some weapons were fitted with the sight bracket. Towards the end of 1944, a further term was given to the weapon; this, StG44 (for *Stürmgewehr* -'assault rifle' - 44), is said to have been bestowed upon the rifles by a well-satisfied Adolf Hitler. At any rate, it more adequately describes the rifles' role. The weapon was originally designated as a machine pistol—or submachine gun—in order to circumvent Hitler's directive that development of rifles was to cease and production of machine pistols stepped up; by calling the weapon an MP the production figures thus appeared in the 'MP' columns of the monthly production reports, boosting the figures, and disappeared from the rifle columns. Honor was satisfied, and the true situation was only revealed after the MP44 had proved its worth on the Eastern front. Nothing succeeds like success.

Versions of the StG44 were developed with curved barrels; they are described in the next entry.

Length: 37.00in (940mm). **Weight unloaded:** 11lb 4oz (5.10kg). **Barrel:** 16.50in (418mm), 4 grooves, right-hand twist. **Magazine:** 30-round detachable box. **Cyclic rate:** 500rpm. **Muzzle velocity:** c.2125 ft/sec (647 m/sec).

• Maschinenpistole mit Vorsatz J, P or V; (Maschinenpistole 44 mit Krummlauf)

C.G. Haenel Waffen- und Fahrradfabrik, Suhl; Rheinmetall-Borsig AG, Düsseldorf

7.92x33mm Kurz

The curved-barrel *Maschinenpistolen* were a remarkable wartime development and illustrate the gusto with which the German High Command entered into futile projects, which promised relatively little and diverted valuable production time from more conventional weapons.

The base for the Krummlauf device was an MP44 to which was fitted a curved-barrel unit with suitable mirror sights attached to the muzzle. The prime object was to have a weapon which the occupants of armored personnel carriers could poke through firing ports and deal with hostile infantry who were close to the vehicle and attempting to stick mines or grenades to it.

The idea originated in a system for testing aircraft machine guns, which have to be capable of functioning irrespective of the attitude of the aircraft. To test a gun at a high angle of elevation demands a very long impact area, not always conveniently found. Therefore a curved barrel attachment was devised, to be clamped to the

Exhibit D

THE COMPLETE AR-15/M16 SOURCEBOOK

What Every Shooter Needs to Know

REVISED AND UPDATED EDITION

Duncan Long

Introduction

I can still remember the first time I held an AR-15. Remember it like it was yesterday. This was unlike any other rifle I'd ever held: there was no wood and blued metal as with the traditional guns I'd owned; this shooting machine resembled something from a sci-fi movie with its plastic and matte black metal and a pistol grip that might be found on a ray gun. Even the balance was different—in the center of the weapon instead of along the barrel somewhere. And the plastic handguard had ventilation holes in it. It wasn't just that the firearm's looks were weird. The AR-15 was foreign to my grasp, a new type of gun that seemed confusing to hands used to cradling a wooden stock.

Equally odd were the contrasting stories I'd read and heard about the AR-15. An army recruiting manual off a dusty high school library bookshelf told in glowing terms how a bullet fired from the M16, the military counterpart to the gun I now held, could pierce a car's engine block, travel through the passenger compartment, and exit through the back bumper with power to spare. Right . . . At the other end of the scale were the "war stories" of GIs coming back from Vietnam about dead U.S. soldiers with M16s lying jammed beside them, as well as tales recounting the failure of this rifle's bullets to stop an enemy even though he was "pumped full of lead." Some of the stories, I would later learn, were true and could be attributed to the incompetence of military planners. However, I would also learn that the yarns about the bullets lacking potency were totally false and could be attributed to panic and poor marksmanship.

So there I was, holding this controversial rifle in my hands and wondering what it was really capable of. I shouldered the AR-15 and was pleasantly surprised at the clear picture presented by its peep sight and natural aim. (The safety under my thumb seemed to be at just the right place and worked with a positive feel.) I dry-fired the gun; the trigger pull was crisp and short. Nice. Shooting proved a revelation as well. The rifle seemed to put bullets right on target, about as far as I could see on the hilly Kansas field where I did this first test. And the 30-round magazines I'd bought along chugged ammunition like there was no tomorrow. Very quickly I fired several hundred rounds, and the barrel became scorching hot, oil smoking from it. Yet the handguard kept my fingers cool, and the point of impact didn't seem to wander despite the enormous heat buildup. Nor did the gun jam or malfunction, which would have happened with a hunting rifle had I put that much ammunition through it so fast.

I knew then that I was holding a very different firearm. And after that first session, I came home knowing that I had found *the* rifle that was everything I had ever hoped for. That feeling hasn't changed since then, even though I've traded, built, and tested more variants and models of this gun than anyone has the right to enjoy while I wrote one book or article or another about it. This amazing firearm will one day be bested, but it has set a standard that has so far proved impossible to beat and will remain the gun against which new weapons are measured for some time.

Chapter 1

Beginnings

Because of its checkered past, as well as a design very different from what Americans had carried in the past, the AR-15 sparked more controversy than any other rifle in recent history. It has inspired both hatred and love among those who have carried it on the battlefield, into the field to plink, or in the back of a patrol car.

In part, these emotional reactions stem from the rifle's design. Where walnut and polished blue steel normally are found, the AR-15 boasts waterproof plastics and an aluminum receiver. And even though the gun is becoming old (as military firearms designs go these days), its styling and good human engineering continue to give it a space-age appearance that traditionalists view with horror, even though the gun is now pushing the half-century mark.

The AR-15 was among the first firearms of the 20th century designed to take advantage of modern industrial methods. This allowed for streamlined production without a lot of special milling while also giving the shooter a lightweight, durable weapon that didn't look like it had been cobbled together by a plumber and sheet-metal worker. The use of plastics and aluminum in major assemblies along with castings and steel stampings allowed many machining operations to be done away with, which also made the gun less expensive to manufacture, an important factor in the marketplace.

At the same time, nothing was sacrificed in quality. Employing modern industrial machinery to fabricate rifle parts also allowed tight enough tolerances to permit ready substitution of parts when repair or replacement is necessary, a real plus for military users and a boon to gunsmiths. Likewise, the tight tolerances made off-the-shelf AR-15s as accurate as any highly modified target version of previous military rifles.

The AR-15 was conceived as a light and handy gun chambered for a cartridge that would produce a light recoil while shooting a bullet that took advantage of the high-velocity wounding potential of a small projectile. The overall result was a very potent battlefield weapon.

Despite the initial adverse reactions, it wasn't long before the excellence of the AR-15's design became apparent to everyone. In fact, its design features have been copied by manufacturers of many other military rifles, and more than a few knockoffs can be found in such diverse places as the People's Republic of China and the U.S. civilian market.

Like the rifle itself, the .223 Remington cartridge (also known as the 5.56x45mm and the 5.56mm NATO) that was developed for it has greatly influenced military thinking and has proven to be the most effective rifle cartridge ever created for combat. While the future will undoubtedly see the fielding of a more lethal round, the .223 Remington is going to be a hard act to follow. Little wonder, then, that many countries have adopted the round for their battle rifles and that the former Soviet Union switched to a very similar round for its AK-74 assault rifles. Little by little, the cartridge (or one virtually identical to it) has been adopted by all the major military powers of the world.

ARMALITE'S BETTER IDEA

The lineage of the AR-15 can be traced to the 1950s. Interested in creating a small business, engineer and attorney George Sullivan, then the chief patent counsel for Lockheed Aircraft Corporation, initiated plans for creating rifles that departed radically from previous civilian firearms as well as those used by the U.S. military. Some brainstorming with firearms inventor and international arms broker Jacques Michault produced sketches and plans for rifles that would use aluminum receivers, fiberglass stocks, and straight-line, high sight layouts with a rear sight that doubled as a carrying handle—all of which later found their way to the AR-15.

Feeling that such firearms had a great potential in the civilian marketplace as well as with the U.S. military, Sullivan soon invested in a machine shop in Hollywood with the intention of fabricating experimental rifles

German rifles like this Sturmgewehr MP44, built cheaply by using modern industrial techniques, paved the way for later "assault rifles" that would be developed through the last half of the 20th century.

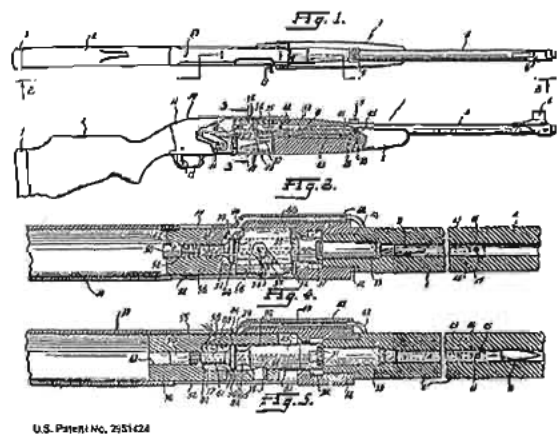
around the proposed designs. A short time later at a luncheon conference, Sullivan found himself sitting next to Richard S. Boutelle, president of Fairchild Engine and Airplane Corporation, and took the opportunity to tell the executive about the new rifle ideas and designs. Boutelle quickly became interested in the project, and on October 1, 1954, the Armalite Division of Fairchild Engine and Airplane Corporation opened its doors in California.

The first rifle created by the fledgling company was the AR-1 (Armalite Rifle number 1), based on a design of Sullivan and his brother-in-law, Charles Dorchester (who later became the plant manager for the new company). The two had actually started working on the rifle in 1947, so it was quickly completed once the new company started operation. The result was Armalite's Parasniper Rifle, a scoped, bolt-action sporting rifle that could double as a military sniper rifle. The rifle was chambered in .308 Winchester round (7.62mm NATO) and incorporated three features that would be seen in later rifles of the series: a fiberglass stock (filled with foam), an aluminum receiver, and an aluminum barrel with a steel lining.

Armalite's charter required that it develop prototypes and, when the designs were perfected, license the manufacturing rights to other companies. It was hoped this would quickly generate money for the fledgling company while minimizing capital outlays. Consequently, since there were no buyers for the design, the AR-1 never got beyond the prototype stage. The rifle did show the potential for creating a firearm with modern materials and techniques, however, and opened the door for the designs that would soon pour from the company.

Eugene Stoner

A former marine and army ordnance technician,

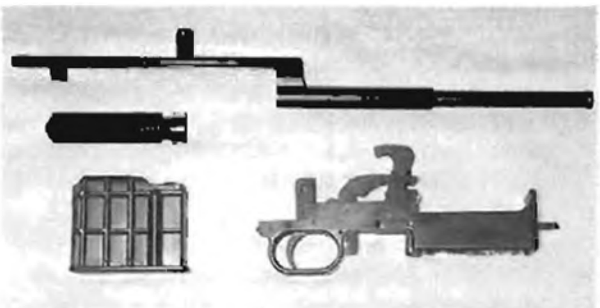


Stoner patent drawing for the rifle design he brought with him to the Armalite company.

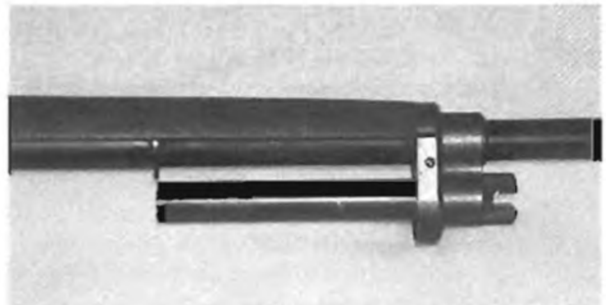
Eugene Stoner is the man whose name most often comes to mind as the designer of the AR-15. And rightly so, since it is obvious the lion's share of features found on the guns leading up to the AR-15 were his ideas. Stoner was not with Armalite from the start but joined the fledgling operation as Armalite's chief engineer, winning this position with a semiautomatic rifle design he had brought with him to the business. Stoner continued working on this rifle, which would eventually become the company's AR-3.

So although the AR-3 never went into large-scale production either, it embodied many of the features that later found on the AR-15, including an aluminum body and a fiberglass stock. And it too demonstrated the practicality of Armalite's goals and blazed the path for subsequent rifles.

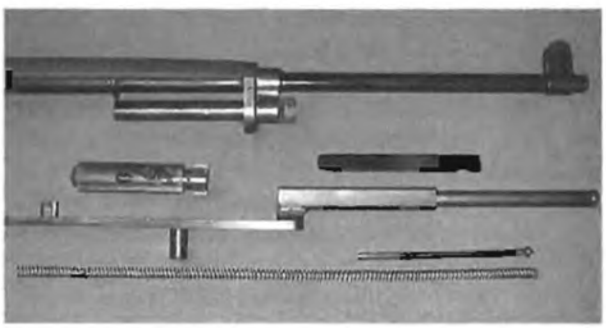
The AR-3 prototype rifle. (Photo by Randy Green.)



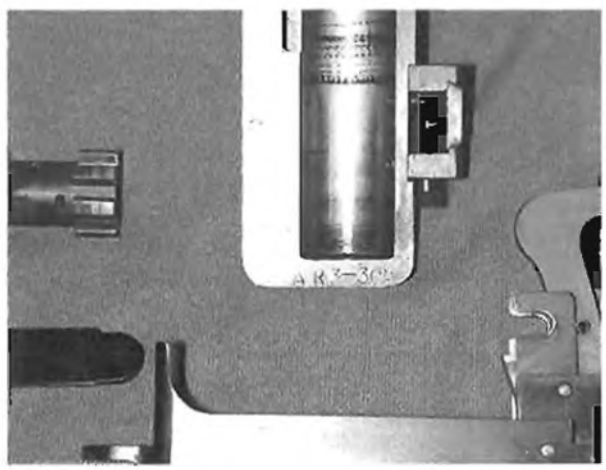
The AR-3 trigger group and bolt assembly. (Photo by Randy Green.)



AR-3 barrel and gas tube. (Photo by Randy Green.)



The AR-3 barrel, bolt assembly, and carrier above recoil spring. (Photo by Randy Green.)



"AR-3" stamp inside receiver. (Photo by Randy Green.)

View of AR-3 receiver. (Photo by Randy Green.)

Two other talented workers were soon teamed up with Eugene Stoner: L. James Sullivan (no relation to George Sullivan), who worked as a designer/draftsman, and Robert Fremont, who supervised prototype manufacture and led studies that determined whether the tolerances needed for rifles would be practical from a mass-production standpoint. These three men worked on a number of the Armalite weapons and became the driving forces behind the company's design work (as well as such work worldwide in the decades to come).

Both Stoner and Sullivan would later go on to

While working on this book, I was contacted by Randy Greenfield, who happened to have bought the AR-3 prototype. The pictures shown here are possibly the only ones ever to appear in print. The gun was well machined and looks like a production firearm. And while the layout and many of the components are not consistent with the design that would eventually be adopted for the AR-10 and AR-15, they point to the route the designers were taking that would eventually lead to these guns. As such, this makes this a very interesting bit of history. As Greenfield wrote,

I used a magnet to test the rifle and the following parts are non-magnetic and presumably were machined aluminum blocks:

Receiver
Trigger housing
Magazine housing
Front sight

The magazine itself has a stamped aluminum housing and machined aluminum follower block. The assembly is similar to the M14 with the barrel fitting into the stock and the trigger group locking it from the bottom. The trigger group is held to the stock with two screws, a machine screw forward of the magazine and a wood screw behind the trigger. I weighed the complete rifle on a reasonably accurate scale and it is in the 6-7 pound range.

create a variety of new firearms and related products. Sullivan is credited with extensive work on such firearms and products as the AT-22, Ultimax 100 LMG, Hughes Chain Gun, Ruger Models 77 & Mini-14, and C-Mag, as well as many other designs that haven't met with as much success and recognition as these have enjoyed.

By the Numbers

It should be noted that several Armalite firearms were being developed during the same period rather than just one after another as might be suggested by the numbers the company gave the various models. Apparently, such designations were assigned to rifles as new models were put into development, and so it's probable that several firearms were in various stages of development at any one time. The numbers only indicate to some extent the order in which the firearms were offered to licensing companies, but not when they actually went into production.

Many of the guns never even got into production—and some hardly got off the drawing boards. The AR-2, AR-4, AR-6, and AR-8 never went into production or were even offered for licensing as far as anyone knows. Exactly what these "missing" models might have been is unknown, and they may or may not have been similar to the company's other firearms (for example, the AR-13, according to company officials, was a "hyper-velocity aircraft gun"). And some of the models, such as the AR-16, were limited to prototypes because no manufacturers expressed interest in purchasing the rights to them.

THE AR-5

Armalite's first brush with commercial success came in 1957 with the AR-5 rifle, which was designed for the U.S. Air Force's requirements for an aircrew survival weapon. Work on the AR-5 was apparently initiated by the friendship between Boutelle and Gen. Curtis LeMay, who headed the U.S. Strategic Air Command.

The AR-5 was a bolt-operated rifle chambered for the .22 Hornet. The rifle used a detachable magazine, designed for the Harrington & Richardson (H&R) M4 survival rifle being built for the air force, and a barrel that was held to the front of the receiver by a threaded ring; the rifle was 30 1/2 inches long when assembled and 14 inches when broken down, making it short enough to meet the air force's length requirements.

The rifle's receiver/action, barrel, and magazine could all be stowed in the A-5's hollow fiberglass stock when the firearm was broken down for storage. The materials used to make the rifle were so light that the rifle could float on water because of the buoyancy of the hollow stock (undoubtedly a strong selling point for a survival rifle, which might conceivably see use in a life raft or near the water). In addition to holding the rifle components, the hollow stock had a small storage compartment for a kit of matches, needles, fishhooks, and so forth, making it a survival package in itself.

Twelve AR-5s were fabricated for air force testing and, with some minor modifications, accepted for use on military planes. The AR-5 was designated the MA1 by the air force, but Armalite never saw any great monetary results from the rifle because the air force's large inventory of M4 and M6 Survival Guns precluded the purchase of significant numbers of the AR-5 (MA1).

Nevertheless, the experience of dealing with the military and the enthusiasm shown for the gun by those testing it suggested to those running Armalite that there might be a market for military firearms. Thus the company adjusted its initial marketing thrust, which

AR-5 survival rifle.

focused on civilian buyers while considering later advancement into military sales, and embarked on a two-pronged development course that would produce guns aimed at civilian as well as military buyers.

THE AR-7

To take advantage of the work it had done on the AR-5 as well as create a viable moneymaker, Armalite created the AR-7 with an eye toward the commercial market in the United States. The rifle had the basic layout of the AR-5 but was chambered for the more popular .22 LR and changed to a semiauto blowback action (which was inexpensive to manufacture). The detachable aluminum barrel (with steel lining) was lengthened to 16 inches to conform to the U.S. Bureau of Alcohol, Tobacco, and Firearms (BATF) regulations for civilian rifles. The ability of the rifle to be broken down and stored in the hollow stock was retained, as was its ability to float on water.

AR-7 Explorer Pistol.

Although Armalite actually produced a few of these firearms and sold them to the public, rather than tie up its production equipment with the rifle it sold the rights to the AR-7 to Charter Arms Corporation in mid-1973. Charter Arms produced the firearm for a number of years as the AR-7 Explorer and later sold a pistol version called the Explorer Pistol. (This pistol version may have been created earlier by Armalite, although Charter Arms has generally received credit for this design; a photo of Sullivan surrounded by Armalite's firearms shows him holding a Golden Gun shotgun in one had while holding what appears to be a pistol version of the AR-7 in the other.)

In 1990, Survival Arms, Inc. took over production of the AR-7, working under a license agreement with Charter Arms. In the late 1990s, AR-7 Industries, LLC also commenced production of the AR-7. In 1998, the design came full circle and was introduced into the product line of the newly reorganized Armalite company. (For a more detailed look at the AR-7 and its many variations, spin-offs, and accessories, see *AR-7: Super Systems*, available from Paladin Press).

THE AR-17 GOLDEN GUN

Armalite's AR-9 was a semiautomatic shotgun with an aluminum barrel and body incorporating a number of design features that later found their way into the AR-10 and AR-15 rifles (including a rotating bolt design). Rather than market the 5 1/2-pound shotgun, Armalite decided in 1955 to shelve the design and instead exploit many of its features for a commercial shotgun that was

AR-7 Industry rifles

AR-17 Golden Gun.

Three AR-10 prototypes created by Stoner.

eventually marketed as the AR-17 Golden Gun. This two-cartridge semiauto shotgun met with limited success and was in many ways ahead of its time, with a polycarbonate stock and an anodized aluminum barrel and receiver (both of which normally had a gold-colored finish).

THE AR-10

Development of the AR-10 can be traced back to 1953 to a design Stoner created before joining Armalite. Stoner's rifle was originally chambered for the .30-'06 cartridge (feeding off a Browning Automatic Rifle magazine) and was later modified for the new 7.62mm NATO cartridge, which appeared to be on its way to becoming the standard round for much of the free world.

As with most modern firearm designs, Stoner's work built upon earlier systems. Much of the bolt and receiver-mounted recoil tube of the AR-10 (and later the AR-15) can be traced to the original design of the Johnson light machine gun, which had been created at the end of World War II by American inventor Melvin M. Johnson Jr. While this automatic rifle saw only limited use during

World War II, it did prove to be a successful and forward-looking design, and it is obvious from a casual inspection of the AR-10 that Johnson's gun had a strong influence on Armalite's designers.

In fact, it's possible that Johnson himself had a hand in some of the developmental work with the AR-10 because he was on Armalite's payroll as "military rifle consultant and publicist"—perhaps one of the odder job descriptions of the century. At any rate, one of the most important features of the light machine gun to find its way into the AR-10 was the cam-controlled rotary bolt, which locked into the barrel, rather than the receiver, of the new gun. This made it possible to use a lightweight aluminum receiver with the firearm since the barrel supported all the gas pressure produced when the weapon was fired.

Another feature that enabled the AR-10's light weight was a simplification of its gas system. In lieu of a complex rod and spring assembly, a blast of gas was diverted through a gas port in the barrel and routed down a tube to unlock the firearm's chamber shortly after a round was fired. This, too, was borrowed from a previous firearm design, the Swedish Ljungman Gevar 42, which, in turn, was later employed with the 1944 and 1949 MAS rifles.

Even today, Armalite is a bit touchy about the suggestion that it built upon past designs, arguing that the AR-10 gas system is not the same as that of the Ljungman. In a sense this is true, since the gas system of the AR-10 and subsequent Armalite designs based on it employ a camming bolt and carrier, which are unlocked by gas pressure pushing against the bolt carrier key. However, it should be noted that the Ljungman system, like the later AR-10, has a tube that ports gas from the barrel to a cavity in the bolt carrier, thereby causing the gun to cycle. This in no way takes away from the genius of Stoner in building on the past to assemble a system that was greater than the sum of the parts borrowed from past firearms.

Trials and Tribulations

A version of the AR-10, the AR-10A, was submitted to the U.S. Springfield Armory in 1956 for testing as a possible replacement for the M1 Garand rifle. The AR-10 was able—unlike the M14—to shoot in the automatic mode while remaining easy to control due to its straight-back design and a special titanium muzzle brake. The rifle met with success, and soon the army expressed an interest in more rifle trials with the new weapon.

Unfortunately, Armalite switched from the first prototype guns with their had steel barrels to a new design that used a steel liner surrounded by an aluminum jacket (similar to that developed for the earlier Armalite survival guns); during military tests early in 1957, the barrel burst just ahead of the soldier firing the weapon. Even though no one was injured, the potential for harm to testers was obvious, and the rifle was immediately pulled from the trials.

Stoner—with the assistance of armorers at the U.S. Springfield Armory—quickly fabricated an all-steel, conventional-style barrel for the rifle so the testing could be resumed. Ironically, it was later discovered that milling longitudinal cuts into the steel barrels allowed the rifles to remain as light as those with aluminum-and-steel barrels.

One of the main features of the rifle, an efficient muzzle brake that had originally been made of "duralumin," was replaced by an equally efficient but more durable—and also more expensive—one made of a titanium alloy. This added considerably to the expense of the firearm. And the "Buck Rogers" look of the rifle undoubtedly met with some negative reaction from conservative forces in the military. Add the minor malfunctions, part breakage, and the barrel failure, and the U.S. Army's enthusiasm for the new Armalite rifle quickly dropped off. A short time later, the army chose the M14 rifle over the Belgian Fabrique Nationale (FN) FAL and the AR-10.

The Dutch AR-10

Even though the AR-10 was still being redesigned by Stoner and L. James Sullivan, Fairchild had actively promoted the rifle worldwide. In 1957 Armalite licensed the government-owned arsenal of Artillerie-Inrichtingen of Hembrug, Holland, to manufacture the new rifle with an eye toward sales to the Dutch military as well as to other buyers around the world.

For a time the Dutch military seemed poised to purchase large quantities of the AR-10; Artillerie-Inrichtingen quickly invested $2.5 million to tool up for producing the new rifle, undoubtedly with a hope of some large initial sales at home. During this period the AR-10A design was modified, with the gas tube being moved from the side of the barrel to run instead from the front sight/gas port assembly and down along the top of the barrel to a "gas key" coupled to the bolt carrier.

Since the Dutch military wanted the capability to launch rifle grenades from any rifle it adopted, the efficient muzzle brake of the original AR-10 was sacrificed for a more conventional flash hider that could accommodate a rifle grenade. This was an unfortunate trade-off because it sacrificed much of the lightweight rifle's ability to handle full-auto fire without loss of control by the shooter.

Because Fairchild executives expected large sales of the AR-10, the Artillerie-Inrichtingen arsenal was licensed to build, but not sell, the new rifles. Worldwide sales rights were broken down and sold by Armalite to Interarms (which was to handle sales to Norway, Sweden, and

"Family" of AR-10s created by Artillerie-Inrichtingen.

The Cuban-Sudanese version of the AR-10.

Finland, as well as all South American sales and African sales south of the Sahara) and Cooper-Macdonald, Inc. (which was to handle Southeast Asian sales).

The first AR-10s Artillerie-Inrichtingen produced were plagued with problems, including poor accuracy due to improper heat treatment of the cold-forged barrels. By the time these problems were solved, countries shopping for a 7.62-caliber battle rifle had adopted the FN FAL or weapons offered by other manufacturers. The nail in the coffin for the AR-10 came when the large Dutch contract that had been expected fell through.

In the end, Artillerie-Inrichtingen manufactured fewer than 6,000 AR-10s. Cuba, Mexico, and Panama purchased only a handful of the guns for testing; Venezuela chose to buy only 6; Finland asked for 10, and Guatemala purchased from 200 to 500. The "large numbers" went to Sudan, which acquired from 1,500 to 1,800; Portugal, which procured from 800 to 1,000; and Nicaragua, which bought 7,500.

In short, the AR-10 was a commercial failure.

Artillerie-Inrichtingen finally halted production of the rifle in 1959, and Colt's Patent Firearms was licensed to manufacture the improved version of the AR-10A. By this time the weapon had seen major improvements in the form of a stronger extractor, a more reliable magazine system, and a cocking handle that had been moved from inside the carrying handle to the rear of the receiver. It had become an excellent weapon with no interested buyers, since both the Fabrique Nationale and Heckler & Koch now were offering similar rifles in the same chambering that had had the advantage of extensive military testing by some of the major armies of the world. In short, no one wanted to take a chance on the AR-10 when there were other "safe" choices that had been adopted by Germany, Britain, and other large military powers.

AR-10 Innovations at Armalite

While developing designs for the Artillerie-Inrichtingen, Armalite devised several innovative versions of the AR-10, including a short-barreled carbine, several light machine gun (LMG) variations, and a sniper model. Included were belt-fed guns as well as a clever high-capacity magazine that utilized a spring-lifter that enabled a standard AR-10 to feed hundreds of cartridges without the need to reload or modify the gun for belted operation. Later, Colt's went on to modify the gas tube and spring-load it for use with quick-change barrels and developed a belt-fed model of the rifle. But, as with later firearms families, none of the variations attracted much interest among military buyers.

Today most authorities see the AR-10 as an excellent weapon that missed its place in history because of poor timing and marketing. And despite rumors of manufacturers tooling up to construct a version of the AR-10 for the public, such civilian models have all been AR-15 variants chambered for the .308 round. A true AR-10 built to the specs of the original design has never materialized. The problem with creating a new AR-10 is one of economics; it will always be cheaper to produce an AR-15 chambered for the .308 than to completely retool for a true AR-10 rifle that is not much different and has little to offer other than historic interest to the buyer.

While exact figures aren't known, it appears that the numbers of AR-10 rifles sold by Armalite and its contracts during this original organization of the company (not to be confused with the current operation covered later in this book) were quite small. Among these were a few apparently chambered for the Soviet/Russian 7.62x39mm cartridge, which were tested by Finland as a possible alternative to its AK-47-style Valmet rifles.

Most of these AR-10s were simply for testing and evaluation. Additionally, Nicaragua ordered 7,500 AR-10s but canceled the order when one of the test weapons allegedly blew up. The total numbers produced are as follows:

Country	Quantity
Cuba	1
Finland	6–10
Guatemala	200–500

The "family" of AR-10s created by Armalite.

Mexico	1
Panama	1
Portugal	800–1,000
Sudan	1,500–1,000
Venezuela	1

LESS WELL-KNOWN ARMALITE RIFLES

Armalite also created the AR-11, which boasted a conventional stock and resembled the AR-3 (and was chambered for the .222 Remington cartridge that eventually would be modified to become the round used in the AR-15). The company's AR-12 was a steel-stampings version of the AR-10, the basic design of which was modified to make it easy to mass-produce in Third World countries; the AR-12 was chambered for the 7.62mm NATO and might have been made at about half the cost of the AR-10 but never went beyond the prototype stage. The AR-14 was the sporting version of the AR-10 with a conventional Monte Carlo stock (without a pistol grip) and iron sights. It was chambered for .308 Winchester/7.62mm NATO, .243, and .358.

The AR-16 rifle appeared during 1959 and was notable because it exploited the inexpensive manufacturing techniques pioneered by the AR-12. Chambered for the 7.62 NATO/.308 Winchester, the AR-16 wasn't commercially successful; only three of the guns were ever made. But the rifle did break ground for the development of the AR-18, which would eventually become a competitor with the AR-15 for use among the militaries of the free world.

THE AR-15

Whereas Armalite's timing had been all wrong and economic failures seemed to be the norm for previous offerings from the company, the AR-15 enjoyed just the opposite. The rifle captured the imagination of buyers and had several lucky breaks that made the sales of the gun skyrocket.

One could conclude that this was to be expected, however, considering all the work Armalite had put into the design of the guns that led up to the AR-15. Add to that the fact that company officials, salesmen, and other personnel had by now created a lot of good contacts within the industrial-military complex as well as becoming more savvy marketers of firearms in general. Having gained valuable experience with

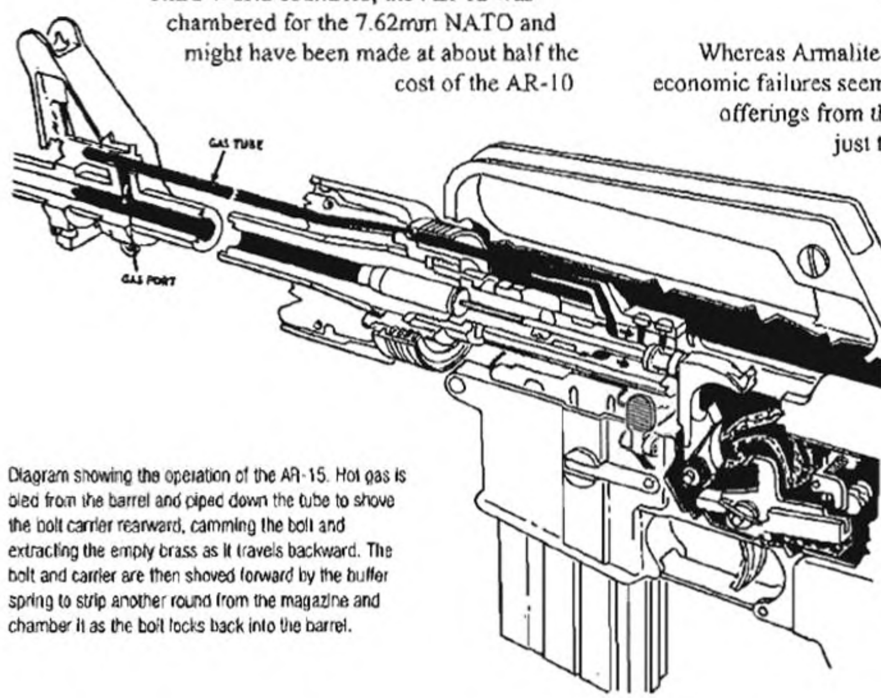


Diagram showing the operation of the AR-15. Hot gas is bled from the barrel and piped down the tube to shove the bolt carrier rearward, camming the bolt and extracting the empty brass as it travels backward. The bolt and carrier are then shoved forward by the buffer spring to strip another round from the magazine and chamber it as the bolt locks back into the barrel.

The XAR1501 prototype that would eventually lead to the AR-15 design.

Early AR-15, identifiable by its lack of flash hider.

Armalite's AR-15.

previous rifles, the company now had an excellent weapon as well as the ability to laud its capabilities to potential buyers.

Developed from 1956 to 1959, the AR-15 made use of a number of principles and features of the AR-10 and in many ways was simply a scaled-down AR-10. Like the AR-10, it used the same type recoil/buffer system in the stock, a gas tube to unlock the chamber and operate the bolt of the rifle, and lightweight aluminum receiver halves with the bolt locking into a barrel extension.

Placing the recoil spring in the stock of the rifle and dispensing with the heavy gas rod found in most similar guns shifted the balance of the rifle toward the stock. While traditional shooters may dislike this arrangement, many shooters find the rifle even easier to carry than might be the case with another firearm of its weight because of this shift in balance toward the rear of the gun. And many also find it easier to hold on target because of this.

The basic design of the AR-15 is generally credited to Stoner because he headed the AR-10 project, but the actual work on the AR-10 was started before he joined the company, and some features date back to the rough sketches created by Jacques Michault and George Sullivan. However, because Stoner perfected and debugged the AR-10 and later picked out and refined the cartridge that would be used in the AR-15, he is generally credited with the AR-15, even though his contributions were only a part of the developments that eventually led to the rifle.

Much of the actual scaling down of the AR-10 to create the AR-15, as well as the perfection of the new rifle, was done by Robert Fremont and L. James Sullivan, while Stoner apparently worked to perfect the AR-10 for Dutch manufacture. "Scaling down" a firearm is no minor task, since it involves changing the parts of the rifle to accommodate a smaller cartridge while retaining the length and size of the grip, stock, and barrel to fit the human body. Adding to the complexity of the process was the fact that the pressure of the gases that would be contained in the smaller chamber were actually higher than with the large 7.62mm cartridge, so some parts of the firearm actually had to be scaled up somewhat.

Because the new smaller cartridge of the AR-15 had a flatter ballistic arc than the AR-10's round had enjoyed, Fremont and Sullivan adopted a simplified two-position "L" rear peep sight to replace the complicated screw mechanism of the AR-10. The new system moved the elevation adjustments to a spring-loaded detent on the screw-in front sight.

Perhaps to stay within the later military weight requirements, the first AR-15 prototypes had fluted barrels under the handguard and dispensed with the foam reinforcement inside the stock and handguard in favor of simply using fiberglass shells with an aluminum heat shield under the handguard. The greatest change in the new design was in the trigger group, where the disconnector was replaced by a completely new design and modified trigger and hammer layout (the auto sear design and selector remained pretty much the same).

A MORE POTENT ROUND

The cartridge created for the AR-15 was the result of many years of testing by the U.S. military and varmint hunters alike. The military work dates back to the 1920s when army ordnance personnel created a lightweight .22-caliber bullet for the M1 rifle cartridge with an eye toward a long-range machine gun round. This work was revised in the 1950s when the army started sifting through information garnered from ALCLAD.

The ALCLAD study had started out to learn the requirements for better body armor (some of which had proven highly effective when tested in the field during the Korean War). But the study got into areas of interest to small-arms experts when it examined such things as the range at which casualties occurred, the effects of bullets or shell fragments on the human body, the frequency and distribution of wounds, and so forth. To obtain these data, The army's Continental Army Command Operations Research Office (ORO) conducted a large statistical study involving the 3 million casualty reports from the first two world wars and the Korean conflict.

The results of this study flew in the face of most military thinking. It found the following:

- In combat, nearly random shots produced more casualties than did aimed fire.
- Rifle fire was seldom used effectively at distances greater than 300 yards.
- The majority of rifle casualties were produced at ranges of 100 yards or *closer*.
- Even expert marksmen could seldom hit targets beyond 300 yards because of terrain features or the marksmen's need for cover.

This study was buttressed by research done by the military writer and historian, Gen. S.L.A. Marshall, who discovered that nearly four-fifths of all foot soldiers in World War II never fired a round in any given battle—with one exception. The soldier charged with carrying the Browning Automatic Rifle (BAR) almost always fired his weapon, apparently because he could dominate his enemy through automatic fire. And to some extent his firing also encouraged the soldiers next to him to engage the enemy as well. This finding also laid the groundwork for development of the AR-15 as the U.S. military searched for a lighter alternative to the BAR—a rifle capable of controlled automatic fire that would enable troops to fight aggressively in battle.

SALVO

The above facts led to the Operations Research Office SALVO project in the early 1950s. In turn, the project made a number of findings that would affect later small-arms design and basically send military small-arms development in the United States in two very different directions. The two major points made by SALVO were these:

- A lightweight projectile was adequate for a soldier's needs at normal combat ranges.
- Long bursts of fire tended only to waste ammunition, while three- to five-round bursts were the most effective automatic fire in small arms.

The principal thrust of the SALVO project was to outline the requirement for a small-caliber rifle that was capable of automatic fire. To achieve these ends, designers took two routes. One was toward the use of smaller bullets in more compact cartridges, the route that would finally prove to be most effective. The other was the basis of the Special Purpose Individual Weapon (SPIW) project, carried out during the early 1950s with the aim of creating a weapon with a superfast projectile that would satisfy the requirements for an effective weapon put forth by the ALCLAD and SALVO research. SPIW was principally directed at producing a weapon that could create a multiple projectile pattern of shots through the use of flechettes packaged in one round, similar to a shotgun shell. (Later the thrust of the program shifted to single flechettes packaged in separate cartridges and fired serially or several at a time in multibarreled guns.)

After some experimentation, flechette configuration was more or less settled: a small rocket-shaped steel dart weighing only around 10 grains (0.65 gram). This permitted packing a number of the darts into one payload package without producing excessive recoil, while putting a number downrange on the target to increase the chances of hitting it, even if the shooter's aim was somewhat off the mark. Generally this basic configuration is credited to Irwin Barr, who commenced work toward perfecting the flechette as a modern weapons projectile in 1950. His Cockeysville, Maryland, company, Aircraft Armaments Incorporated (AAI), handled much of the work and eventually landed a number of government contracts to develop the flechettes and weapons to fire the projectiles.

Barr conducted his early project without funding, contacting the Department of Defense (DOD) to let it know what he was doing in the early days of his project. His work was received with great interest, and in 1952 AAI was offered a contract to produce some demonstration shotgun shells loaded with Barr's flechettes.

Work progressed, and in May 1956 AAI received another contract to study the effectiveness of flechettes. Nine months later, AAI concluded that the 10-grain flechette was the optimally sized flechette and that a speed of 4,000 fps would make it as effective as the much larger but slower 150-grain bullet in a .30-'06 cartridge fired from the M1 rifle.

By now it seemed like flechettes were the fast track to the future, so the U.S. Army awarded a contract to AAI to carry the concept forward with a test gun that would be employed in a variety of tests. Toward this end, AAI employed 10 Winchester Model 70 bolt-action rifles, which were rechambered to accommodate flechette ammunition. Tests with these guns further suggested that the flechette load held promise, so in October 1962 the army asked for rifles that could both fire at specific targets like a rifle and hit a large area with a barrage of projectiles.

This time AAI had some competition, with bids being submitted not only by AAI but by nine other firms as well. Of these, AAI, Harrington & Richardson, and Winchester received development contracts early in 1963, with work to also be done at the U.S. Army's Springfield Armory. These three companies and Springfield Armory each presented 10 test rifles in March 1964 for evaluation. Army test personnel decided that the Springfield Armory and AAI prototypes had the most going for them and provided more funds to develop each system, hoping one or the other would prove viable.

The Springfield Armory design was quite futuristic for its day and in many ways blazed the trail for the modular systems that more or less became the norm in the last decades of the 20th century. The gun could be converted into several configurations, including a bullpup rifle or standard rifle. The AAI design was more conventional in its layout, departing from the basic rifle concept only in its use of a flechette payload.

Springfield Armory and AAI each submitted 10 rifles in August 1966 to the U.S. Infantry Board at Ft. Benning, Georgia, for testing. Things didn't go well in the tests, with both systems proving faulty; however, it was felt that AAI rifle showed promise, so the company received more funding to continue development of its system through a 35-month research-and-development program.

Although by this time the AR-15 had made its way to the scene and voices were calling for its adoption (more on this story in a bit), some felt the flechette gun was the best bet. One of these was General Electric's Armaments Division, which submitted a proposal to refine and perfect Springfield Armory's modular design. The company was issued a contract for this in January 1969, and AAI again had competition.

To carry out its work, General Electric leased the Springfield Armory complex from the government (the armory having recently been closed) and hired Richard Colby, who had been working at the armory on SPIW. Ultimately, the work would reach a dead-end: no practical system was ever developed from the project before funding ran out.

Meanwhile, AAI had four different projectile packages in the works by mid-1969. But the work toward perfecting its rifle had reached an impasse: the gun was far from reliable. Hoping to get the bugs out of the rifle system so that work with the flechette testing could go forward, the U.S. Army transferred the work to its Small Arms Systems Agency at the Rock Island Arsenal in Illinois.

The latest version of the AAI design at this point was the XM70, which went through many modifications and design changes to make it reliable, as well as testing its ammunition as the work progressed. This continued through the early 1970s, with the rifle ultimately becoming viable.

But there was a growing realization that the flechette concept itself was far from promising. In fact, the projectiles weren't nearly as effective as had been hoped. The fin stabilization proved to be very inaccurate over long ranges, and the area coverage afforded by groups of the projectiles was haphazard at best, with a large percentage often hitting the ground well before the target range, thereby being totally wasted. Additionally, there were some doubts about how effectively it would actually wound a soldier, the fear being (apparently based on animal tests) that the wound would be small and penetrating but perhaps not debilitating in many instances.

In addition the AR-15 was by then becoming established in the U.S. military—the army having decided to adopt the rifle as its M16— so the decision was made to pull the plug on all funding for SPIW.

This wasn't the last of the flechette, however; AAI would be submitting a gun chambered for a flechette round in the mid-1990s for consideration by the U.S. military. But today the program is generally seen as a technological failure. Ultimately, military planners decided to stick with conventional but scaled-down rifle ammunition rather than adopt the shotgun-shell-style or single-flechette cartridges created by SPIW.

Conventional Bullets

Running counter to SPIW were several programs that would actually lead to viable weapons systems. Some of the tests involved were conducted using necked-down M1 carbine cartridges firing .22-caliber bullets. These proved that such weapons were practical and effective (and the rifle was liked by the troops due to its low recoil and light weight). The end result was the suggestion that an ideal combat weapon would fire a conventional, but smaller than currently employed, .22-caliber bullet weighing 55 grains and traveling at 3,300 fps.

Armalite learned about the army tests and proposed switching to the smaller caliber during the AR-10 testing. Much of the AR-10's failure had been due to the new system's not having been tested long enough to uncover all the bugs. Thus, Armalite set out to make a new rifle that would conform to the military's needs by building on the AR-10 system, which had by then seen a lot of refinements and was close to being perfected.

The new AR-15 was originally chambered for the .222 Remington used in the AR-11, since it came closest to the type of cartridge the army would be asking for. This round was then topped with a 55-grain boattail bullet developed for Armalite by the Sierra Bullet Company. Because the original cartridge case was not large enough to create the velocity desired, it was lengthened slightly, and the new round was named the .222 Special.

The first ammunition manufactured for use in testing was made by Remington and bore the head stamp of .222 Special. Later, when Remington began marketing the .222 Magnum, which was very similar, Armalite renamed the .222 Special the .223 Remington to avoid confusion (the .223 round would fit and fire in rifles chambered for the .222 Magnum — with potentially disastrous results). Ironically, the bullet for the .223 Remington is .224 inch in diameter, making the ".223" label misleading to many novices.

The gas system of the AR-15 was tied into the basic design of the rifle and the military's velocity requirements. Through experimentation, Armalite engineers discovered that for the gas system to work properly, a fast-burning powder had to be used; a slow-burning powder would not be completely burned by the time it entered the gas system to propel the bolt open and to operate the reloading mechanism. In fact, repeated firings with a slower powder created major fouling in the bolt of the rifle until jamming finally developed. Because of this, one of original design specifications for the new rifle was for fast improved military rifle (IMR) powders rather than the slower ball powders traditionally used by the U.S. military.

As will be noted later, the specifications for this cartridge would later create problems for the AR-15, due to bureaucratic blundering and lack of proper training of troops in Vietnam.

THE CONARC TRIALS

As Armalite had expected, the U.S. Continental Army Command (CONARC) announced that it was searching for a lightweight, small-caliber weapon to replace some or all of its rifles and submachine guns. Interested manufacturers and individuals submitted their proposals, and in 1957 the Infantry Board in Ft. Benning officially asked Winchester-Western (a division of the Olin Mathieson Corporation) and Armalite to develop candidate rifles and ammunition to be tested as possible replacements for the M14 and 7.62mm NATO round. These had been developed by the military itself and were failing to perform as well as had been hoped. A third rifle was to be created "in house" by the U.S. Springfield Armory to compete against the two commercial designs and serve as a standard against which the other two rifles would be compared.

The requirements set forth by the Infantry Board for a small-caliber high-velocity rifle were as follows: (1) the rifle would weigh less than 6 pounds when fully loaded; (2) the rifle would need to be capable of automatic fire; (3) the round the rifle fired would be capable of penetrating body armor, a steel helmet, or a 10-gauge steel test plate out to 500 yards; (4) the round would be equal in lethality to the M1 Carbine within 500 yards; (5) the weapon would have a detachable 20-shot magazine; and (6) accuracy and trajectory would be equal or better than the M1 rifle out to 500 yards.

The range requirements in two of these specifications were 200 yards greater than the ranges ALCLAD had shown were needed. Those privy to the requirements have admitted that the range was raised from 300 to 500 yards simply to make the specifications look better to superior officers. Later, when the military decided to use meters rather than yards to conform to other NATO countries, the specifications were changed to 500 meters, making the final cartridge have to perform at twice the range ALCLAD had found was actually needed. Some of this added range might have been justified if the army ever mounted a scope offering magnification of distant objects on its rifles so that the longer range potential might be utilized by troops. But as long as rifles are going to be issued with iron sights, range requirements greater than 300 yards are unsupported by any known studies (and there is no sign that other research or testing to prove otherwise has ever taken place).

On March 31, 1958, Armalite delivered 10 AR-15s, 100 magazines, and 100,000 rounds of ammunition to the Infantry Board for the trials. Because no manuals had been created for the new rifles, Eugene Stoner accompanied the guns and served as a "living manual,"

Lightweight rifle candidates: the gun submitted by Winchester-Western (top), the gun created by Springfield Armory (center), and Armalite's AR-15.

The M1 carbine in many ways served as the yardstick against which the AR-15 was measured. Like the AR-15, the M1 carbine was light and handy, firing a cartridge that produced little recoil and was easy to manage during automatic fire.

showing army personnel how to operate the firearm and helping with minor repairs necessitated by the wear incurred during the tests.

The tests at Aberdeen Proving Ground in Maryland and Ft. Greely, Alaska, suggested a number of modifications and improvements to the AR-15, most of which were subsequently made. The barrel was strengthened (to allow for firing with small amounts of water in the bore of the rifle) and a flash hider was added to it; the cocking handle was moved from the inside of the carrying handle to the rear of the receiver (probably due to problems with the lever becoming overheated with extended firing and to allow those wearing arctic mittens to operate the mechanism); the single-piece handguard was replaced with a clamshell design held in place with a knurled (later ribbed) spring-loaded ring; a rubber butt was added to the plastic stock (probably to help prevent the stock from breaking); the rear sight's size was increased; the selector was modified so that the safe setting was forward rather than the original setting pointing upward (since dragging the rifle could set it to the fire position); and the trigger pull was reduced to 7 pounds and its return spring strengthened.

Additionally, to improve the mechanism's tolerance for dirt, the clearance between the magazine and receiver was increased, the clearance around the buffer increased, and the bolt carrier's lands reduced. Since the dust cover had a tendency to come loose, a cam was added to it. To increase reliability of the rifle, the feed ramp angle was also altered and the capacity of the magazine reduced from 25 to 20 rounds. All these changes made the rifle about a pound heavier than the original specifications of the Infantry Board but resulted in a better rifle as far as the military testers and Armalite were concerned.

Winchester's rifle, designed by Ralph Clarkson, proved to be very similar to the M1 carbine and sported a traditional walnut stock coupled with the look of a miniaturized M14 rifle. By fluting the rifle's barrel, Winchester was able to keep the weight of the gun to only 5 pounds with an empty magazine. However, the Winchester rifle had a major problem: in order to beat Armalite in delivering rifles for testing with the army, the company had started chambering its rifles for the .222 Remington before the range requirements for the new rifle were upped from 300 to 500 yards. Winchester made some frantic efforts to modify the gun and cartridges, but the end result was less than ideal reliability of both rifle and ammunition, so the AR-15 came out looking better after the trials than might otherwise have been the case.

BIGGER IS NOT BETTER

During 1959, the army conducted tests involving the AR-15 and Winchester's .224 Lightweight Military Rifle but reached no decision on adopting the Armalite cartridge or either of the rifles for actual military use. However, during the tests one thing became very apparent: the lighter weight of the AR-15 coupled with its more controllable recoil made it popular with troops testing it as well as highly effective in putting aimed fire on target. During the trials the soldiers noted how the smaller rifles (the Winchester and especially the AR-15) handled. Nearly all preferred the smaller caliber weapons to the heavier M14 rifles.

During this same period, the Combat Development Experimentation Center (CDEC) discovered that a 7- or even 5-man squad armed with AR-15s could do as well or better in hit-and-kill potential in combat-style tests than the traditional 11-man squad armed with M14 rifles—something that undoubtedly didn't sit well with military planners because the U.S. Army had just elected to arm its soldiers with the M14.

During the tests, it also became very clear that the heavy recoil of the M14 rifle was almost impossible for an average soldier to control under actual combat conditions (as opposed to target-style shooting). And the AR-15 proved to have an overall malfunction rate of only 6.1 per 1,000 rounds fired. This was amazingly good for a nonproduction gun and outperformed the M14, which was averaging a failure rate of 16 per 1,000 during these same tests.

The army CDEC's report concluded that the army should develop a lightweight, reliable rifle "like the AR-15" to replace the M14 and also suggested that the increased firepower afforded by such a weapon would allow a reduction in squad size—all of which undoubtedly displeased more than a few generals in the Pentagon. No contracts were offered to either company for new rifles; the military "stuck to its guns," keeping the M14.

The M14 rifle proved heavy and awkward at best and was almost unmanageable when fired in the automatic mode.

Changing the Results

What happened next during U.S. military tests involving the AR-15 is clouded in controversy. Supporters of Armalite would later claim that efforts had been made to sabotage the AR-15. Certainly this appears to be the case, though as with most historic occurrences that are less than open to public scrutiny, it may be that a series of blunders and mishaps created the problems. Whatever the cause, the outcome was that the AR-15 came out of the tests looking bad.

The problems started when three of the AR-15s the U.S. military was employing in testing were sent to Ft. Greely to check their functioning under arctic conditions. (Today the need for a standard weapon that functions in all climates may be questioned; however, in the middle of the Cold War the need for this capability was not far-fetched. Although the United States had never really seen battlefield conditions as extreme as those at Ft. Greely, with Soviet territory just a few miles from Alaskan shores, there was serious concern about the potential need for such a rifle. In addition, considering the stalemate of the Korean War and the growing tensions in Vietnam, having to repel an invasion of Alaska by Chinese or Soviet troops was seen as a possibility if not a probability.

It wasn't until Armalite officials received a call for replacement parts from Ft. Greely that they even knew some of their firearms had been sent to the base. Unsure of what was going on, the company sent Stoner with the parts, both to replace the parts himself and to determine what exactly was behind the somewhat unusual breakage problems, since the parts called for were normally not subject to failure.

What the inventor found was later described as appalling: some of the guns had been improperly disassembled. Worse, parts had been lost and replaced—with handmade parts of dubious quality.

After repairing the rifles, Stoner test-fired them and found that the AR-15s functioned well in the arctic conditions at the base. Thinking the problems were cured and knowing that the firearms were functioning properly, Armalite officials undoubtedly heaved a corporate sigh of relief and figured the testing would again give their rifle high marks.

Only months later did the shock come. The rifle appeared to be the proverbial "jammatic," with numerous failures, according to the data that emerged from Ft. Greely. As company officials looked into the matter, they discovered what must have been infuriating: the problems created by the substitute parts were included in the test results and conclusions, with no mention of the alterations or near flawless performance after Stoner had placed the proper parts in the guns.

The M16A2 functions reliably in temperature extremes. Here a U.S. Marine uses his ski poles to steady his M16A2 rifle in preparation for a live-fire exercise. (Courtesy of U.S. Department of Defense.)

DIVESTING THE AR-15

Although it is hard to know what insiders at Armalite and Winchester thought of the testing done by the U.S. military, many historians feel that the army had intended to use the tests as a vehicle to show off its own designs while giving the illusion of the tests' being open and fair. As more than one critic of the trials has suggested, the U.S. military had a long history of creating its own firearms designs. The thought of a civilian operation's developing a weapon that would be adopted as the standard-issue rifle was not one that many military leaders cared to entertain. The key criteria for the tests, as this argument goes, were that rifles from outside sources be rejected by the military while in-house designs received every benefit of the doubt. Given the Ft. Greely tests, as well as subsequent rigged tests that would come, this argument seems plausible. If so, then the tests were all just window dressing designed to justify the army's selection of the M14 rifle as its new firearm.

After army brass announced the decision to adopt the M14 rifle, officials at both Armalite and Winchester realized they had invested a lot of time and money in the military trials of their rifle with little to show for it. Soon Winchester discontinued work on the weapon and the model was shelved, never to go into production.

Likewise, Armalite (whose parent company, Fairchild, was having financial difficulties keeping the firearms branch going) found itself struggling because of the lack of any military contracts and the black eye given by the Ft. Greely tests. What had looked like a promising start on a major sale to the U.S. military had fallen flat. Thinking it was simply throwing away good money after bad if it continued to market the design, Armalite sought to divest itself of the AR-15. What had appeared to be a goose that would lay golden eggs was, as far as company officials at Armalite could tell, dead. The firearm that had looked so promising was placed on the auction block.

By now, having failed to generate any significant revenue despite creating so many excellent rifle designs, Armalite saw key personnel leaving the company, headed for greener pastures. Fremont left for a more secure job with Colt's in 1959 and was followed by Stoner two years later. Sullivan left in 1960. Thus the firearms team that had created so many innovative designs disintegrated.

Chapter 2

Colt Firearms

Too many times, excellent firearms designs have gone into the dustbin of history simply because there was no market for the gun. This might easily have been the case with the AR-15 had Colt's Firearms Corporation not also been having economic problems at the same time that Armalite was. Instead, what appeared to be the death knell for the AR-15 became the chain of events that would make this firearm one of the success stores of the 20th century and put it into the hands of troops around the world (as well as those of numerous civilian and police users).

Colt's Firearms Corporation was created in the mid-1800s by Samuel Colt, who secured a patent for the first successful revolver mechanism in 1836. Although his business was not as successful as sometimes pictured (in part due to the intense competition for business from Smith & Wesson and other gunmakers), Colt guns have always captured the imagination. They even inspired the post-Civil War slogan, "Abe Lincoln may have freed all men, but Sam Colt made them equal." Colt guns did just that, doing away with the brawn that was often called for when a single-shot weapon failed to do its work, instead giving a shooter several follow-up shots to deal with a single enemy, or even a band of outlaws or renegades.

Colt died at the early age of 47, but his business continued, flourishing in large part through military sales of firearms created by and licensed from John Moses Browning. Business was especially good during World War I, World War II, and the Korean War, thanks to the military contracts needed to win these conflicts.

Following the Korean conflict, the company began doing some serious belt tightening. Although civilian sales were a major part of Colt's operation, its bread and butter often came through major sales to the U.S. government. The firm had seen money roll in from military contracts almost from the day Samuel Colt had started his firearms operation. At one time or another, Colt had made Gatling guns, single- and double-action revolvers, various automatic pistols (including the 1911 adopted by the U.S. military), the BAR, and several styles of Browning machine guns.

This came to an abrupt halt when the U.S. Army decided to adopt the M14 rifle and Colt failed to obtain the contract to make the new guns. Meanwhile, orders for the weapons it had been making were cut back with an eye toward phasing in guns like the BAR. Colt undoubtedly realized it was hurting and things were only going to get worse if it didn't add a new product that could add military sales to its lineup.

In September 1955, Colt's management had formed a conglomerate with Leopold D. Silberstein's Penn-Texas Corporation, becoming a wholly owned subsidiary of the holding company based in New York. This arrangement continued until 1959, when a group of investors gained control of the company, dismissed Silberstein, and renamed his company Fairbanks Whitney.

When it learned that the license to build the AR-15 was up for grabs in 1959, Colt's management jumped at the chance to obtain the rights and, in the process, secured the rights for manufacturing the AR-10 as well.

SELLING THE PRODUCT

After Colt signed the contract with Armalite, its aggressive sales techniques enabled it to sell a number of the rifles to several small Southeast Asian countries. (The rifle was much easier for Asian soldiers to control since it was lighter and offered less recoil—both important considerations for the smaller physique of the average oriental trooper.)

Eugene Stoner, who was soon working for Colt in marketing, accompanied gun exporter Bobby Macdonald through Southeast Asia, demonstrating the AR-15 and AR-10 to potential governmental buyers in Burma, India, Indonesia, Malaya, Australia, and the Philippines. While none of those who saw the AR-10 were much interested, the AR-15 was loved by nearly every government representative who fired it. When word of the AR-10's failure to attract a potential buyer reached Colt, the company suspended all plans to produce the larger-caliber rifle, even though more than $100,000 had been spent in tooling for it.

(NOTE: The AR-10 nearly got another lease on life as the U.S. Army's sniper rifle when it was one of six rifles tested at the Aberdeen Proving Ground in 1977. The Rock Island Arsenal modified the rifle, removing the front sight assembly and the rear sight/handle and incorporating a scope base and ART scope. But the tests were inconclusive and only pointed to the need for a better ranging system and more accurate ammunition. Again, the AR-10 failed to be adopted for military use.)

In December 1959, Colt produced its first run of 300 AR-15 rifles, which was broken into small lots and sent for testing to many of the countries Stoner and Macdonald had visited. Some of the governments expressed interest, but sales were blocked to most of them because the mutual-aid funds the U.S. government was offering required that firearms be standard issue with the U.S. military. The AR-15 wasn't issued to U.S. troops, so the U.S. government wouldn't provide funds for its purchase. With funds running low and a lack of actual buyers, Colt was getting close to serious problems and Armalite was not receiving the royalties it had been hoping for from AR-15 sales.

Then both companies had a stroke of luck.

RIVALRY TO THE RESCUE

Boutelle, president of Fairchild, had maintained his friendship with General LeMay during the years since the development of the AR-5 survival rifle. During a skeet shoot on his farm, Boutelle demonstrated an AR-15 to the general, firing at a ripe watermelon, which exploded spectacularly when struck by the burst of high-velocity bullets. LeMay was very impressed with what he saw, thus setting in motion a chain of events that would eventually bail both Armalite and Colt out of their financial woes.

Problems had been brewing between the air force and the army since the former had rejected the latter's M14 as too heavy and awkward. The army then turned around and refused to supply parts for the M1 Garand the air force had retained, claiming the spare parts for the World War II-vintage rifle had been scrapped when the M14 was adopted. Consequently, air bases with nuclear weapons were being guarded by security forces armed with the outdated M1 carbine, a weapon never noted for the effectiveness of its cartridge or reliability with automatic fire. Thus the air force was forced to either make due with the M1 carbine or adopt a rifle it viewed as being no great improvement on World War II-vintage rifles.

And then LeMay saw the demonstration of a rifle that fit the bill for the air force's needs, firing a potent little bullet while still being almost as lightweight as the M1 carbine and pounds lighter than either the M1 Garand or the M14.

At LeMay's prompting, the U.S. Air Force started its own tests of the AR-15 at Lackland Air Force Base in Texas. The tests suggested the new rifle was everything the service had hoped for. In 1960, the air force asked for an analysis of the weapon by the Army Ordnance Corps in order for the AR-15 to be granted candidate rifle status for more air force tests.

The army's test and evaluation was conducted at Aberdeen Proving Ground, and the AR-15 proved nothing short of phenomenal. The rifles fired by army personnel proved capable of 10-round groups of 1.5 inches at 100 yards using iron sights and 10-shot groups of 1.1 inches with scopes—as good as many target rifles.

It didn't end there, however. The rifle not only was accurate, it was tough and reliable. During endurance tests of 18,000 rounds fired, only 10 parts broke and the average malfunction rate was only 2.5 rounds per 1,000—an excellent figure for a gun that had hardly gone into production. Of course, the "not-invented-here" syndrome appears to have been alive and well during the tests; the army final report begrudgingly concluded that the AR-15 was "reasonably satisfactory"—an understatement if ever there was one.

The air force followed up with more tests of the AR-15 at Lackland, this time comparing it with the M14 (perhaps to show the army how well a reasonably satisfactory gun would do in contrast to the army-designed M14). When the smoke cleared, 43 percent of the shooters firing the AR-15 could qualify as expert marksmen, whereas only 22 percent of those shooting the M14 could reach this level of skill.

The air force had found its rifle.

But there were hurdles to be jumped before the acquisition process could be started to get the rifles. Most important was the need for appropriations from Congress, which routed funds to what it felt were more urgent needs (at least in terms of constituents). Only after fighting for 2 years to get approval for the purchase was the air force finally able to procure 8,500 AR-15s in 1962.

GOOD NEWS, BAD NEWS

Ironically, the air force order for the firearms would pave the road for future sales of the guns to both the air force and foreign countries but would fail to bring financial success for Colt and Armalite employees involved in laying the groundwork for the deal. During the 2-year wait for the deal to be finalized, both Colt and Fairchild were taken over by larger corporations. During the

Although the AK47 family of weapons are tough and reliable, the cartridge they were chambered for was definitely second best when compared with the .223 Remington.

reorganization of the two companies, Boutelle got fired, and both companies' personnel who had been involved in marketing sample guns to foreign companies, which would soon be buying quantities of the rifles, were also laid off.

Yet a few AR-15s continued to be sold to various military users around the world; and those guns were gaining users who had nothing but good words for what was becoming known as "the little black rifle." Limited testing in Asia, especially in the South Vietnamese combat arena, showed just how lethal the lightweight rifle and the .223 bullet it fired were (and proved the ALCLAD requirements for an ideal combat rifle had been on the mark). Wanting to put the best weapon possible in the hands of its troops, Army of the Republic of South Vietnam (ARVN) placed an order for 1,000 AR-15s in December 1961, and, since the rifle had been approved for use by the air force (even though it hadn't been funded), the way was cleared for sales to Vietnam.

Meanwhile, U.S. army troops were slugging it out with communist guerrillas in Vietnam. And just as the its tests had suggested in 1959, the army was finding that the M14 was too heavy for easy handling and that automatic fire was so haphazard that most guns were being modified to fire only in the semiauto mode. Compounding the problem was an occasional blowup of an M14 receiver that had apparently been improperly

The AK47 was heavier and less user friendly than the M16; it also had inferior sights, but most important, its ammunition was inferior ballistically to that of the AR-15.

heat-treated. Although the latter event was rare, soon Colt representatives were pointing out such problems to potential buyers and paving the way for the future sales of the AR-15 and rejection of the M14.

PLAYING THE GOLDEN ARPA

Perhaps recognizing the problems the M14 would present in jungle warfare, the U.S. Army purchased 8,500 AR-15 rifles to test in 1961. In 1962 Colt persuaded the DOD's Advanced Research Project Agency (ARPA) to test an additional 1,000 in its Project AGILE, which was aimed toward finding a better weapon for use in Vietnam.

The ARPA tests again silenced many critics of the AR-15. Among the findings were the following:

- A squad armed with AR-15s had five times the level of overall kill potential than a squad armed with M14s.
- AR-15s could be produced at a lower cost and with a higher degree of quality control than the M14.
- The AR-15 was more reliable, durable, rugged, and easier to care for than the M14 under the adverse conditions often found in combat.
- Soldiers learned to shoot better and more quickly with the AR-15 (than with the M14).
- Three times as many rounds could be carried by a soldier with an AR-15 (in contrast to the M14) when the weight of both the weapon and the ammunition was taken into account.

Equally arresting findings came from the AGILE tests involving Vietnamese troops and U.S. advisors who used the rifles in actual combat. Here again, the AR-15 proved extremely durable and reliable. Not only that, the round used by the rifle showed itself to be highly potent against enemy targets.

Up until the time the AR-15 was fielded in Vietnam, the wounds created by small-arms fire tended to be through-and-through wounds resulting from the bullet's momentum and stability. This was true of the AK47 and SKS used by the Vietcong and North Vietnamese as well as the M14 and M1 carbine. Such penetrating wounds were the most common unless bullets were deflected somewhere in their paths by obstacles or through a collision with hard tissue in the target.

This situation changed with the AR-15, whose bullet was light, fast moving, and unstable—a combination that proved deadly in the battlefield.

One of the U.S. advisors who had seen the AR-15 used in combat wrote,

> At a distance of approximately 15 meters, one Ranger fired an AR-15 full automatic, hitting one VC with 3 rounds with the first burst. One round in the head took it completely off. Another in the right arm took it completely off, too. One round hit him in the right side, causing a hole about 5 inches in diameter.

Another soldier in the field gave an equally graphic account of the effectiveness of the new rifle:

> On 9 June a Ranger Platoon from the 40th Infantry Regiment was given the mission of ambushing an estimated VC Company. . . . Back wound, which caused the thoracic cavity to explode. . . . Stomach wound, which caused the abdominal cavity to explode. . . . Heel wound; the projectile entered the bottom of the right foot, causing the leg to split from the foot to the hip. . . . These deaths were inflicted by the AR-15 and all were instantaneous except [for a] buttock wound. He lived for approximately five minutes.

As another reported, "Range was 50 meters. One man was hit in the head; it looked like it exploded. A second man was hit in the chest, his back was one big hole."

But it didn't end there. Troops in Vietnam also discovered that rifle grenades fired from the AR-15 enabled them to lay down what was similar to their own mortar fire. Furthermore, troops cared for the weapon and treated it more carefully than the M1 carbine because they had greater respect for it.

In short, the little black rifle fielded in Vietnam was everything its designers had promised—and more. The troops not only liked the rifle, they also were chalking up serious body counts with it. The weapon enabled those using it to "own the battlefield," not only becoming deadly opponents to Vietcong troops, but also becoming more aggressive as they learned the capabilities of the rifle they carried.

CHANGES AT COLT

Colt continued to do well turning out AR-15 rifles for the U.S. military as well as reviving a number of older guns, such as its black-power revolvers and Sharps rifle, as Western movies and TV fueled the civilian market for guns of the Old West. However, changes came again in 1964 when the company reorganized under the name Colt Industries and the firearms section became a subsidiary called Colt's Inc., Firearms Division.

Colt aggressively sought to broaden its market by continuing to sell revolvers of all and the .45 semiauto 1911 pistol to the public through the 1960s and 1970s and into the 1980s. In addition, it created its Colt Custom Gun Shop, which made special target handguns as well as offering engraving on all of its firearms. Nevertheless, the company's bread and butter continued to be sales of its AR-15 rifle to military, police, and civilian buyers around the world.

The M16 rifle version of the AR-15 proved popular among U.S. troops—when it functioned properly—not always a given due to ammunition that wasn't formulated for it and lack of cleaning kits. (Courtesy of U.S. Army.)

MEANWHILE, BACK AT ARMALITE

With its engineers gone and large sales of the AR-10 and other rifles failing to materialize (except for the AR-15, the rights to which Armalite had sold to Colt's Firearms without realizing as much profit as could have been, given later sales), Armalite and its parent company, Fairchild, were in financial trouble in 1961. This led Sullivan and the other original owners of Armalite to buy the company back from Fairchild along with the rights and title to all firearms designs except the AR-10 and AR-15, which had been licensed to Colt. The goal of this reorganized company was still to create firearms, but with an eye toward actually making some serious money in the process; finding financial backing was not impossible due to the track record of Armalite. Funding was supplied by Capital Southwest Corporation of Dallas (with Charles Dorchester and Richard Klotzly later acquiring the majority common stock position in Armalite by buying out Capital Southwest Corporation late in 1971).

This new business entity became "Armalite, Inc." and except for the change of ownership was run by the same key personnel. Armalite worked from 1962 through 1971 without meeting with any great financial success.

Since Armalite had failed to experience any great wealth flowing in from its deal with Colt, the company needed a new rifle that might gain acceptance by those not interested in the AR-15 and thereby bring in much-needed capital. Since Colt now owned the rights to the gas system used on both the AR-10 and AR-15, this new rifle also could not employ this or other features found on the AR-15.

This task wasn't as daunting as it might otherwise have been because a rifle design meeting this criterion was actually on the shelf at Armalite. All that was needed was some modifications to the design. Thus, from 1962 to 1964, engineers at Armalite worked on modifying the AR-16 rifle to the .223 Remington cartridge in much the same way that the AR-10 had been modified to create the AR-15. This new rifle was designated the AR-18, and Armalite pinned nearly all of its hopes for financial success on the new gun. (Although the AR-18 was marketed after Stoner had left the Armalite Company, according to Burton T. Miller, who was the vice president of Armalite during this time, Stoner was nevertheless responsible for much of the development of the AR-18 before its introduction, having taken part in the development of the AR-16.)

Due to its being chambered for the more compact .223 cartridge, the AR-18 was slightly shorter than the AR-16. But it continued the overall construction design of mostly sheet-metal stampings that were easy and cheap to produce. Internally, the gun employed a gas piston similar to that of the Soviet Tokarev to move the bolt and its carrier rearward, in the process keeping the trigger group clean of powder residue, a fact that gave the AR-18 the potential to be slightly more reliable than the AR-15, and most certainly making cleaning and maintenance of the rifle easier. Unlike the AR-15, which had a large recoil spring in the stock, the AR-18 used twin recoil springs and guides located within the rear of the receiver; this made possible a folding stock (and later bullpup designs when this system was adopted by other rifles).

Soon this new rifle was in competition against its AR-15 sister in military trials around the world. Although it is arguable whether the AR-18 was a better rifle than the AR-15, one thing is almost certain: the AR-18 never really got a fair trial against its competitor during U.S. military trials. This was because of a disastrous business arrangement Armalite made in selling the manufacturing rights of the new rifle to the Howa Machinery Company of Nagoya, Japan.

Sadly for both companies, this coincided with the Japanese government's efforts to force an end to the war in Vietnam. To bring pressure on those involved with the conflict, the Japanese government refused to grant an export license to Howa for the shipment of AR-18s to any country even remotely involved in the fighting. What appeared to be a lucrative market was suddenly out of reach to those wanting to sell and demonstrate the AR-18.

This problem was compounded when the U.S. Army started searching for a gun that would be even more reliable than the AR-15. One potential choice was the AR-18. The Japanese government's refusal to allow the guns out of the country left Armalite no choice but to supply the army with hand-built AR-18s from the Armalite factory, which were undoubtedly less reliable than those produced at the Howa plant. Thus both firms both missed yet another chance. The U.S. Army became committed to purchasing the more expensive—but readily available—AR-15 manufactured by Colt. (And by the time the Vietnam War was over, the U.S. military was fully committed to the AR-15, which pretty well had all the bugs worked out of its design and was as reliable as anyone could ever have hoped for, far outperforming most similar rifles that were available.)

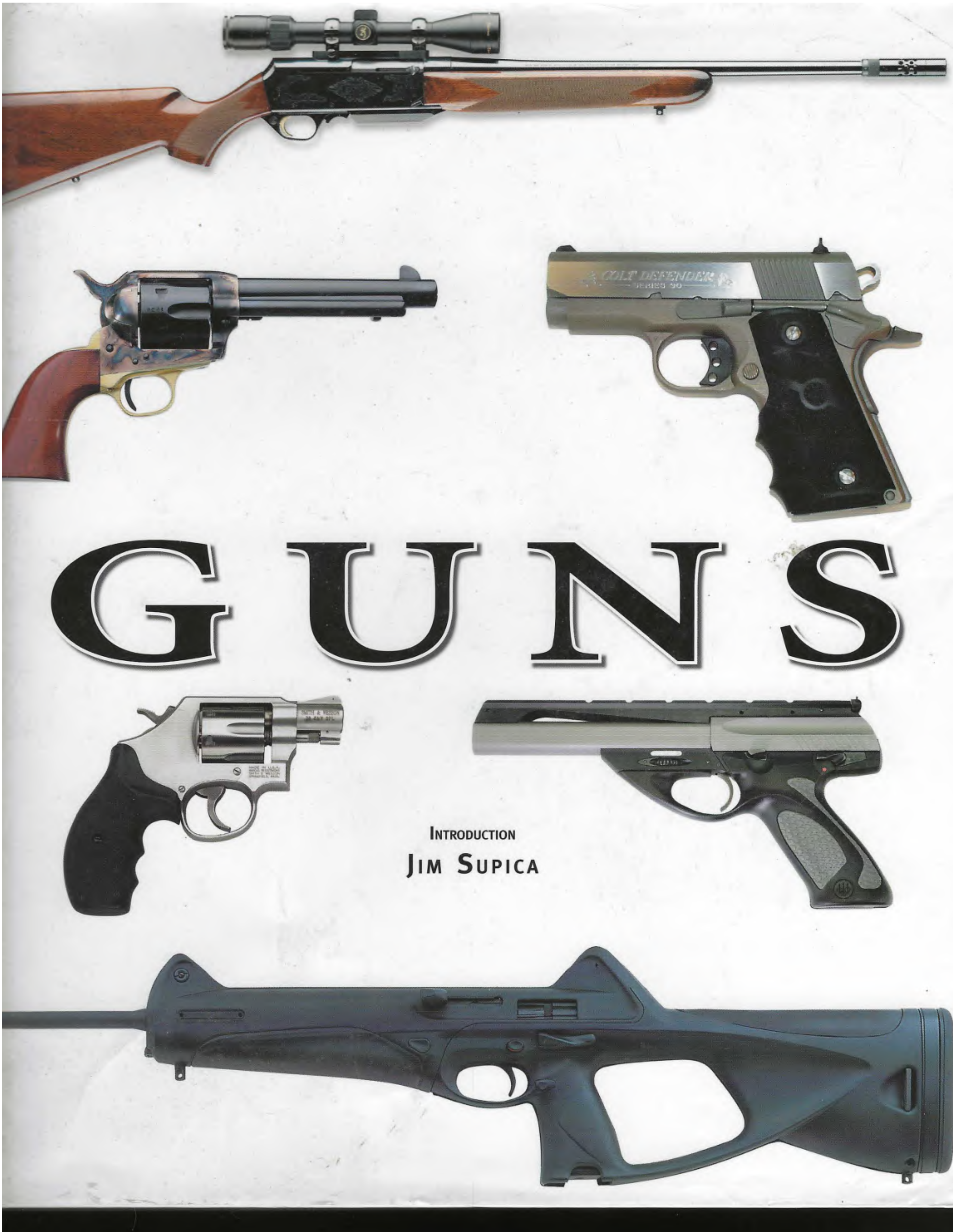
Testing the AR-18

Exactly why the few AR-18s produced by hand at Armalite for limited testing by the U.S. military failed to live up to expectations is a matter of some debate. Armalite had earlier arranged for exhaustive tests by the independent H.P. White Laboratory in Belair, Maryland, which verified Armalite's claims that the AR-18 was both tough and reliable. Yet this wasn't the result seen in the military tests subsequently conducted by the U.S. Army. What was going on?

Some Armalite officials later claimed these tests were less than fair, again suggesting that the army was protecting its new rifle just as it had earlier done with the M14. According to Burton T. Miller, some tests the army conducted with the 10 available AR-18s employed the wrong type of ammunition and a defective magazine. If so, this undoubtedly resulted in failures of the rifle because ammunition was fed poorly into the chamber.

To make matters intolerable, the Japanese

Exhibit E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the Arisaka, and so forth. The Springfield '03 was still widely issued to American forces, but in the decade preceding the outbreak of hostilities, the U.S. army had been first testing competing designs of semi-auto rifles, and then proceeding with manufacture and issue of the pattern deemed best.

The U.S. M-1 Garand in .30-06 caliber was without question the finest full power rifle fielded in WWII. Instead of a fixed or detachable box magazine, it was loaded with 8 rounds held in a metal clip. When the last round was fired, the clip was automatically ejected with the action remaining open for quick insertion of another loaded clip. It was rugged, reliable, and powerful.

Germany also was developing a mid-range shoulder weapon, but with a different intent. They sought a detachable magazine rifle that would fire a reduced power cartridge and would be controllable and effective in full-auto firing mode, with more range & power than a sub-machine gun. The resulting MP-43 filled the bill, but was developed late in the war. The concept was one which would survive the conflict – the Germans called the weapon a "Sturmgewehr", loosely translated as "assault rifle".

Most military establishments hesitated to "downsize" the power and range of their primary rifles in the early Cold War years. The semi-auto detachable magazine concept was an

The Luger represented a design advance in auto-pistols, and served as a military sidearm for Germany and other countries in the first half of the 20th Century. Shown here are scarce long-barreled variations. Photo by Jim Supica, ArmchairGunShow.com.

It was also heavy. The army sought a weapon that was more accurate and powerful, and had a longer range than a pistol, but which was lighter and handier than the full size rifle, intended primarily as a secondary weapon for tankers, artillery crews, and personnel who were not in a primary combat role. This role was ably filled by the M-1 Carbine, a semi-auto accepting a 15 round detachable box magazine. It fired a new straight-wall cartridge, midway in power between the pistol and the full sized rifle.

Right: *Firearms history is replete with odd & unusual designs. From top: Unwin knife pistol, ca. 1860's; cane pistol w/ bayonet, ca. mid-19th Century; tiny 2.7mm Kolibri auto-pistol, shown with silver dollar for scale, early 20th Century; U.S. military WWII "Liberator" single shot sheet metal .45 acp pistol, designed to be dropped to partisan forces behind enemy lines and intended as a "use a gun to get a gun" one-use weapon to kill an enemy soldier to acquire his more-effective weapon. Photo by Jim Supica, ArmchairGunShow.com.*

Examples of rare 20th Century military rifles include the Pedersen semi-auto (top), an early competitor of the Garand; and a Chinese Mukden bolt action Mauser pattern rifle. Photo by Jim Supica, ArmchairGunShow.com.

obvious success, and there was something to be said for full-auto capability. A series of full power "battle rifles" were introduced to meet this need – the FN-FAL and the Heckler & Koch G3 being two patterns that were widely adopted. The U.S. developed a Garand look-alike with detachable magazine and full-auto capability, the M-14.

However, the assault rifle concept wouldn't go away. The Soviet Union accepted the lower power round idea in it's fixed magazine semi-auto chambered for an intermediate power 7.62 x 39 mm round in 1945, the SKS, which saw wide distribution and production in Soviet client states, and enjoys popularity in the post-cold war US as an inexpensive semi-auto military surplus rifle.

They followed two years later with what would become probably the most widely produced military long arm design in history, and the quintessential assault rifle – the Kalashnikov designed AK-47, in the same caliber.

The AK-47 is a select fire (semi-auto or full-auto) carbine size weapon with a detachable 20 or 30 round box magazine. It has a well-deserved reputation for relatively cheap production, and for reliability even in the most adverse environments, or when used by under-trained indigenous forces who may neglect maintenance. It makes extensive use of sheet metal stampings in its construction, with a simple wooden buttstock with pistol grip.

The U.S. version of the assault-weapon configuration was introduced in 1963, originally known as the AR-15 and XM-16 designed by Eugene Stoner. It was ultimately adopted as the M-16 manufactured by Colt. It is chambered for the 5.56 Nato round, a military twin of the .223 Remington cartridge, and takes a detachable box magazine of 20 or 30 rounds. The rear sight is mounted on a distinctive integral carrying handle, and the stock and handguard are made of black synthetic material.

Initial reviews of the M-16 were mixed. A combination of an improper type of powder used in cartridge manufacture and a mistaken belief that maintenance could be neglected resulted in some early failures in the field. Some in the military establishment resisted a .22 caliber round for combat, dismissing it as a "poodle shooter".

This concern may be understood by reviewing a statistic commonly used to summarize a cartridge's power level – the

Exhibit F

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CHAPTER 6

THE AK VERSUS THE AR

A Hard Look at What May Be the Modern World's Two Most Often Used Tools of Warfare!

WHEN IT COMES to a comparison of the world's premier battle rifles, it is interesting to consider where and perhaps why they originated. A great influence where the Russians were concerned lay in the fact that their World War II semi-automatic rifle program had been less than successful. Only when the SKS, firing an intermediate-power cartridge, was adopted was the program considered any sort of a plus.

The United States, on the other hand, had the viable M-1 Garand. The success of this particular model – by design and in battle – colored our national thinking for decades.

However, both major powers recognized the obvious fact that static defense and warfare favoring static defenses was a thing of the past. Rapid deployment forces and superior firepower were then thought to be the watchwords of the future. Lighter weapons – most with the capability of full-automatic fire – would become the order of the day. Each nation apparently adopted this doctrine...but in different vehicles. The U.S. continued development of the M-1 Garand until it emerged as the M-14, a full-size, full-power rifle equipped with a detachable box magazine. The Russians adopted a rifle that was based largely on the German MP 44. The Russians liked the AK's firepower above all. The AK-47, the most popular of the various models, features a 30-round magazine and could be fired in the full-auto mode. The piece was – and is – designed to allow great reliability, which means that the parts are fitted loosely!

In the U.S., the M-14 was regarded as a good rifle, but experiments showed the rifle was not controllable in the full-auto mode. The heavy-barreled M-15, fitted with a bipod, then was suggested as a successor, but was not considered an efficient battle tool for full-automatic fire. Thus, controversy erupted between those who advocated rapid but accurate semi-auto fire and the emerging doctrine of firepower over accuracy. The situation remained static until events in Vietnam caused the U.S. military powers to consider an alternative weapons system.

The Saiga rifle is a beefed-up AK firing a 308 cartridge. The safety is up and on, locking the bolt. In the down position, the rifle is ready to fire. Campbell contends this is certainly not the handiest of modern battle rifle safeties.

In the Russian armed forces, the AK-47 did not replace Soviet machine guns at first, but it was noted that the AK utilized technology developed in the design and ultimate production of the successful PPSh-type 7.62mm Tokarev weapons. In this operation, metal stampings took the place of carefully machined parts. This approach made for an inexpensive weapon that could be mass-produced readily and quickly.

The bores of the early AKs were hard-chromed largely because of the previous Russian experience with poor quality ammunition and corrosive effects caused by inferior gun powder.

"While the AK may not invite close tolerances, it is not sloppy," according to Robert K. Campbell, who has made a study of the weapon. "Parts do not wear quickly to produce eccentric surfaces."

Campbell adds that "a parallel may be found between Armalite and Glock. The original Armalite corporation was unknown for weaponry, but wished to introduce aluminum into battle rifle production. At roughly the same time, Glock was entering its first venture in the firearms field by using a polymer frame. Both efforts, of course, have been successful. Even then, the AR-15 rifles and ultimate clones were produced on the newest machinery which was used to full advantage. However, the AR cartridge was designed to be more lethal than that fired from the AK."

Another then unique feature of the AR was the gas system. This rifle does not utilize a separate gas piston as does virtually every other gas-operated rifle in existence. Instead, the late Gene Stoner – a long-time friend of Jack Lewis prior to the inventor's passing – designed the rifle to deflect gas into a chamber in the bolt assembly.

"In one regard, the bolt is the action piston," Campbell soon learned. "This system has the advantages of low recoil impulse and high accuracy. A trade-off is that the system must be kept clean for proper function. Today, the M-16 variants all feature chrome-lined barrel and chamber surfaces. Problems in function with early rifles were answered with this chroming process."

In comparing the two types of rifles, one must realize that the AR-15 design arrived on the scene somewhat later concept-wise than the AK and is a somewhat fresher creation. The philosophies of the countries building these rifles also are evident in the production facilities needed to produce either rifle. State-run mega-factories appear best at producing the AK, while a good AR can be built by relatively small companies equipped with good CNC machinery. The technical differences of the two certainly exist on paper, but the real deal is how each rifle of its type handles and shoots. Thus, a comparison of the two rifles was undertaken by Bob Campbell to determine just how they stacked up against each other.

"In fairness, one must recognize the fact that there are many variants of either type rifle. I could have matched a precision-grade AR against perhaps a Krebs custom AK, or I could have chosen an Armalite version with optical sights and lorded it over the AK. I could have built up one or the other, but I opted for good but not extraordinary gear," Campbell explains. "The AR was ably represented by a Bushmaster carbine. The AK was a Century Arms variant with a folding stock."

It perhaps should be noted that the AR actually was the personal rifle of Campbell's son and had been fitted with a Vitor stock.

In comparing weights of the two combat-ready contenders, average weight of the loaded AR types was established as being about 7.5 pounds. The AK, carrying a loaded magazine as well, came in at 9.5 pounds. The Bushmaster used in the test had a 16-inch barrel, while the tube of the AK was 17 inches.

"The first question about the two weapons involved their handling qualities. To me, the AR

The AR-15 system, as exemplified by this Bushmaster carbine, is touted as being among the most ergonomic rifles ever fielded. It is considered to be user-friendly.

Campbell feels that cheek weld with the AR rifle is excellent. The sights come to the eye as the rifle is shouldered, the fore-end offering a comfortable grip.

The sight radius of the AK is shorter than that of the AR and the rear sight is much farther from the eye than with the AR sights. Proper hold can be uncomfortable.

The safety on the AK-47 tested illustrated the belief that the device is less than user friendly. Moving it in either direction is somewhat demanding.

felt better, offering the shooter confidence during quick movements, although the support hand felt cramped, when gripping the rifle's fore-end.

"I got the feeling," said Campbell, "that the AK was designed to be used by smaller people, but the Russians are by and large comparable in size to Americans. The forend of the AR has much more area for comfortable hand placement."

Campbell also felt that cheek weld with all of the AK variants he has tried over the years becomes more difficult than with the AR. "Some fellows with long arms must bend their wrist uncomfortably to hold the AK," the investigator reports. "This results in a slightly cramped grip. The three-position stocks available for the AR make firing with body armor relatively comfortable and allows the rifle to be carried comfortably. Truth is, the AK is less ergonomic than the AR."

In making the piece ready to fire, the cocking handle of the AR is easily actuated with either hand. Campbell says the AK is not difficult to make ready, but is less handy than the AR in this respect.

Bob Campbell insists the AR safety is among the most positive ever designed. Easy to manipulate, it offers rapid handling with a high degree of safety.

"With the AK, the bolt is cocked easily with the right hand in most cases, but the left hand is clumsy in coming over the top of the receiver to cock the rifle. The AR system is friendlier," Campbell contends.

He also feels that the AR safety is leagues ahead of anything else in current use. The safety lies under the thumb in a positive position for operation. Thus, the thumb can make the rifle safe in one quick, sweeping motion.

"The AK safety is a long lever mounted on the right side of the receiver. This lever resembles the safety of the Remington Model 8 and is no handier," according to Campbell. "The lever blocks the bolt when in the upper position and it requires the firing hand to be removed from the firing grip to manipulate the safety. The weak hand may travel over the top of the receiver to handle the safety, but this is a poor tactic.

"The safety of the AR-15 is much superior to that of the AK-47 in every way," is the evaluation on that score.

"Trigger compression for both types of rifles is probably close to equal," Campbell opines. "Both use military-style triggers that are neither light nor crisp. The Bushmaster trigger is the equal of any commercial offering, but the Century AK, while abrupt, was usable. Either trigger guard is suitable for gloved-hand use, although the AK is more generous."

Campbell found the sights of the AR much better for accurate fire at short, medium and long range, but especially at longer ranges. "The open sights of the AK simply do not allow the positive, quick sighting of the AR-type rifle. The aperture sight of the AR-15 quickly centers the eye."

Campbell feels a concern that must be addressed by law enforcement officers and citizen shooters is the fact that the AR tends to shoot low at close range. This is common to all military rifles, but the need to place the sights of the AR far above the bore adds to the problem.

"In a hostage situation, at up to 10 yards, a center hold on the forehead of a hostage taker could result in a shot to the hostage. As an example, if the hostage taker is holding your wife from behind in a take-over robbery and you take a dead-on center of the forehead hold and proceed to do business, the bullet will strike about in her clavicle. This is not something the designers were concerned with in coming up with a battle tool, but anyone using an AR for personal defense must understand this issue. The AK is slightly less offensive in this regard."

As for changing magazines, Campbell feels the AK is dated. "Robust and reliable, true, but the magazine is more difficult to change quickly than with the AR"

The AK magazine catch is located forward of the trigger guard and is actuated while the magazine is swung out and now. A new magazine is grasped, and then literally rocked into the receiver.

"The AR system is much smoother. A push of the magazine release allows the spent magazine to fall free. Since the magazine well extends below the bolt, it acts as a funnel to allow the magazine to be seated quickly. The ability of a soldier to keep up a barrage of fire is much greater with the AR."

Campbell also found that in firing, the AK recoil is greater than that of the AR. He says that neither rifle is uncomfortable or difficult to handle, but the AK-47 offers greater recoil. He found the sound of the fired cartridge is louder than that of the AR-15.

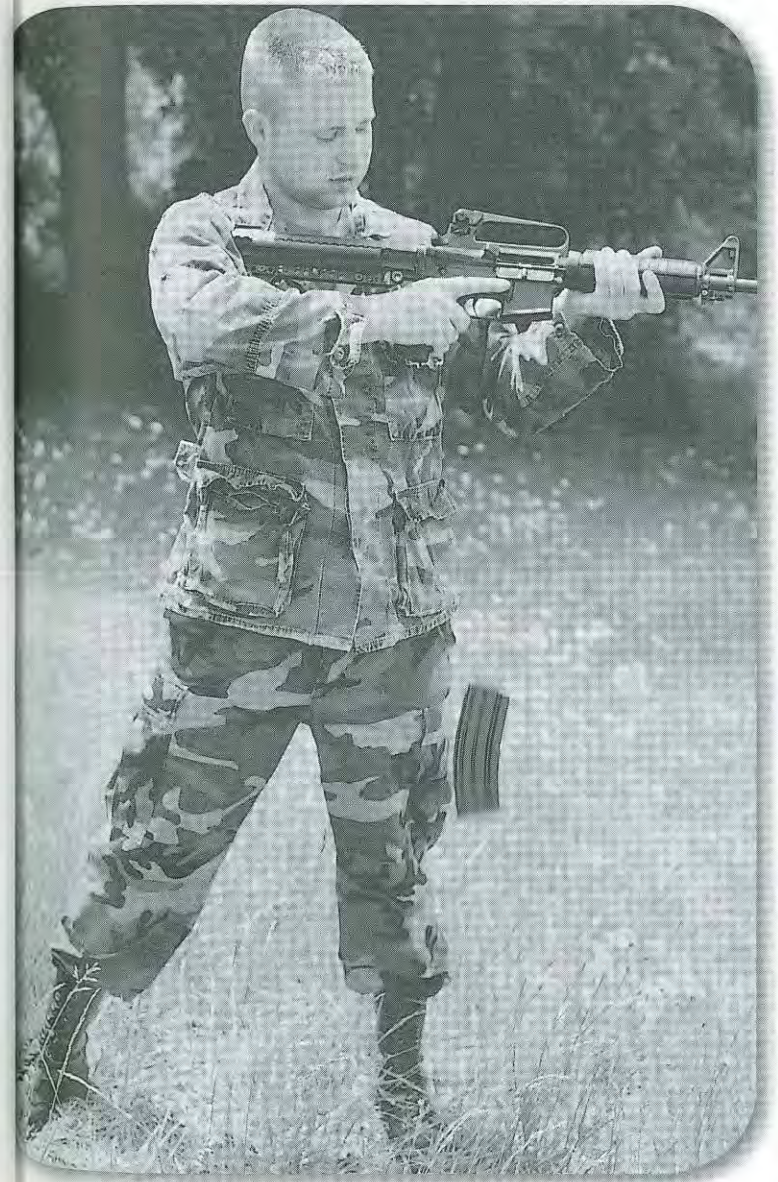
"As for reliability, the AK-47 has the mechanical and practical advantage," the investigator found. The gas cylinder of the AK-47 sits above the barrel and is cleaned and serviced easily. The gas tube is fairly large, affording much leverage in operation. The AR-15 has what is termed a gas impingement system. Gas alone works the bolt and there is no gas cylinder.

"There is an economy of manufacture realized by eliminating the gas cylinder and piston," Campbell says, "and the system also allows better stability and accuracy. At the same time, though, unburned powder may blow into the chamber causing carbon to form upon the gas port channel. The system demands clean-burning ammo or a malfunction may occur in less than 1,000 fired rounds."

The AR is assembled with closer tolerances than the AK and this is reflected in the AR-15's greater accuracy. This rifle was designed to allow quick, easy maintenance and troops in combat situations sometimes strip and clean the rifle several times a day.

"However, judicious use of hard chrome and ammunition development have done much to make the AR-15 series a much more reliable rifle than was the case with the original issue. In a worst case scenario, the AK is the more reliable beast, but the AR is certainly a reliable system."

During his evaluations, Campbell fired the AK in several positions, including offhand, in the under-the-arm unaimed position, kneeling and prone. He found it less well balanced than the AR, but feels a seasoned shooter could perform acceptably in most combat situations. "An exception was firing from the prone position, since the length of the extended magazine makes firing difficult."



For rapid reloading with a fresh magazine, one simply has to push the magazine release button and the empty falls out, saving seconds in the process.

Here the Bushmaster has been outfitted with the ATN illuminated reticle scope. This scope can be set for 100, 200 and 300-yard targets by click adjustments.

After the magazine release has been pushed to its forward position, the magazine of the AK must be rocked out, requiring what may be precious extra seconds.

The fresh magazine must be seated with a repeat of the rocking motion, then one must be certain that it is locked securely into the rifle's magazine shallow well.

Campbell contends that the AK is the less accurate rifle, but adds that this accuracy deficit involves more than one facet. He says the rifle did not group well off the bench as did the AR and in rapid-fire, maximum-speed drills, the AK did not equal the AR.

"I think that while we realize the AR is the more accurate system overall, we must also give the devil his due. The AK is not a bad system and can be used credibly. A difficulty in achieving the best results with the AK is the issue sights. The AK uses open sights that are a bit tighter than the buckhorn sights found on lever-action rifles, but they are not precise by any measure. The rear sight ranges from a U to a V, depending upon the date of issue and the manufacturer, while the front sight is a simple post."

The rear sight of the AR-15 features two aperture settings, the larger aperture being for close-range combat shooting, while the other opening is meant for long-range precision fire.

"In firing the rifles, I found that if I shot 10 to 20 rounds rapid-fire at ranges from 10 to 100 yards, the groups from the AR would be half the size of those from the AK. I also found that I tended to concentrate on the AR sights more closely. One tends to use the AK as designed: as a bullet hose! It will lay down a lot of firepower pretty quickly," Campbell found.

As for absolute accuracy, Campbell could not resist the comparison. "I used surplus-grade 'burner' ammo for most of the firing tests with good results. Wolf Ammunition's 62-grainer was used in the Bushmaster, while the 122-grain HP load from the same importer was fired in the AK.

"There were no malfunctions of any type in either rifle. I then used upscale loadings designed to give the top accuracy in each rifle. The results were unremarkable. The AK did not benefit from top-quality ammo nearly as much as did the AR. For the Russian rifle, I used 7.62x39mm top-quality loads from Cor-Bon and they

To reload the AR, one simply thrusts a magazine into the magazine well and it locks in. This allows for extremely rapid replenishment of 5.56mm ammunition.

Campbell says he is happy to have both of the rifles in the family. If he could afford only the AK, he would make do, but would hope to buy the AR soon!

Accuracy Results

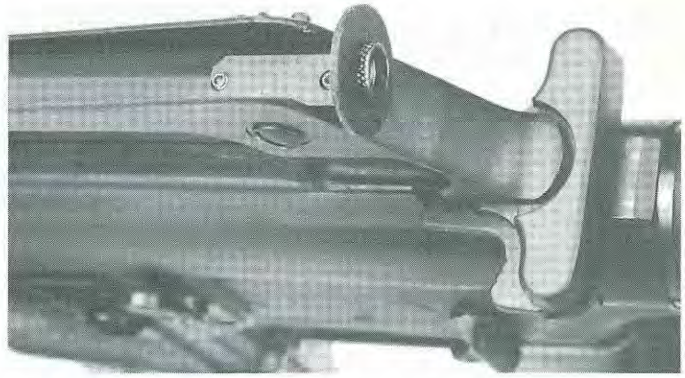
Five-shot 100-yard groups measured from outside to outside of the most distantly spaced bullet holes.

Bushmaster 5.56mm (16-in. bbl.)

Load	Group size (inches)
62-grain Wolf Ammunition	2.0
55-grain Winchester USA ball	1.8
64-grain Winchester JSP	1.5
55-grain Cor-Bon JSP	1.4
60-grain Black Hills	1.5
77-grain Black Hills	1.3

Century Arms AK-47 7.62x39mm (17-in. bbl)

Load	Group size (inches)
124-grain Norinco ball	4.5
122-grain Wolf Ammunition	3.65
123-grain Federal American Eagle	3.75
124-grain Winchester USA	3.6
125-grain Cor-Bon JHP	2.9
150-grain Cor-Bon JSP Hunter	3.25



This Bushmaster carbine has been fitted with KNS precision sights. Note that the cocking handle is handy for use by either hand. In pure function, Bob Campbell considers the AR variants as the premier among current battle rifles.

seemed to improve the ballistic effect, making it a respectable ranch or personal defense weapon. However, in the matter of accuracy, it will require another system to show the 7.62x39 rifle in a different light.

Campbell feels that the Russian battle tool is colored by World War II experience. House-to-house fighting in Stalingrad and other cities showed that firepower often decided the battle's outcome. In such environs, accuracy beyond 300 yards meant little.

The AK does not require a great deal of training. Soviet human resources certainly should never be underestimated, but diverse groups from all over the world have been able to learn to fire and maintain the AK-47 quickly.

The United States Army fought the same war against the same enemy in Europe, but came to different conclusions. Americans of that era were generally fine shots, since our freedoms allowed us to use firearms and become proficient with them.

The M-16/AR-15 is not the highly accurate long-range rifle that was the M-14, but it is more accurate than the AK and most of its clones. Campbell considers the M-16 a model of human engineering, noting that the Soviets favored a mechanized unit, whereas Americans still counted on infantry foot soldiers, so light weight and self-sufficiency were important. The AR-15 was developed to meet that need.

Which rifle does Bob Campbell prefer?

"I like the AK," he says. "It is a reliable rifle, an ideal centerfire plinker and an important part of history. But the AR would be my first choice in battle."

Gabriel Suarez, at his Arizona shooting school, shows that in the hands of a trained operator and from a solid firing position, the AK-47 is effective.

Exhibit G

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AD NUMBER
AD343778
CLASSIFICATION CHANGES
TO: unclassified
FROM: confidential
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TO: Approved for public release, distribution unlimited
FROM: Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; 31 JUL 1962. Other requests shall be referred to Defense Advanced Research Projects Agency, Arlington, VA.
AUTHORITY
31 Jul 1974, DoDD 5200.10; DARPA per DTIC Form 55

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ADVANCED RESEARCH PROJECTS AGENCY
Washington 25, D. C.

20 August 1962

To: Addressees
From: OSD/ARPA

Subject: Field Test Report, AR-15 Armalite Rifle
Enclosure: Final Report, OSD/ARPA Research and Development Field Unit - Vietnam

1. The AR-15 Armalite rifle has been subjected to a comprehensive field evaluation under combat conditions in Vietnam. The results of this evaluation, contained in the attached report, are forwarded for your information.

2. Because of the controversy which has surrounded this weapon, particular care was exercised to insure that the tests were objective, thorough and adequately documented, and to insure that valid data and conclusions were derived therefrom.

3. The suitability of the AR-15 as the basic shoulder weapon for the Vietnamese has been established. For the type of conflict now occurring in Vietnam, the weapon was also found by its users and by MAAG advisors to be superior in virtually all respects to the - a. M-1 rifle, b. M-1 and M-2 Carbines, c. Thompson Sub-machine gun and d. Browning Automatic rifle.

4. Test data derived from recent Service evaluations of the AR-15 in the U.S. support the technical conclusions of the report. The Central Intelligency Agency has conducted similar tests; it is understood that the resultsof that evaluation are essentially identical to those contained in the report.

5. Photographs 7 and 8, Appendix D, pictures of Viet Cong KIA showing the wound effect of the AR-15 bullet, were deleted from the attached report by this office.

6. The conclusions and recommendations of this report have been made available to COMUSMACV and CINCPAC by the originator and to DOD and CIA by OSD/ARPA.

R. C. Phelps
R. C. Phelps
Asst Director, for AGILE

Downgraded at 3 year intervals; Declassified after 12 years. DOD Dir 5200.10

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RESEARCH & DEVELOPMENT FIELD UNIT
Advanced Research Projects Agency
Office of the Secretary of Defense
APO 143, San Francisco, California

MACRD 31 July 1962

SUBJECT: Report of Task No. 13A, Test of Armalite Rifle, AR-15 (U)

THRU. Commander (3)
U. S. Military Assistance Command, Vietnam
APO 143, San Francisco, California

TO: Commander in Chief, U. S. Pacific (3)
c/o Fleet Post Office
San Francisco, California

Advanced Research Projects Agency (3)
Office of the Secretary of Defense
The Pentagon
Washington 25, D. C.

1. (C) Forward herewith is the final report of the test of the Armalite Rifle (AR-15). It should be noted that the report proper in its present form reflects the views of the U. S. element of CDTC only. It is being handled in this fashion to avoid the inference that the Vietnamese, in seeking a newer weapon, might have influenced the recommendations in the report.

2. (C) However, combat evaluations in Vietnam are necessarily joint ventures and the results must be made known to appropriate GVN authorities. This report will now be coordinated with the Vietnamese element in CDTC and will be officially closed out as a combined report. It is thought that this is unlikely to

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result in any substantive change in the report as now written.

1 Incl.
AR-15 Report w/5 Annexes

WILLIAM P BROOKS, JR.
Colonel, Arty
Chief

Copies furnished:
CHMAAG, VIETNAM (4)

DOWNGRADED AT 3 YEAR INTERVA[illegible]
DECLASSIFIED AFTER 12 YEARS
DOD DIR 5200.10

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RESEARCH & DEVELOPMENT FIELD UNIT
Advanced Research Projects Agency
Office of the Secretary of Defense
APO 143, San Francisco, California

REPORT OF TASK NO. 13A

TEST OF

ARMALITE RIFLE, AR-15 (U)

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REPORT OF TASK NO. 13A
TEST OF
ARMALITE RIFLE, AR-15 (U)

1. (U) REFERENCES.

a. (U) OSD Message, DEF 907037, DTG 122354Z December 1961.

b. (U) MACRD Message 367, DTG 050203Z June 1962.

c. (U) US Army Infantry Board Report of Project 2787, 27 May 1958, Subject: Evaluation of Small Caliber, High Velocity Rifle - Armalite (AR-15).

d. (U) Final Report, Lightweight High Velocity Rifle Experiment, US Army Combat Development Experimentation Center, Fort Ord, California, dtd 30 May 1959.

e. (U) Evaluation Report of the Colt Armalite AR-15 Automatic Rifle, US Air Force Marksmanship School, Lackland AFB, Texas, dtd 22 September 1960.

f. (U) Report No. DPS-96, A Test of Rifle, Caliber .223, AR-15, Aberdeen Proving Ground, Maryland, dtd 9 January 1961.

g. (U) Fourth Report on the Test of the US Carbine, Cal. .30, M1, ORD Program #4972, Aberdeen Proving Ground, Maryland, dtd 13 Aug 1942.

h. (U) First Report on Test of Production Models of the Carbine, Cal .30, M2, ORD Program #4972, Aberdeen Proving Ground, dtd 1 Aug 1945.

i. (U) US Army Infantry Board Supplemental Report of Project No 2787, "Evaluation of Small Caliber, High Velocity Rifles - Armalite (AR-15)", dtd 13 August 1958.

2. (C) PURPOSE.

The purpose of this test was to determine if the AR-15 Rifle is compatible with the small stature, body configuration and light weight of the Vietnamese Soldier and to evaluate the weapon under actual combat conditions in South Vietnam. At the request of MAAG, Vietnam, the scope of the test was expanded to include a comparison between the AR-15 and the M2 Carbine to determine which is a more suitable replacement for other shoulder weapons in selected units of the Republic of Vietnam Armed Forces (RVNAF).

3. (U) DESCRIPTION OF MATERIEL:

The AR-15 Rifle is a lightweight, gas-operated rifle equipped with a 20-round, detachable magazine. It is chambered for Cartridge, Caliber .223. When fired in the rifle, this round gives the 55 grain bullet a muzzle velocity of 3200 feet per second. It has a plastic stock with a rubber butt, assembled in line with the bore. This, in conjunction with its high line of sight and separate hand grip, is designed to minimize rotation about the shoulder during firing. The two piece upper hand guard is made of metal and plastic and is designed for easy disassembly and rapid dissipation of heat. A lever above the grip on the left side of the receiver provides a selector for the trigger safety, semi-automatic and automatic fire. A bolt catch holds the bolt to the rear after the last round has been fired. A cover is provided for the ejection port in the receiver. A three-pronged muzzle attachment, threaded to the barrel, serves as a flash suppressor, grenade launcher, and a front support for a bayonet. The lower part of the front sight is machined to form a bayonet lug. Standard accessories include: Bayonet w/scabbard; bipod w/case; grenade-launching sight; and a cleaning rod. Photographs of the weapon appear in Annex "D".

4. (C) BACKGROUND.

a. (U) The problem of selecting the most suitable basic weapon for the Vietnamese soldier is complicated by his small stature and light weight. The average soldier stands five feet tall and weighs ninety pounds. Principle US weapons presently issued to Vietnamese troops include the M1918A2; the Thompson Sub-Machine Gun, Caliber .45; and the US Carbine, Caliber .30, M1.

b. (U) Because of its availability and the results of extensive studies and previous testing by military agencies, the Colt Armalite AR-15 Rifle was selected in July 1961 as the most suitable weapon for initial tests. This weapon was developed by the Armalite Division of Fairchild Aircraft Corporation to meet the military characteristics for a lightweight rifle utilizing the high velocity small caliber principle. It was first tested by the US Army Infantry Board in 1958 (Ref 1.c.). Since then, the weapon and its ammunition have undergone extensive engineering and service tests by: Aberdeen Proving Ground; the Combat Development Experimentation Center, Fort Ord, California; and the US Air Force at Lackland Air Force Base, Texas, (Refs 1.d., 1.e., 1.f.). The rifle, with several modifications resulting from these tests, is presently being manufactured by Colt's Patent Firearms Manufacturing Company, Hartford, Connecticut. (Prior to completion of this report, the U. S. Air Force adopted the AR-15 as its basic shoulder weapon, replacing the M2 Carbine, the Browning Automatic Rifle and the M3 Sub-Machine Gun).

c. (C) Based upon favorable observations of the AR-15 by both US Advisors and RVNAF Commanders following limited firing demonstrations conducted in Vietnam during August 1961, weapons were requested in numbers sufficient to conduct a full scale combat evaluation of the AR-15 by selected units of the RVNAF. In December 1961, the Secretary of Defense approved the procurement of 1000 AR-15 Rifles, necessary ammunition, spare parts and accessories for evaluation.

d. (C) OSD/ARPA negotiated a contract with the firm of Cooper-MacDonald, Inc., Baltimore, Maryland, for procurement and air shipment of all materiel. The first shipment was received on 27 January 1962 and subsequent increments arrived approximately every three weeks until the contract was fulfilled on 15 May 1962. Operational evaluation and testing began on 1 February and terminated on 15 July 1962.

5. (C) <u>SUMMARY OF TESTS</u>:

a. (C) <u>General</u>.

(1) (C) To accomplish the stated purpose of this test, it was divided into two parts. One part was a combat evaluation of the AR-15 in which the weapons were issued to specially selected ARVN Units for use in their operations against the Viet Cong. Along with the rifles and ammunition, Vietnamese Unit Commanders and US Military Advisors were given weapon preference and operational questionaires and requested to complete and return them after training and combat use of the AR-15. Samples of these questionnaires appear as Appendices 1, 2, and 3 of Annex "A".

(2) (C) The other part of the test consisted of a comparison between the AR-15 Rifle and the M2 Carbine. Areas in which the two weapons were compared included: physical characteristics; ease of disassembly and assembly; marksmanship ability at known distances, semi-automatic and automatic fire; markmanship ability at unknown distances, semi-

automatic and automatic fire; ruggedness and durability; adequacy of safety features; effects of open storage in a tropical environment; ability to penetrate dense brush and heavy foliage; and, the individual Vietnamese soldier's preference between the two weapons.

b. (C) Results, Combat Evaluation.

(1) (C) For detailed report see Annex "A".

(2) (C) Summary. The Vietnamese Unit Commanders and US Advisors who participated in the evaluation consider the AR-15 Rifle to be a more desirable weapon for use in Vietnam than the M1 Rifle, BAR, Thompson Sub-Machine Gun, and M1 Carbine for the following reasons:

(a) (C) It is easier to train the Vietnamese troops to use the AR-15 than the M1 Rifle, BAR, M1 Carbine, or the Sub-Machine Gun.

(b) (C) The AR-15's physical characteristics are well suited to the small stature of the Vietnamese soldier (see photographs 1 and 2, Annex "D").

(c) (C) It is easier to maintain the AR-15 both in the field and in garrison than the M1 Rifle, BAR, Sub-Machine Gun, or the M1 Carbine.

(d) (C) The ruggedness and durability of the AR-15 are comparable to that of the M1 Rifle and superior to that of the BAR, Sub-Machine Gun, and M1 Carbine.

(e) (C) The AR-15 imposes less logistical burden than any of the four principal weapons presently being used by Vietnamese Forces.

(f) (C) The AR-15 is tactically more versatile than any present weapon being used by Vietnamese Forces.

(g) (C) In semi-automatic fire, the accuracy of the AR-15 is considered comparable to that of the M1 Rifle, and superior to that of the M1 Carbine.

(h) (C) In automatic fire, the accuracy of the AR-15 is considered comparable to the Browning Automatic Rifle and superior to the Sub-Machine Gun.

c. (C) Results, Comparison Test of the AR-15 Rifle and the M2 Carbine.

(1) (C) For detailed report see Annex "B".

(2) (C) Summary:

(a) (C) Test #1, Comparison of physical characteristics

(i) (C) The AR-15 is comparable to the M2 Carbine in size and weight.

(ii) (C) The addition of an integral grenade launcher, telescope mount, and an accessory bipod the AR-15 Rifle capabilities that the M2 Carbine does not possess at present and attainment of which would require modification of the weapon (see photograph 3, Annex "D").

(iii) (C) Both the AR-15 and the M2 Carbine are compatible with the light weight and diminutive stature of the Vietnamese soldier (see photographs 4 and 5, Annex "D").

(b) (C) Test #2, Comparative ease of disassembly and assembly.

(i) (C) The AR-15 is simpler than the M2 Carbine and requires less time to disassemble and re-assemble for normal field cleaning (see photograph 6, Annex "D").

(ii) (C) The average Vietnamese soldier can be trained in the disassembly and assembly of the AR-15 in less time than for the M2 Carbine.

(c) (C) Test #3, Marksmanship ability, known distance.

(i) (C) The ARVN soldier's ability to deliver accurate semi-automatic fire at known distances up to 200 meters with the AR-15 and the M2 Carbine is comparable. (It is noted that a higher percentage of test participants fired qualifying scores with both the AR-15 and the M2 Carbine than with the M1 Rifle.)

(ii) (C) The ARVN soldier can deliver far more accurate automatic fire at known distances up to 200 meters with the AR-15 than he can with the M2 Carbine.

(d) (C) Test #4, Marksmanship ability, unknown distance.

(i) (C) The ARVN soldier's ability to deliver accurate semi-automatic fire on targets of unknown range using the AR-15 and the M2 Carbine is comparable.

(ii) (C) The ARVN soldier can deliver more accurate automatic fire on targets of unknown range with the AR-15 than he can with the M2 Carbine.

(e) (C) Test #5, Comparative ruggedness and durability

(i) (C) The AR-15 is more durable than the M2 Carbine under conditions that require prolonged firing.

(ii) (C) The AR-15 will stand up to rough handling normally encountered in combat situations better than the M2 Carbine.

(f) (C) Test #6, Comparison of the adequacy of safety features.

(i) (C) The safety features on the AR-15 and the M2 Carbine are comparable with regard to their adequacy and the ARVN soldier's ability to understand how they function.

(ii) (C) The location of a single selector switch, which combines the functions of safety and type of fire selector, on the left side of the AR-15's receiver where it is easily accessible to the thumb, enables the ARVN soldier to get the first round off faster with the AR-15 than he can with the M2 Carbine. He must manipulate the safety selector on the M2 Carbine with his trigger finger, then return it to the trigger to fire. With the AR-15, he can keep his finger on the trigger while manipulating the safety selector with his thumb.

(g) (C) Test #7, Effects of open storage in a tropical environment.

(i) (C) The functioning capability of the AR-15 is less affected by prolonged exposure to tropical weather than that of the M2 Carbine.

(h) (C) Test #8, Brush penetration

(i) (C) The trajectory of the AR-15 bullet is not significantly affected when fired through dense underbrush at ranges up to 50 meters.

(ii) (C) The AR-15 round will penetrate jungle undergrowth equally as well as the M2 Carbine round at ranges up to 50 meters.

(i) (C) Test #9, Troop opinion poll

(i) (C) The great majority of the ARVN soldiers who participated in the comparison test prefer the AR-15 to the M2 Carbine.

6. (C) DISCUSSION:

a. (C) The extremely mobile type of offensive warfare being stressed by US Advisors in Vietnam and the small stature and light weight of the Vietnamese soldier place a high premium on small, lightweight weapons. In addition, the violent short clashes at close ranges which are characteristic of guerrilla warfare in Vietnam make it highly desirable to have a dependable weapon capable of producing a high rate of accurate and lethal full automatic fire.

b. (C) From the viewpoint of standardization and simplicity of training and the resultant long range reduction of the logistics burden, characteristics of existing weapons were studied to determine if a single weapon could be found that would meet the requirements for a basic shoulder weapon for Vietnamese troops. It is believed that such a weapon should encompass the following desirable characteristics of individual weapons:

(1) The effective range of the M1 Rifle.

(2) The light weight and small size of the M1 Carbine.

(3) The full automatic capability of the BAR.

(4) The simplicity of the SMG.

Other highly desirable, if not mandatory, features would include a bayonet, grenade launching and sniper capability.

c. (C) The AR-15 appeared to more nearly satisfy the above prescirbed characteristics than any other US weapon. The import of the AR-15 weapon/ammunition weight for units that conduct extended operations without normal resupply capabilities can be seen in comparing the 24 lb. weight of an M1 with a battle load of 220 rounds of ammunition with the 12 lb. weight of the AR-15 with 220 rounds. This weight difference equals approximately 430 rounds of AR-15 ammunition.

d. (C) The Comparison Test (Annex "B") shows the AR-15 to be distinctly superior to the M2 Carbine. Although the M2 Carbine is sufficiently light for use by the Vietnamese soldier, it does not possess the essential characteristics of a basic weapon for offensive warfare. It lacks the effective range of the M1 Rifle and has a high malfunction rate (Ref 1. e. and 1. h.). However, it is apparently available and was considered by MAAG as the prime competitor against the AR-15.

e. (C) The Combat Evaluation (Annex "A") shows that all US Advisors and Vietnamese Commanders who participated in the evaluation prefer the AR-15 to any other weapon with which the RVNAF are now armed. The lethality of the AR-15 and its reliability record were particularly impressive. All confirmed casualties inflicted by the AR-15, including extremity hits, were fatal (see photographs 7 and 8, Annex "D"). The high degree of reliability and trouble-free performance of the weapon reflected in previous test reports (Ref 1. c., 1. d., and 1. f.) was also noteworthy during the testing and evalutaion here. No parts breakage was encountered while firing approximately 80,000 rounds during the Comparison Test. Only two parts have been issued to date to replace breakage for the entire 1,000 weapons. Stoppages on the AR-15 are easily cleared by the individual soldier through the application of "immediate action".

f. (C) A thorough review of the numerous stateside AR-15 test reports referenced in paragraph 1 reveals nothing which would make the foregoing views unsound. The reported poor performance of the AR-15 under cold weather conditions is of no concern in Vietnam. The widely held view that the AR-15 operates poorly under rainy conditions was disproved in the weapon's second test by Aberdeen Proving Ground (Ref 1. f.). Those results were confirmed here during field operations. No deficiencies in the weapon requiring correction prior to adoption were found during the test in Vietnam, although two minor changes are recommended for product improvement. These recommendations appear in Annex "C".

g. (C) The combat evaluation part of this test is somewhat subjective since it is based on the individual judgments of many users. It is believed, however, that the professional judgments of the senior US Advisors and Vietnamese Commanders of the units testing the weapon, all of whom are mature, experienced soldiers, does provide for a sound combat appraisal.

h. (C) From an operational viewpoint, it is believed that the tests conducted in Vietnam show the superiority of the AR-15 over the M2 Carbine and over other weapons now issued to RVNAF. It is believed that the decision as to what units might be issued the AR-15 or which weapons the AR-15 might replace is dependent on cost and logistical factors which are beyond the purview of this unit.

7. (C) CONCLUSIONS: It is concluded that:

a. (C) The AR-15 is more compatible with the light weight and small stature of the Vietnamese soldier than the M1 Rifle, the Browning Automatic Rifle, and the Thompson Sub-Machine Gun.

b. (C) The AR-15 is superior to the M2 Carbine.

c. (C) The M2 Carbine lacks the necessary dependability and versatility for consideration as the basic shoulder weapon for Vietnamese troops.

d. (C) The AR-15 is capable of replacing any or all of the shoulder weapons currently being used by the Armed Forces of the Republic of South Vietnam.

e. (C) The AR-15 is considered by both Vietnamese Commanders and U.S. Military Advisors who participated in the tests as the best "all around" shoulder weapon in Vietnam.

8. (C) RECOMMENDATIONS: It is recommended that:

a. (C) The AR-15 be considered for adoption as the basic weapon for all RVNAF with a view toward improving effectiveness and simplifying training and weapons/logistics systems.

b. (C) Priority for adoption of the AR-15 be given to those units which frequently operate in jungle environment for extended periods, because of the significant operational and logistical advantages accruing to their having the lightest and most effective weapon/ammunition combination available.

c. (D) The M1 and/or M2 Carbine continue to be issued only to those individuals who, because of their duty or position, can function effectively with a weapon best suited for a defensive role.

ANNEXES:

A. Combat Evaluation w/3 Appendices
B. Comparison Test
C. Suggested Corrective Actions
D. Photographs 1 through 8

ANNEX "A"

DETAILS OF THE
COMBAT EVALUATION OF THE AR-15

I. (C) GENERAL.

Selected Vietnamese Units which had previously been engaged in considerable combat were issued AR-15 Rifles and ammunition for use against the Viet Cong. In addition, each Unit Commander and US Military Advisor with these units was given questionnaires in which he was requested to evaluate the AR-15 in comparison with the other weapons presently used by the RVNAF. (See Appendices 1, 2, and 3 for samples of questionnaires.)

II. (C) DISTRIBUTION OF WEAPONS AND AMMUNITION.

Unit	AR-15 Rifles	Ammunition
7th Infantry Division	100	50,000 rds
Rangers	100	50,000 rds
Airborne Brigade	390	195,000 rds
VN Marines	100	50,000 rds
VN Special Forces	100	50,000 rds
Special Battalions	125	120,000 rds
5th Infantry Division	40	25,000 rds
Father Hoa	10	10,000 rds
Total	965	550,000 rds

III. (C) DETAILS OF TEST.

A. (C) Purpose: To evaluate the performance of the AR-15 Rifle under actual combat conditions and to compare this performance to that of the weapons presently being used by the RVNAF.

B. (C) Method: Each Unit Commander and US Military Advisor of those units receiving AR-15 Rifles evaluated its performance in combat and compared it to the performance of those weapons presently being used by the RVNAF. Areas in which the AR-15 was evaluated and compared included: training; physical characteristics; ease of maintenance; ruggedness and durability; logistical considerations; accuracy; and tactical versatility. In the questionnaires given them, Commanders and Advisors were instructed to award 5 points to the most desirable weapon, 4 points to the second, 3 points to the third, 2 points to the fourth, and 1 point to the least desirable weapon in each category delineated above.

C. (C) Results: The results from the questionnaires are set forth in the table below and reflect the evaluation of the AR-15 by Commanders and Advisors of most of the different types of tactical units in Vietnam (as listed in paragraph II above). The figures indicate the total number of points awarded to each weapon by Vietnamese Unit Commanders and U.S. Military Advisors in their joint responses to the questionnaires.

1. Training.	AR-15	M1 Rifle	BAR	SMG	M1 Carbine	Max. Poss.
a. Simplest to train the troops to use	59	44	15	37	55	70
b. Simplest to train in functioning	61	50	15	37	47	70
c. Simplest to train in disassembly and assembly	63	48	14	37	48	70
Total	183	142	44	111	150	210

2. Physical Characteristics	AR-15	M1 Rifle	BAR	SMG	M1 Carbine	Max. Poss.
a. Easiest for soldier to aim and fire	60	29	17	42	62	70
b. Easiest to carry over open terrain	59	29	14	43	64	70
c. Easiest to carry through jungle terrain	59	29	14	45	63	70
d. Easiest to hold on a target while firing several rounds	69	40	24	24	53	70
Total	247	127	69	154	242	280

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3. Maintenance	AR-15	M1 Rifle	BAR	SMG	M1 Carbine	Max. Poss.
a. Simplest to disassemble and assemble	65	43	14	39	49	70
b. Easiest to maintain in the field	63	51	16	34	46	70
Total	128	94	30	73	95	140

4. Ruggedness & Durability	AR-15	M1 Rifle	BAR	SMG	M1 Carbine	Max. Poss.
a. Most rugged weapon	52	59	33	35	31	70
b. Had fewest stoppages or malfunctions during firing	59	59	20	32	39	70
c. Most reliable under all conditions	57	60	28	30	35	70
Total	168	178	81	97	105	210

5. Logistics	AR-15	M1 Rifle	BAR	SMG	M1 Carbine	Max. Poss.
a. Imposes least logistical burden	66	47	17	30	50	70
Total	66	47	17	30	50	70

6. Tactical	AR-15	M1 Rifle	BAR	SMG	M1 Carbine	Max. Poss.
a. Easiest to employ	64	40	18	39	49	70
b. Preferred in ambush/ counter-ambush situations	69	28	36	48	29	70
c. Preferred against massed troops	65	32	61	33	19	70
d. Tactically most versatile	69	43	38	29	31	70
Total	267	143	153	149	128	280

ANNEX "A"

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7. General	AR-15	M1 Rifle	BAR	SMG	M1 Carbine	Max. Poss.
a. Preferred by troops	67	28	18	46	51	70
b. Preferred by commanders and advisors	64	33	21	39	43	70
c. Most suited to VN soldier under present tactical conditions	67	30	21	42	50	70
d. Most effective at most common range for engaging VC (0-200 meters)	63	46	49	22	30	70
Total	261	137	109	149	174	280

Recapitulation: In all aspects covered, the total ratings for all weapons were as follows:

AR-15	M1Rifle	BAR	SMG	M1Carbine	Maximum Possible
1320	868	503	763	894	1470

8. Accuracy. Advisors and Unit Commanders were requested to evaluate the accuracy of the AR-15 and compare it with other present weapons in both automatic fire and semi-automatic fire. Their evaluation is reflected in the following table:

	AR-15	M1 Rifle	BAR	SMG	M1 Carbine	Max. Poss.
a. Semi-automatic fire	61	62			45	70
b. Automatic fire	65		57	42		70

9. (C) Remarks. Unit Commanders' and Advisors' remarks concerning the value of the AR-15 to Vietnamese Units and its worth as a combat weapon in the war in South Vietnam as opposed to existing weapons were also requested. Generally, the comments were extremely favorable to the AR-15. All of the comments received are presented below in their entirety and in the form in which they were received.

(1) (C) "On 160900 June 62, one platoon from the 340 Ranger Company was on an operation vic. YT260750 and contacted 3 armed VC in heavily forested jungle. Two VC had carbines, grenades, mines, and one had a

SMG. At a distance of approximately 15 meters, one Ranger fired an AR-15 full automatic hitting one VC with 3 rounds with the first burst. One round in the head-took it completely off. Another in the right arm, took it completely off, too. One round hit him in the right side, causing a hole about five inches in diameter. It cannot be determined which round killed the VC but it can be assumed that any one of the three would have caused death. The other 2 VC ran, leaving the dead VC with 1 carbine, 1 grenade and 2 mines." (Rangers)

(2.) (C) "On 9 June a Ranger Platoon from the 40th Inf Regt was given the mission of ambushing an estimated VC Company. The details are as follows:

a. Number of VC killed: 5
b. Number of AR-15's employed: 5
c. Range of engagement: 30-100 meters
d. Type wounds:
   1. Back wound, which caused the thoracic cavity to explode.
   2. Stomach wound, which caused the abdominal cavity to explode.
   3. Buttock wound, which destroyed all tissue of both buttocks.
   4. Chest wound from right to left, destroyed the thoracic cavity.
   5. Heel wound, the projectile entered the bottom of the right foot causing the leg to split from the foot to the hip.

These deaths were inflicted by the AR-15 and all were instantaneous except the buttock wound. He lived approximately five minutes.

The following is a list of minor deficiencies noted during this period:

a. The stock and heat deflector will reflect light. This light is visible for approximately 150 feet at night.

b. A brass brush is needed to remove carbon from the bolt carrier." (Rangers)

(3.) (C) "72 AR-15 Rifles were carried into this action (airborne assault). The drop zone was barely acceptable and many troops landed in high trees. Several LMG's and BAR's were not operational after the drop. Only one AR-15 was reported slightly damaged (damaged pistol grip) and all were operational. Throughout the entire operation, which lasted 6 days and covered over 40 kilometers of difficult terrain including dense jungle and frequent water crossings, the weapons (AR-15) held up exceptionally well." (Airborne Brigade)

(4.) (C) "The AR-15 proved to be an effective weapon on this operation for the following reasons:

a. The weapon held up very well on the paradrop which took place on a small drop zone surrounded by dense forests. Landings of the troopers were much rougher than normal. Many troops landed in high trees. This subjected the individual weapons to a much more severe test than usual. Some of the LMG's and BAR's were not operational after the jump. All AR-15's were functional.

b. Field maintenance on this weapon (AR-15) proved to be much simpler than on the other weapons.

c. While no decisive engagement was made so that the striking power of this weapon (AR-15) could be observed, the troops had great confidence in it and it is my belief that it would have greatly increased our overall firepower had it been tested." (Airborne Brigade)

(5.) (C) "During the period from 16 April to 11 May 1962, the 8th Battalion, Airborne Brigade, participated in two (2) operations of five (5) and four (4) days duration.

The AR-15 was carried during both operations. I was not in a position to observe the engagement of Viet Cong with the AR-15 during either operation although it was fired on different occasions.

The following remarks therefore, are confined to other observations and personal opinions on the AR-15:

a. Maintenance requirements for the AR-15 were negligible. I inspected numerous weapons throughout the entire period stated above and always found the weapons in excellent firing condition.

b. A great simplification in the small arms weapons could be effected by the adoption of the AR-15 to replace the BAR, M1, and Carbine. The effectiveness of the weapon (AR-15), however, I cannot attest to at this time.

c. The troopers have a great amount of respect for the AR-15. If the weapon were adopted as TO&E for Airborne Units, there would be a tremendous psychological uplift in the individual soldier's belief in his ability to shoot and kill." (Airborne Brigade)

(6.) (C) "One company (96 off & EM) completely equipped with the AR-15. Six operations took place prior to any real use of the weapon.

Five VC were hit, all five with body wounds, and all five killed. Four were probably killing wounds with any weapon listed, but the fifth was essentially a flesh wound. The AR-15 made it a fatal wound.

The troops have a great deal of respect for the weapon and prefer it to all others. They take excellent care of it.

One left upper handguard was cracked and broke during routing a stubborn captive from a wooded area. The soldier concerned placed the handguard against a VC head with considerable force." (7th Infantry Division)

(7.) (C) "On 23-24 May 1962, one company completely equipped with AR-15's (87) plus Bn Hq elements was involved in one light and one heavy action. No wounded were captured and all casualties were inflicted with the AR-15. 27 Viet Cong were killed (24 counted by the advisor) and 25 captured. Grenades were used for the first time and were very effectively employed at ranges of 100-500 meters. They served as the real artillery support as we could not get the artillery to fire any closer than 400 meters. About 36 grenades were utilized in the havy action, all propelled from the AR-15. The troops are very enthusiastic about the weapon and treat it with greater care than usual." (7th Infantry Division)

(8.) (C) "To date, this weapon has been used only for training. The simplicity of construction has reduced training time necessary for maintenance by approximately fifty per-cent. It is believed that this is an ideal weapon for this type weather and terrain." (Special Battalions)

(9.) (C) "On 13 April, 62, a Special Forces team made a raid on a small village. In the raid, seven VC were killed. Two were killed by AR-15 fire. Range was 50 meters. One man was hit in the head; it looked like it exploded. A second man was hit in the chest; his back was one big hole." (VN Special Forces)

(10.) (C) "This weapon is ideal for this country primarily for these reasons:

a. Durability & ease of maintenance.
b. Good Accuracy.
c. Rapid rate of fire.
d. Light weight (size & shape make it easy for Vietnamese to handle).
e. Excellent killing or stopping power." (Airborne Brigade)

D. (C) Analysis: Based on the numerical ratings and the comments of US Advisors and VN Unit Commanders, the AR-15 is the most desirable weapon for use in Vietnam for the following reasons:

1. Ease of training.

2. Suitable physical characteristics.

3. It is easy to maintain.

4. It is more rugged and durable than present weapons.

5. It imposes the least logistical burden.

6. It is the best weapon for all-around tactical employment.

7. Its semi-automatic firing accuracy is comparable to that of the M1 Rifle, while its automatic firing accuracy is considered superior to that of the Browning Automatic Rifle.

8. Vietnamese troops, Commanders and US Advisors prefer it to any other weapon presently being used in Vietnam.

APPENDICES:

1. Weapons Questionnaire
2. For the RVNAF Unit Commander
3. Questionnaire for the Senior MAAG Advisor

WEAPONS QUESTIONNAIRE

Based upon your experience and observation as the Commander or Advisor of a unit of the RVNAF, rate the weapons on the right side of this questionnaire in order of preference with respect to the characteristics and questions listed. Your answers should reflect your opinion as to the value of the weapons to the Vietnamese, not the US Forces.

Rating Key:
- 5 - first choice
- 4 - second choice
- 3 - third choice
- 2 - fourth choice
- 1 - last choice.

A. TRAINING	AR-15	M1 Rifle	BAR	SMG	M1 Carbine
1. Which weapon is easier to train the troops to use?	____	____	____	____	____
2. Which weapon is easier to train the troops in functioning?	____	____	____	____	____
3. Which weapon is easier to train the troops to disassemble and assemble?	____	____	____	____	____

B. PHYSICAL CHARACTERISTICS	AR-15	M1 Rifle	BAR	SMG	M1 Carbine
1. Which weapon, because of its size and shape, is easiest for the soldier to aim and fire?	____	____	____	____	____
2. Which weapon, because of size, shape and weight, is easier for the soldier to carry over open terrain?	____	____	____	____	____
3. Which weapon, because of size, shape and weight, is easier for the soldier to carry in the jungle?	____	____	____	____	____
4. Which weapon is easiest to hold on a target while firing several rounds?	____	____	____	____	____

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APPENDIX 1, ANNEX "A"

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C. MAINTENANCE	AR-15	M1 Rifle	BAR	SMG	M1 Carbine
1. Which weapon is simplest to disassemble and assemble?	____	____	____	____	____
2. Which weapon is easiest for the troops to maintain in the field?	____	____	____	____	____

D. RUGGEDNESS & DURABILITY	AR-15	M1 Rifle	BAR	SMG	M1 Carbine
1. Which weapon is most rugged?	____	____	____	____	____
2. Which weapon had the fewest stoppages and malfunctions?	____	____	____	____	____
3. Which weapon is the most reliable under all conditions?	____	____	____	____	____

E. LOGISTICS	AR-15	M1 Rifle	BAR	SMG	M1 Carbine
1. Which weapon imposes the smallest logistical burden? (Consider weight, spare parts, ease of repair, etc.)	____	____	____	____	____

F. TACTICAL	AR-15	M1 Rifle	BAR	SMG	M1 Carbine
1. Which weapon is easiest to employ?	____	____	____	____	____
Why?					
2. Which weapon would you prefer in ambush/counter-ambush situations?	____	____	____	____	____
Why?					
3. Which weapon would you prefer against mass attacks?	____	____	____	____	____
Why?					

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APPENDIX 1, ANNEX "A"

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	AR-15	M1 Rifle	BAR	SMG	M1 Carbine
4. Which weapon do you consider most versatile? (Consider all capabilities)	____	____	____	____	____

G. ACCURACY (Rate 5, 4 & 3)	AR-15	M1 Rifle	BAR	SMG	M1 Carbine
1. Which weapon appears most accurate when fired semi-automatically?	____	____	____	____	____
2. Which weapon appears most accurate when fired automatically?	____	____	____	____	____

H. GENERAL	AR-15	M1 Rifle	BAR	SMG	M1 Carbine
1. Which weapons do the troops prefer?	____	____	____	____	____
Why?					
2. Which weapon would you prefer for your personal use?	____	____	____	____	____
Why?					
3. Which weapon do you think is most suited to the Vietnamese soldier under present tactical conditions?	____	____	____	____	____
Why?					
4. At what range do you think most Viet Cong are engaged?	____	____	____	____	____
5. Which weapon do you think is most effective at that range?	____	____	____	____	____
6. If the TO&E of your unit only allowed a single weapon, which one would you choose?	____	____	____	____	____
Why?					

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I. REMARKS: In the space below, please make any pertinent remarks you may have concerning the AR-15 Rifle, its effectiveness in South Vietnam, its assets or its shortcomings (Continue on back of page if necessary).

Unit____________________

Date____________________

Signature____________________

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APPENDIX 1, ANNEX "A"

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FOR THE RVNAF UNIT COMMANDER

QUESTION NO. 1:

How many weapons of each of the following types were carried into the combat engagement, how many rounds of ammunition per weapon were carried, and how many rounds fired?

	No. Weapons	Ammo rds/weap.	Ammo rds. fired
BAR	______	______	______
M1	______	______	______
SMG	______	______	______
Carbine	______	______	______
AR-15	______	______	______

QUESTION NO. 2:

How many VC were killed? ____________
wounded? ____________

How many of the VC were KIA by the AR-15? ____________

How many of the VC were wounded by the AR-15? ____________

QUESTION NO. 3:

What percentage of the friendly fire was full automatic? ____________

What percentage of the AR-15 fire was full automatic? ____________

What percentage of the AR-15's had the safety device installed that allowed either full or semi-automatic fire? ____________

QUESTION NO. 4:

What was the maximum range at which shots were fired at the VC?____

What was the average range? ____________

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APPENDIX 2, ANNEX "A"

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QUESTION NO. 5:

Were aimed shots fired through light brush? ____________

If so, about what percent of the total fire from all weapons (BAR, SMG, M1, Cargine, AR-15) were aimed shots through light brush?

Less than 5% ____________ Less than 20% ____________

Less than 50% ____________ More than 50% ____________

In your opinion were shots from the AR-15 missed because of brush deflection? ____________

If your answer to this question is yes, is it your opinion that the full automatic feature of the AR-15 and the extra rounds that can be carried for a given weight allowance do or do not compensate for this bruch deflection? Yes____________ No____________ No Opinion____________

QUESTION NO. 6:

Were any rifle barrels bent in air drops or other rough handling and hard usage? ____________

Were any barrels damaged by being fired with water in the bore?____

Were there any malfunctions of any type? ____________

If yes, please elaborate in the remarks section of this questionnaire.

QUESTION NO. 7:

As a unit commander of the RVNAF, how would you rate the AR-15 Rifle in the guerrilla warfare action you expect to fight as compared with the other types of weapons listed?

In each space use: A - For the AR-15 is better than
B - For there is no difference
C - For the AR-15 is worse than
D - For no opinion

	M1	BAR	SMG	Carbine
Speed of employment	____	____	____	____
Accuracy	____	____	____	____

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APPENDIX 2, ANNEX "A"

	M1	BAR	SMG	Carbine
Striking power				
Fire power				
Reliability				
Field maintenance				
Weight				
Size				
Overall				
Overall for ambushes only				

QUESTION NO. 8:

If the VC tactics grow into large scale attacks and the "human sea" type tactic is used, how would you rate the AR-15 overall against these other weapons? (Same scale as above: A, B, C, D)

M1	BAR	SMG	Carbine

QUESTION NO. 9:

Would the soldier who carried the AR-15 into this engagement choose it again over the weapon he formerly carried?

	% would choose AR-15	% would choose other
Formerly carried the BAR		
Formerly carried the M1		
Formerly carried the SMG		
Formerly carried the Carbine		

QUESTION NO. 10:

As an RVNAF unit commander, if you had your choice of weapons consisting of all four of the following: BAR, M1, SMG, Carbine or the AR-15, which would be your choice?

OPTION A: BAR, M1, SMG, Carbine ________.

OPTION B: AR-15 ________.

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If your answer is option A, would you choose to completely replace any of the four weapons with the AR-15?

Would completely replace: BAR__________.

M1__________.

SMG__________.

Carbine__________.

QUESTION NO. 11:

Please elaborate in the space below or using extra sheets on any point not adequately covered above.

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QUESTIONNAIRE FOR THE SENIOR MAAG ADVISOR

1. In the engagement with the VC covered by this questionnaire, how many of each of the following weapons were carried by your unit?

BAR_____ SMG_____ M1_____ Carbine_____ AR-15_____

2. If the AR-15 had not been used, how many of each would have been carried?

BAR_____ SMG_____ M1_____ Carbine_____

3. As a MAAG Advisor to the RVNAF you obtain insight into the combat situation in SVN not available to the CDTC or to other US Government officials. These questionnaires can only gain a little part of the whole individual weapons problem. Some of the questions asked of the RVNAF unit commander are, therefore, repeated here because they are considered of prime importance.

QUESTION: How do you as a MAAG Advisor rate the AR-15 Rifle in the SVN guerrilla war as compared to the following weapons?

	BAR	M1	SMG	Carbine
A. The AR-15 is better.				
B. No difference.				
C. The AR-15 is worse.				
D. No opinion.				
How would you rate the AR-15 against these weapons for ambushes only?				
How would you rate the AR-15 in a "human sea" attack against these weapons?				

As a MAAG Advisor to RVNAF, if you were to recommend the TO&E of the above weapons or the AR-15 only which would you recommend?_____.

THIS QUESTIONNAIRE IS CLASSIFIED KIN CONFIDENTIAL WHEN FILLED IN

APPENDIX 3, ANNEX "A"

CONFIDENTIAL

4. If you would not recommend completely replacing all four of the above weapons with the AR-15, would you recommend completely replacing any one of the four?

Would recommend completely replacing BAR____________.
Would recommend completely replacing M1____________.
Would recommend completely replacing SMG____________.
Would not completely replace any of these weapons____________.

5. Remarks: In the space below or on additional sheets please elaborate on any points not adequately covered above.

____
(Signature)

ANNEX "B"

DETAILS OF COMPARISON TEST
BETWEEN THE AR-15 AND M2 CARBINE

I. (C) GENERAL.

Personnel from a Vietnamese company that had just completed advanced individual training were used as test subjects for most of this comparison. The unit of 180 men was divided into two groups of 90 men each. Group A received one M2 Carbine per man, while Group B received an AR-15 for each man. Each group was then given a course of instruction on their respective weapon. The instruction for each was identical in time and scope of material covered. Following this, both groups underwent an identical test program which consisted of: assembly and disassembly; known distance firing, both semi-automatic and automatic fire; unknown distance firing, semi-automatic and automatic fire; bayonet course; and, infiltration course. This phase lasted for one week (44 hours). At the end of the first week, the two groups traded weapons and the course of instruction and the tests were repeated.

II.(C) SUMMARY OF TESTS.

To arrive at a valid conclusion concerning the relative suitability of the AR-15 as opposed to the M2 Carbine for possible use by selected units of the Armed Forces of the Republic of Vietnam, a total of nine tests were conducted. They were:

1. Comparison of Physical Characteristics.
2. Comparative Ease of Disassembly and Assembly.
3. Marksmanship Ability - Known Distance (semi-automatic and automatic fire).
4. Marksmanship Ability - Unknown Distance (semi-automatic and automatic fire).
5. Comparative Ruggedness and Durability.
6. Adequacy of Safety Features.
7. Effects of Open Storage in a Tropical Environment.
8. Comparative Ability to Penetrate Dense Foliage.
9. Troop Preference Poll.

III. (C) **DETAILS OF TESTS.**

Test No. 1. Comparison of Physical Characteristics.

Purpose: To compare the physical characteristics of the AR-15 Rifle and the M2 Carbine.

Method: Both weapons were weighted and measured and the resulting data recorded.

Results:

a. Weights (lbs.):

	AR-15	M2 Carbine
Weapon (less sling, magazine and accessories)	6.24	5.98
Magazine (empty)	0.18*	0.25*
Magazine (loaded - 20 rds)	0.68	-
Magazine (loaded - 30 rds)	-	1.02
Bayonet	0.62	0.72
Bipod	0.50	(No Bipod)
Sling	0.19	0.07
Totals: w/20 rd mag loaded	8.23	
w/30 rd mag loaded		7.79

*Figure not included in totals.

Relative Battle Load (lbs.) - including accessories of sling, bayonet, bipod.

	AR-15	M2 Carbine
Weapon w/12 magazines (240 rds)	15.71	
Weapon w/8 magazines (240 rds)		14.93

b. Dimensions (inches):

	AR-15	M2 Carbine
Length of barrel	20.00	18.00
Overall length	37.50	35.58
Overall length w/bayonet	42.98	42.26

Analysis: The Ar-15 and the M2 Carbine are comparable in size and weight and both are compatible with the light weight and small stature of the VN soldier. An integral grenade launcher and telescope mount and an accessory bipod are included in the weapon weight of the AR-15. These are not standard items for the M2 Carbine.

Test No. 2. Comparative Ease of Disassembly and Assembly.

Purpose: To compare the ease of disassembly and assembly of the AR-15 Rifle and the M2 Carbine and the difficulities of training encountered therein.

Method:

a. Each group of test subjects received a two hour period of instruction in the disassembly and assembly of their respective weapons. After completing this instruction, test personnel selected random samples of 10 men and had them disassemble and reassemble their weapons. This procedure was repeated with each group until 100 men had been tested with each weapon. Times were recorded by Non-Commissioned Officers and the weapons were inspected for proper assembly by Test Committee Cadre.

b. For the purpose of this test, both weapons were disassembled only as far as was necessary for field cleaning, i.e., "field stripped".

Results:

		AR-15	M2 Carbine
a.	Average time required for disassembly & assembly.	1 min. 17 sec.	3 min. 17 sec.
b.	Could not reassemble (percent)	0%	19%
c.	Reassembled improperly (percent)	4%	10%
d.	Number of parts handled by soldier in field stripping	7	11

Analysis:

a. The AR-15 is simpler and requires less time to disassemble and assemble for normal field cleaning.

ANNEX "B"

b. The average Vietnamese soldier can be trained in the disassembly and assembly for field cleaning of the AR-15 in a shorter time than for the M2 Carbine. This is further emphasized by the fact that all test subjects had previously received 12 hours of instruction on the M1 Carbine while undergoing basic combat training.

Test No. 3. Marksmanship Ability, Known Distance.

Purpose: To compare the ability of ARVN soldiers to deliver accurate semi-automatic and automatic fire on targets at known ranges using the AR-15 and the M2 Carbine.

Method:

a. Each group of test subjects received 10 hours of preliminary marksmanship training on their respective weapon. Upon completion of formal instruction, zeroing of weapons and practice firing at 26, 100 and 200 meters, each group fired a qualification course for test purposes. Each test participant completed this qualification course with both the AR-15 and M2 Carbine.

b. In semi-automatic fire, the course fired for the test was the standard ARVN M1 rifle qualification course. The scores obtained by the test subject with both weapons in this firing were compared with each other and with previous scores fired by the test subjects in qualifying with the M1 Rifle while undergoing Basic and Advanced Individual Training.

c. In automatic fire, the test subjects engaged the standard ARVN silhouette target at ranges of 75, 100 and 200 meters. Each individual fired a total of 40 rounds from each range. Scores were computed on the basis of 5 points per target hit and an average of 50% hits was used as the basis for qualification.

d. Throughtout all firing, stoppages or malfunctions due to mechanical failures were noted and recorded.

e. Throughout all firing, observations concerning the adequacy of safety features and the ARVN soldier's ability to understand them were recorded.

Results:

	AR-15	M2 Carbine	M1 Rifle
Semi-automatic:			
Percent qualified	26%	27%	15%
Automatic:			
Percent qualified	71%	7%	

Analysis:

a. The ability of the ARVN soldier to deliver accurate semi-automatic fire on targets of known range with the AR-15 and the M2 Carbine is comparable. Test participants, as a group, fired a higher percentage of qualifying scores with both the AR-15 and M2 Carbine than they had previously fired with the M1 Rifle.

b. The ARVN soldier's ability to deliver accurate automatic fire on targets of known range is far greater with the AR-15 rifle than with the M2 Carbine.

Test No. 4. Marksmanship Ability, Unknown Distance.

Purpose: To compare the ARVN soldier's ability to deliver accurate semi-automatic and automatic fire on targets of unknown range using the AR-15 Rifle and the M2 Carbine.

Method:

a. The standard ARVN Transition firing course was used for this test.

b. Semi-automatic fire. Each man received 40 rounds to engage 20 targets at varying ranges from 50 to 250 meters. For a first round hit, he was awarded 10 points. For a second round hit, he was awarded 5 points. Qualification score for the course was 100 points.

c. Automatic Fire. Each man received 80 rounds to engage 20 targets in short bursts. Targets were located at varying ranges from 50 to 250 meters. Scores were computed on the basis of 5 points per target hit. Qualification score for the course was 100 points.

d. Throughout all firing, stoppages or malfunctions due to mechanical failures were noted and recorded.

e. Throughout all firing, observations concerning the adequacy of safety features and the ARVN soldier's ability to understand them were recorded.

Results:

	AR-15	M2 Carbine
Semi-automatic run:		
Percent qualified	23%	22%
Automatic run:		
Percent qualified	23%	15%

Analysis:

a. The ARVN soldier's ability to deliver accurate semi-automatic fire on targets of unknown range using the AR-15 and the M2 Carbine is comparable.

b. The ARVN soldier's ability to deliver accurate automatic fire on targets of unknown range is greater with the AR-15 than with the M2 Carbine.

Test No. 5. Comparative Ruggedness and Durability.

Purpose: To compare the ruggedness and durability of the AR-15 Rifle and the M2 Carbine.

Method:

a. Concurrent with all other testing, observations concerning the ruggedness and durability of each weapon were recorded. During all firing excercises, any stoppage or malfunction of either weapon caused by mechanical failure was noted and recorded.

b. Fifty AR-15 Rifles and fifty M2 Carbines were each run through the standard ARVN Bayonet Assault Course twice. At the completion of the course, the weapons were inspected and "dry fired". Any deficiencies noted were recorded.

c. Fifty AR-15 Rifles and fifty M2 Carbines were each run through the standard ARVN Infiltration Course twice. At the completion of the course, the weapons were inspected and "dry fired". Any deficiencies noted were recorded.

Results:

a. After the first week of firing, seven M2 Carbines were eliminated from the test. Six of these would not fire automatically because of defective disconnector springs; the other would not fire at all because of a broken disconnector pin. In contrast, all AR-15's functioned properly throughout the entire test period.

b. After negotiating the Bayonet Assault Course the second time, two M2 Carbines were eliminated from the test because of broken stocks. No AR-15 Rifles were damaged.

c. Both the M2 Carbine and the AR-15 were carried through the Infiltration Course twice without adverse effect.

Analysis:

a. The AR-15 is considered to be more rugged and durable than the M2 Carbine under conditions which require prolonged firing.

b. The AR-15 will stand up to rough handling normally encountered in combat situations better than the M2 Carbine.

Test No. 6. Comparison of the Adequacy of Safety Features.

Purpose: To compare the adequacy of the safety features of the AR-15 Rifle and the M2 Carbine with respect to their function and location and the ARVN soldier's ability to understand them.

Method:

a. Concurrent with all firing and tests in which ARVN soldiers handled the AR-15 and M2 Carbine, test committee cadre made observations concerning the adequacy of the safety features with respect to their function and location and the soldier's ability to understand them.

Results:

a. No misfires occurred throughout the firing that were attributable to improper functioning of the safety mechanism on either the AR-15 or the M2 Carbine.

b. The ARVN soldiers had no difficulty in understanding the function and operation of the safety mechanisms on either weapon.

Analysis:

a. The safety features on the AR-15 and the M2 Carbine are considered comparable with regard to function and the ARVN soldier's ability to understand them.

b. The location of a single selector switch which combines the functions of safety selector and rate of fire selector, on the left side of the receiver where it is easily accessible to the thumb, enables the ARVN soldier to get the first round off faster with the AR-15 than he can with the M2 Carbine. With the M2 Carbine, he must manipulate the safety selector with his trigger finger, then return it to the trigger to fire. With the AR-15 he can keep his finger on the trigger while manipulating the safety selector with his thumb.

Test No. 7. Effects of Open Storage in a Tropical Environment.

Purpose: To determine the effects of open storage in a tropical climate on the AR-15 Rifle and the M2 Carbine and compare the results of such storage on each weapon.

Method:

a. Two AR-15 Rifles and two M2 Carbines were stored in the open for a period of two weeks without any care or maintenance. At the end of the storage, the weapons were examined and pertinent observations recorded.

Results:

a. M2 Carbines:

1. Because of rust and sand which had collected in the receivers, operating handles on both weapons could not be operated manually and force was required to open the bolts.

2. The operating slide stops would not function properly because sand and grit had fouled the operating slide stop springs.

3. Both magazines were rusty and had collected enough sand to prevent them from operating properly without first being thoroughly cleaned.

4. The chambers and bores of both weapons were rusty.

5. The rear sights on both weapons could not be adjusted for windage due to the collection of rust and grit on the windage screws.

6. Approximately twenty minutes were required to clean each weapon before test personnel considered it safe to fire.

b. AR-15 Rifles:

1. The charging handles on both weapons were difficult to operate because sand had collected within the receiver.

2. The bolt and bolt carriers of both weapons were rusty.

3. The chambers and bores of both weapons were rusty.

4. Approximately five minutes were required to clean each weapon before test personnel considered them safe to fire.

Analysis: The AR-15 Rifle, because it has fewer moving parts, will function more readily than the M2 Carbine after extended periods of storage in the open under tropical conditions.

Test No. 8. Brush Penetration.

Purpose: To determine whether dense brush and undergrowth affects the trajectory of the AR-15 bullet and to compare its ability to penetrate heavy foliage with that of the M2 Carbine.

Method:

a. Silhouette targets were positioned behind dense underbrush which generally consisted of bamboo saplings, bush, grass and vines. From a distance of 15 meters, both the AR-15 Rifle and the M2 Carbine were fired at the targets.

b. The distance was then increased to 50 meters and the targets were fired upon again. (Beyond 50 meters it was impossible to distinguish a target, so this was considered an acceptable maximum distance for the test).

c. Procedures a and b above were repeated several times with foliage of varying density.

Results:

Type of Underbrush	Range	No. of rounds fired	No. of hits AR-15	No. of hits M2
Light underbrush	15 meters	6	6	6
Moderate underbrush & bamboo thicket	15 meters	6	6	6
Heavy underbrush & bamboo thicket inter-woven with vines	15 meters	6	6	6
Light underbrush	50 meters	6	6	6
Moderate underbrush & bamboo thicket	50 meters	6	6	6
Heavy underbrush & bamboo thicket inter-woven with vines	50 meters	6	6	5

Analysis:

a. The trajectory of the AR-15 bullet is not significantly affected when fired through dense underbrush at ranges up to 50 meters.

b. The AR-15 round will penetrate jungle undergrowth equally as well as the M2 Carbine round at ranges up to 50 meters.

Test No. 9. Troop Preference Poll.

Purpose: To obtain subjective data concerning the ARVN soldier's individual preference between the AR-15 Rifle and the M2 Carbine.

Method: Upon completion of all tests by participating personnel, each individual present for duty (158) was questioned with regard to preference between the two weapons.

Results:

a. Thought the AR-15 had the best "feel"	129	
Thought the M2 Carbine had the best "feel"		29

b.	Thought the AR-15 had the best sight	66	
	Thought the M2 Carbine had the best sight		92
c.	Thought the AR-15 would stand up best under combat conditions	107	
	Thought the M2 Carbine would stand up best under combat conditions		51
d.	Preferred the AR-15 grip	129	
	Preferred M2 Carbine grip		29
e.	Thought AR-15 easier to load	120	
	Thought M2 Carbine easier to load		38
f.	Thought AR-15 easier to get ready to use	81	
	Thought M2 Carbine easier to get ready to use		77
g.	Thought AR-15 easier to disassemble	140	
	Thought M2 Carbine easier to disassemble		18
h.	Liked the AR-15 better from recoil standpoint	106	
	Liked M2 Carbine better from recoil standpoint		52
i.	Thought AR-15 easier to get back on target after firing a round	117	
	Thought M2 Carbine easier to get back on target after firing a round		41
j.	Thought AR-15 more dependable	107	
	Thought M2 Carbine more dependable		51
k.	Thought AR-15 best all around weapon for Infantry use	100	
	Thought M2 Carbine best all around weapon for Infantry use		58
l.	Thought AR-15 climbed least when fired automatically	117	
	Thought M2 Carbine climbed least when fired automatically		41

m.	Thought AR-15 more accurate when fired full automatic	136	
	Thought M2 Carbine more accurate when fired full automatic		22
n.	Would prefer AR-15 in combat	130	
	Would prefer M2 Carbine in combat		28

Analysis:

a. The majority of test subjects preferred the AR-15 Rifle to the M2 Carbine in all aspects covered by the poll, except for the sights. Further questioning of the subjects by test committee personnel disclosed that this preference was due to greater familiarity with carbine-type sights, not because of an inability to understand the AR-15 sights. This is not considered a shortcoming of the weapon but a matter of training and familiarization.

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ANNEX "C"

SUGGESTED CORRECTIVE ACTIONS

DEFICIENCY/ SHORTCOMING	SUGGESTED CORRECTIVE ACTION	REMARKS

SECTION I

This section contains deficiencies requiring elimination in order to make the item acceptable for use on a minimum basis.

None	None	None

SECTION II

This section lists those deficiencies and shortcomings in the item which were discovered during test and satisfactorily corrected prior to completion of the test. They no longer represent a defect in the item tested. The correction must be applied to the production model of this item.

None	None	None

SECTION III

This section contains shortcomings which are desired to be corrected as practicable, either concurrent with elimination of deficiencies in Section I, or in production engineering or by product improvement.

1. The upper hand guard is hard to grip when hands are sweaty.	Roughen surface.	Ltr. from OSD/ ARPA on 11 Jul 62 states that manufacturer is now moulding "checkering" on upper hand guards.
2. The weapon cleaning rod is of minimum length and hard to grip.	Add one (1) additional section and provide "T" shaped handle.	

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ANNEX "D"

PHOTOGRAPHS

This Annex contains miscellaneous photographs which visually depict pertinent aspects of the evaluation of the AR-15 conducted in South Vietnam.

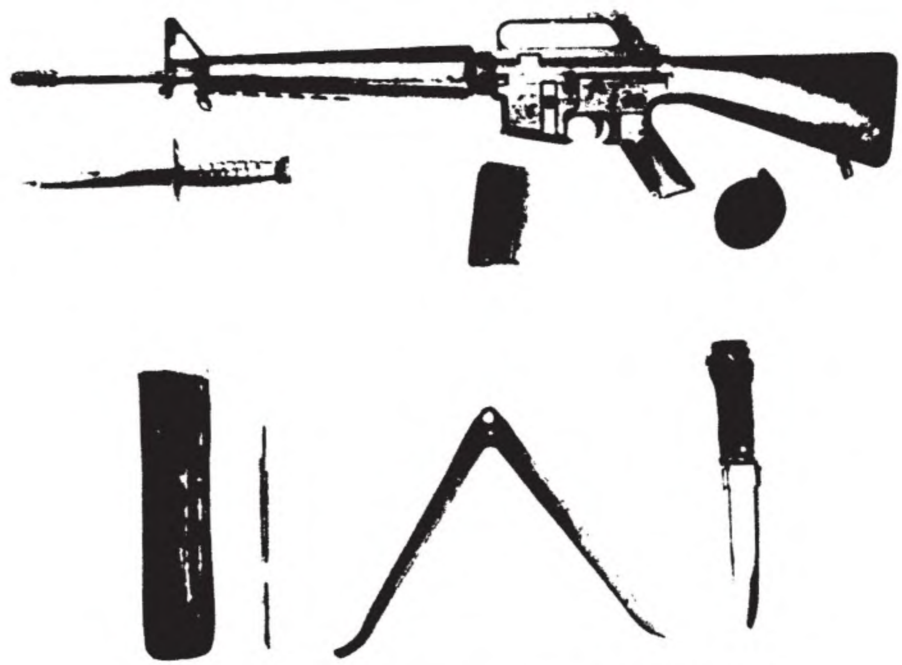
PHOTOGRAPHS:

1. VN Soldier with AR-15 and M1 Rifle
2. VN Soldier with AR-15 and BAR
3. M2 Carbine and AR-15 Rifle with Accessories
4. VN Soldier with AR-15 and M2 Carbine
5. M2 Carbine and AR-15 Rifle
6. M2 Carbine and AR-15 Rifle "Field Stripped"
7. VC Casualty by AR-15 - 150 Meters
8. VC Casualty By AR-15 - 15 Meters

VN Soldier with AR-15.

VN Soldier with M1 rifle.

[illegible] Carbine, Cal. .30, [illegible], w/standard accessories

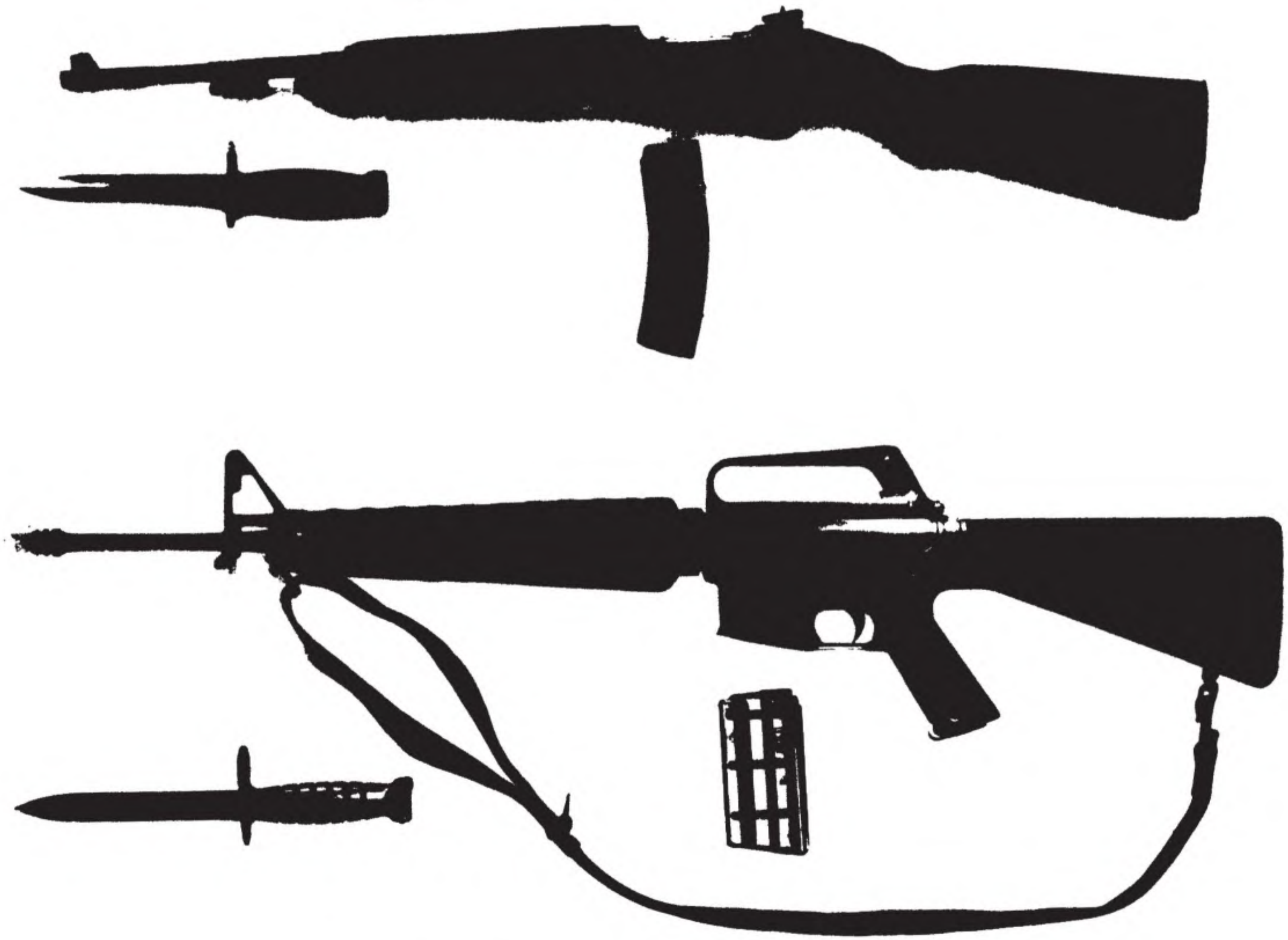


Colt, Armalite Rifle, A[illegible], [illegible] w standard accessories.

PHOTOGRAPH 3, ANNEX [illegible]

Assault Position with AR-15.

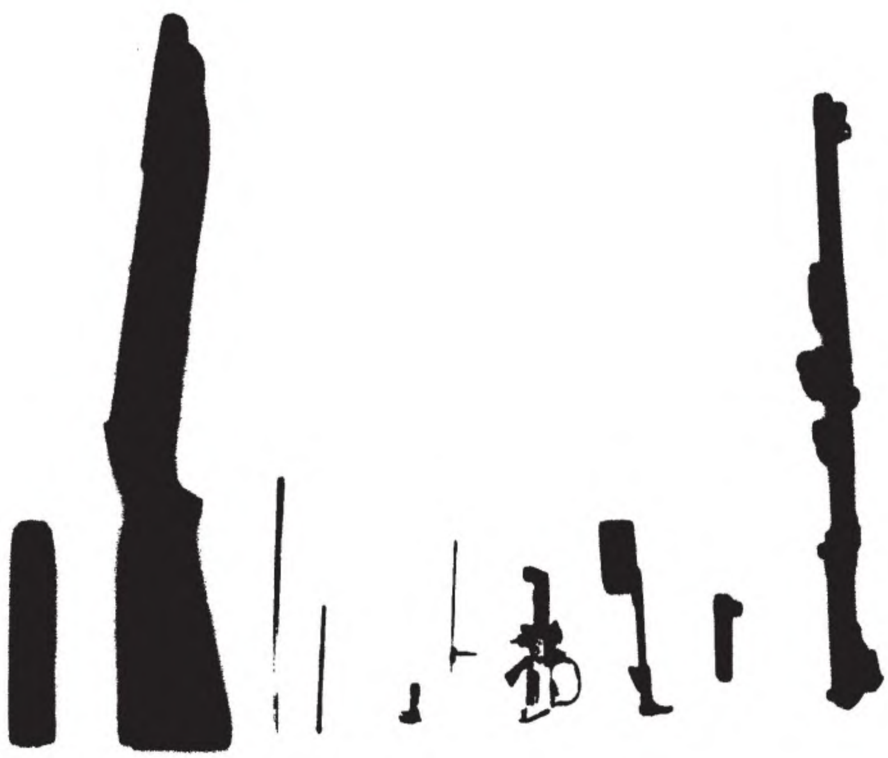
Assault Position with Carbine.



TOP: M2 CARBINE w/ BAYONET, 30 RD MAGAZINE

BOTTOM: AR-15 w/ 20 RD MAGAZINE

AR-15 Rifle, "Field Stripped."



M2 Carbine, "Field Stripped."

PHOTOGRAPH 6, ANNEX "D"

Exhibit H

The UDT SEAL MUSEUM presents

KEVIN DOCKERY

Special Warfare Special Weapons

THE ARMS AND EQUIPMENT OF THE UDT AND SEALS

from 1943 to the Present

THE EMPEROR'S PRESS

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The Arms & Equipment of the UDT and SEALS from 1943 to the present

Produced with the co-operation of the UDT-SEALS Museum

By Kevin Dockery

EMPEROR'S PRESS
Chicago, Illinois

The fortifications put in place on top of a SEAL billet in Vietnam during the Tet Offensive of 1968. At the lower right of the photo can be seen an M1 steel helmet laying on top of an M69 armor vest. Next to the vest is a set of web gear including at least one canteen. On top of the sandbags can be seen the buttplate of a loaded M60 machine gun. Next to the M60, leaning against the crate of ammunition, is a Stoner 63A light machine gun with a 150 round belt drum in place for use. Leaning against the wall just to the left of the sandbags is an M14 rifle with a 20 round magazine locked into place. The bandoleers appear to be additional 7.62mm ammunition in stripper clips for the M14 and additional M14 magazine are laying on top of the wall. Belts of 7.62mm ammunition for the M60 and 5.56mm belts for the Stoner are both draped over the wall. At the base of the M14 are the black fiberboard tubes holding high explosive ammunition for the M29 81mm mortar, the top portion of which can be seen just to the right of the center foreground of the picture.
PHOTO CREDIT: UDT-SEAL MUSEUM

Special Warfare: Special Weapons

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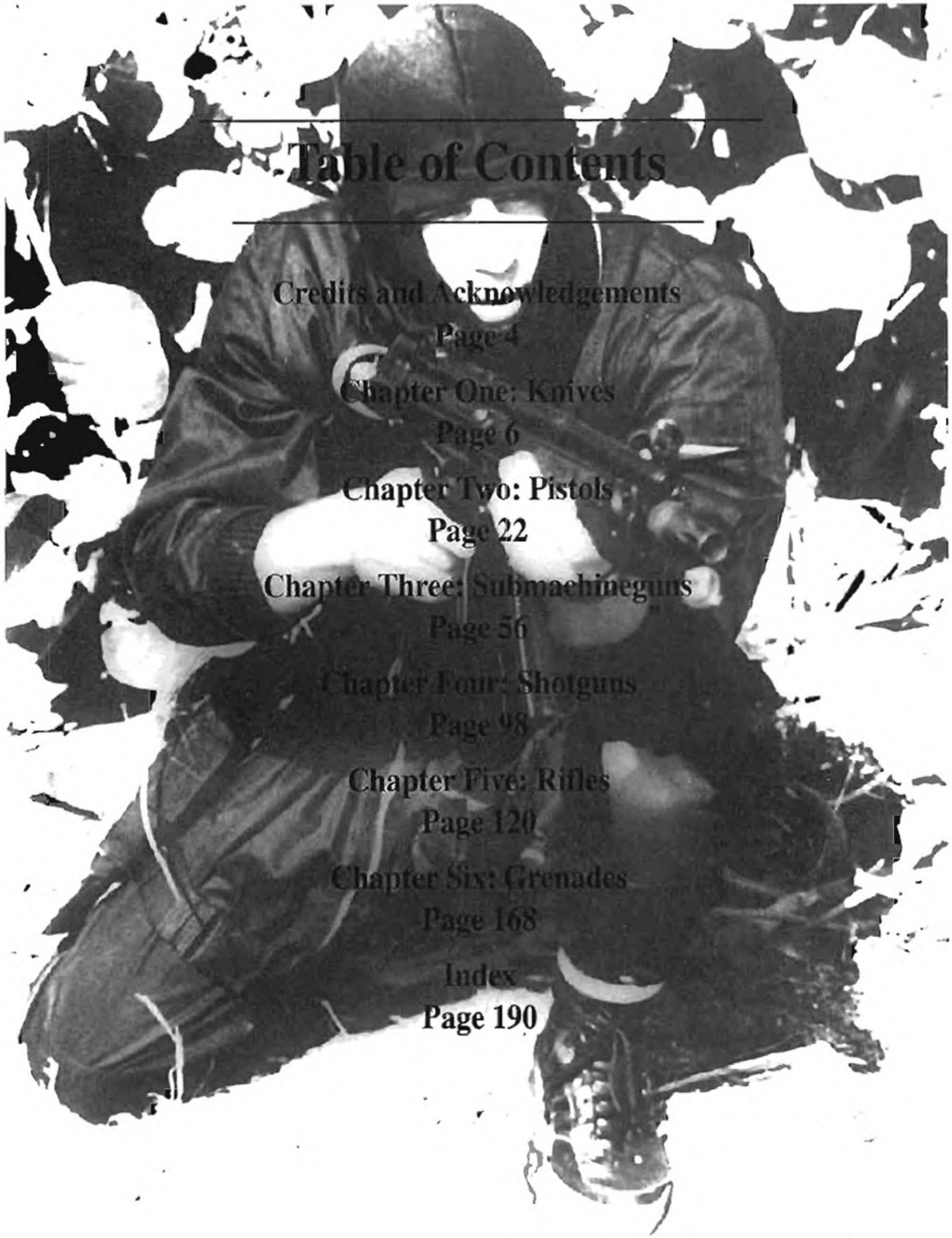

Table of Contents

This book and others to follow in this field are dedicated to the memory of Dr. Edward C. Ezell, Ph.D. who encouraged me to continue my writing, guided me, and told me I had paid my dues.

Help from a great many individuals and organizations went into the creation of this book and the items described between these pages. Because of the nature of their work, many of these individuals did not want to see their name in print. For others, the passage of time has rendered them anonymous.
The Author's personal and heartfelt thanks are extended to both the above and the following individuals, organizations, and institutions;

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Darryl Young

**And to the men of the Teams,
past,
present,
and future.**

A member of UDT-21 proudly displays a t-shirt with his unit's emblem after coming ashore in Denmark during NATO exercise Northern Wedding 82. He is armed with a Vietnam era XM177E2 fitted with a China Lake blank adapter. At his left shoulder is a Mark 1 Ka-bar with a cast aluminum pommel dating from World War II. The story of the UDT's came to an end within a year of this pictures being taken. In 1983, all UDT's were decommissioned and became SEAL Teams or SDV Teams.
Photo credit: US Navy

Rifles

TECHNICAL DATA—M1 Carbine
NSN 1005-00-670-7672
—M2 Carbine
NSN 1005-00-575-0057
CARTRIDGE—30 Carbine (7.62x33mm)
OPERATION—Gas
TYPE OF FIRE—Semiautomatic
M2 Selective fire - semiautomatic/full automatic
RATE OF FIRE—40 rpm
M2 Practical SS 40 rpm, A 75 rpm, Cyclic 750 to 775 rpm
MUZZLE VELOCITY—1970 fps (600 m/s)
MUZZLE ENERGY—956 ft/lbs (1296 J)
SIGHTS—Open, Ramp-type aperture/blade, Adjustable, graduation marks at 100, 200, 250, and 300 yards
FEED—15 or 30 round removable box magazine
WEIGHTS
WEAPON (EMPTY)—5.31 lbs (2.41 kg)
WEAPON (LOADED)—5.92 lbs (2.69 kg) w/15 rd mag
MAGAZINE (EMPTY)—15 round 0.19 lb (0.09 kg)
30 round 0.22 lbs (0.10 kg)
MAGAZINE (LOADED)—15 round 0.61 lbs (0.28 kg)
30 round 1.06 lbs (0.48 kg)
SERVICE CARTRIDGE—M1 Ball 196 gr (12.7 g)
PROJECTILE—111 gr (7.2 g)
LENGTHS
WEAPON OVERALL—35.58 in. (90.4 cm)
BARREL—18 in (45.7 cm)
SIGHT RADIUS—21.5 in. (54.6 cm) w/rear sight set at 100 yds

A group of UDT swimmers from Underwater Demolition Team 16 prepare to board their boat prior to going in to an island in the Pacific during World War II. The men are wearing standard jungle fatigues and inflatable canvas/rubber life belts along with M1 steel helmets. The man at the center of the picture has an unloaded M1 carbine slung across his back and is wearing an M1910 pistol belt with one-quart canteen and first aid pouch. In addition he has a pair of binoculars slung at his left side in their leather case. The binoculars indicate that the man is probably an officer and the uniforms and equipment suggest that the UDT men are going in to the island after the actual invasion has taken place. At the bottom left of the photograph can be seen the muzzle and front sight of an M1 carbine.
PHOTO CREDIT: UDT-SEAL MUSEUM

By the middle of World War II (1943) the average Navy sailor was receiving a limited amount of training in small arms while he attended boot camp as a recruit. Small arms were not a priority in the Navy as the force fought from aboard ship with the U.S. Marines being the primary amphibious ground combat unit. In 1943, when the NCDUs began training at Fort Pierce, Florida, the primary shoulder-fired weapon in the Navy was the bolt-action M1903 Springfield rifle. The semiautomatic M1 Garand was not considered a Navy weapon at that time and all production of the M1 was going to the Army and Marines.

For the men of the NCDUs and UDTs, it was not considered a mission priority to have the men offensively armed. Little emphasis was given to small arms training in the NCDU curriculum at Fort Pierce. The men who made up the UDT operating platoons were considered to be skilled demolitionists and not people to augment ground troops. Instruction in armed and unarmed combat was given to the UDTs in order that these highly trained men would be able to effectively defend themselves if necessary.

M1 (M2) CARBINE

The men who made up the Headquarters Platoon of a UDT were given training in small arms to a much greater extent than the men of the operating platoons. Headquarters personnel were expected to supply boat crews, coxswains, radiomen, and other support to the swimmers who would be doing the actual reconnaissance and demolition swims.

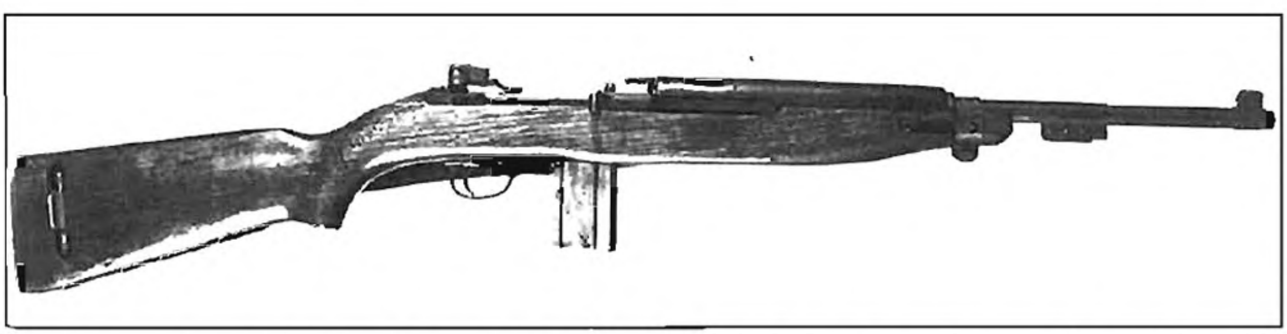
It was towards this end that the men of the Headquarters Platoon received hands-on experience with small arms, primarily the pistol and M1 carbine, as well as gunnery instruction for the .30 and .50 caliber machine guns. If, after the normal eight-week training period, there was a delay in sending the NCDU graduates to Maui for their UDT instruction the men would receive the same classes in small arms as the headquarters personnel.

But for all of their training, the men of the NCDUs and UDTs were still in the military. Common military jobs had to be performed such as guard duty. Because of the highly secret nature of their mission, the men of the NCDUs and UDTs were not able to tell anyone what they did to cause all the explosions heard coming from North Hutchison Island near Fort Pierce. The locals could of course hear the blasting, but the island was off limits to almost everyone but the NCDU students.

But the ammunition and explosive magazines on North Hutchison Island had to be guarded, and it was the men of the NCDU school who pulled that duty. The same situation was repeated at the UDT training compound on Maui in the Pacific. When necessary, the NCDU and UDT men were normally armed with the M1 Carbine.

The M1 Carbine was designed early in World War II after a directive for its development was put out by the Army Ordnance Board in June 1940. The intent was to develop a shoulder-fired weapon weighing about five pounds and having an effective range of 300 yards. The weapon was intended as a replacement for the service pistol and submachine gun for officers and noncommissioned officers as well as being a supplementary weapon for mortarmen, machine gunners, radiomen, and other similar duty positions.

The US service rifle cartridge (30-06) was far too powerful for as light a weapon as the carbine was supposed to be, and the service pistol cartridge (45 ACP) was unable to reach the range requirement. A special .30



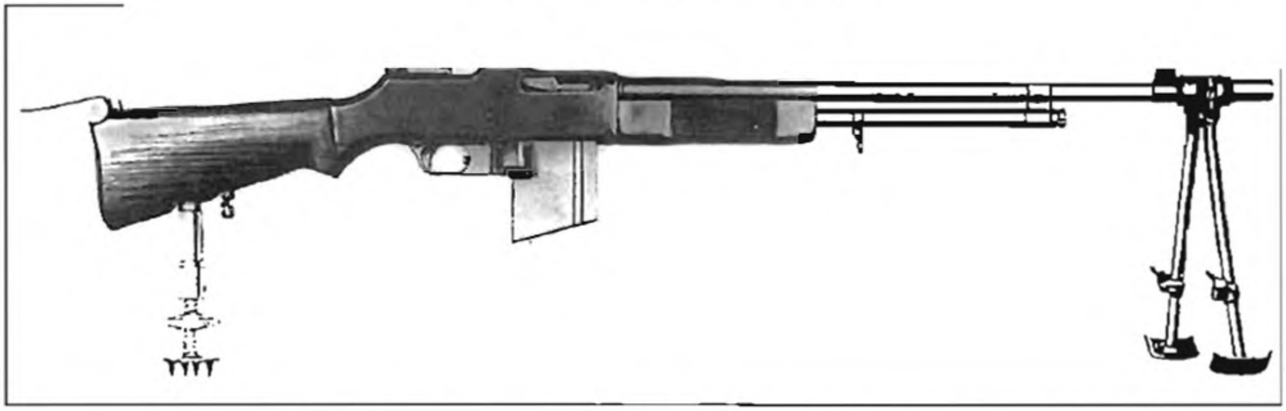
The M2 carbine loaded with a 15 round magazine. The top knob of the small selector lever can be seen at the top of the receiver, above the magazine and just forward of the curved grip of the operating rod.
PHOTO CREDIT: SMITHSONIAN INSTITUTION

TECHNICAL DATA—M1918A2 Browning Automatic Rifle
NSN 1005-00-674-1309
CARTRIDGE—30-06 (7.62x63mm)
OPERATION—Gas
TYPE OF FIRE—Full automatic, fast and slow rates
RATE OF FIRE—Practical [slow] 40 to 60 rpm, [fast] 120 to 150 rpm, Cyclic [slow] 350 to 450 rpm, [fast] 550 to 650 rpm
MUZZLE VELOCITY—2800 fps (853 m/s)
MUZZLE ENERGY—2646 ft/lbs (3588 J)
SIGHTS—Open, Leaf-type aperture w/round-notch battle sight/blade, Adjustable, battle sight set at 300 yards, leaf graduated 100 to 1500 yards in 100 yard increments,
FEED—20 round removable box magazine

WEIGHTS
WEAPON (EMPTY)—18.96 lbs (8.60 kg) w/bipod
WEAPON (LOADED)—20.59 lbs (9.34 kg)w/bipod
Bipod 2.44 lbs (1.11 kg)
MAGAZINE (EMPTY)—0.44 lb (0.20 kg)
MAGAZINE (LOADED)—1.63 lb (0.74 kg)
SERVICE CARTRIDGE—M2 Ball 416 gr (27 g)
PROJECTILE—152 gr (9.8 g)
LENGTHS
WEAPON OVERALL—47.8 in. (121.4 cm)
BARREL—24.07 in (61.1 cm)
SIGHT RADIUS—31.13 in. (79.1 cm)

"The Browning Automatic Rifle Model 1918A2, or simply BAR, is a very heavy and powerful rifle."

Men on board a Navy ship stand mine watch. The sailor holding the weapon is armed with an M1918A2 Browning Automatic Rifle (BAR) with the bipod removed. The weapon will be used to shoot and detonate mines as they are detected before they can threaten the ship.
PHOTO CREDIT: US NAVY



A complete M1818A1 Browning Automatic Rifle (BAR). This example is complete with the rear monopod, an item almost always removed by the user in the field.
PHOTO CREDIT: US ARMY

caliber low-powered round was designed specifically for what was then called the "light rifle" trials in 1941. Several arms manufactures submitted prototype weapons chambered for the new round. By the fall of 1941, only sixteen months after the directive had first been issued, a winner of the light rifle trials had been decided on. The Winchester Light Rifle was adopted as the M1 Carbine in October 1941.

As adopted, the M1 Carbine was a small semiautomatic rifle feeding from a fifteen-round magazine. It was this model carbine that was issued to the men of the UDTs as their duties required. Late in 1944, a selective-fire version of the carbine was developed. Issued as the M2 Carbine, the new weapon had a thirty-round magazine available for it that could also be used in the earlier M1 Carbine. As the M2 Carbine became available, it was issued to the UDTs.

M1918A2 BAR

The only other shoulder weapon trained with and used in any numbers by the UDTs in World War II was at the opposite end of the small arms scale from the M1 Carbine. The Browning Automatic Rifle Model 1918A2, or simply BAR, is a very heavy and powerful rifle. Normally fired from the prone position with the weapon supported by a bipod, the BAR is capable of good accuracy at a long range. The twenty-round magazine of the BAR limits its capacity for sustained fire somewhat as does its lack of a way to change a hot barrel. But the weapon was a great deal more portable that the contemporary belt-fed automatic weapons of the time.

Instead of being selective-fire, that is firing either semiautomatic or full automatic, the M1918A2 BAR instead had two different rates of fire that could be selected by the operator. The fast rate of fire, around 600 rounds per minute cyclic, could put out a rapid volume of fire in order to engage or suppress an enemy position. The slow rate of fire, about 350 rounds per minute cyclic, allowed for single shots to be easily fired by a trained gunner and has more controllable muzzle climb when fired from the standing position.

In the Navy, the BAR would be used for shore or landing party operations. On board ship, the BAR would occasionally be found in use to augment a ship's volume of antiaircraft fire. More important to the men of the UDT, the BAR could be used to give a reasonable amount of firepower to small craft such as a rubber boat. The BAR could be fired from such a boat by a single operator while the light machine gun of the time, the Browning M1919A4 would be very clumsy to use and take up a great deal more room.

Used by the UDT in only limited numbers, the BAR saw little if any combat duty with the Teams during

A technician checks an M1918 Browning Automatic Rifle (BAR) while on board ship in the Pacific during World War II. These early-model BAR's could still be found in Navy arms rooms throughout the war where they were used for ship defense and to arm landing parties. The last weapon on the left is an M1918 BAR with its forearm removed and a pintle adaptor installed. The pintle adaptor would allow the weapon to be placed in any standard machine gun mount on board ship.
PHOTO CREDIT: UDT-SEAL MUSEUM

TECHNICAL DATA—AR-15 (Colt Model 601), M-16 (Colt Model 602)
NSN 1005-00-983-6877, (M-16) 1005-00-856-6885
CARTRIDGE—.223 Remington (5.56x45mm)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 45 to 65 rpm, A 150 to 200 rpm, Cyclic 700 to 950 rpm
MUZZLE VELOCITY—3250 fps (991 m/s)
MUZZLE ENERGY—1313 ft/lbs (1780 J)
SIGHTS—Open, Flip-type aperture/post, Adjustable, battle aperture 0 to 300 meters, long range aperture 300 to 500 meters
FEED—20 or 30 round removable box magazines
WEIGHTS
WEAPON (EMPTY)—6.35 lbs (2.88 kg) w/o sling
WEAPON (LOADED)—7.46 lbs (3.38 kg) w/20 rd mag & sling
Sling 0.40 lbs (0.18 kg)
MAGAZINE (EMPTY)—20 round aluminium 0.19 lb (0.08 kg)
30 round aluminium 0.24 lbs (0.11 kg)
MAGAZINE (LOADED)—20 round 0.71 lb (0.32 kg)
30 round 1.02 lbs (0.46 kg)
SERVICE CARTRIDGE—M193 Ball 182 gr (11.8 g)
PROJECTILE—56 gr (3.6 g)
LENGTHS
WEAPON OVERALL—38.6 in. (98 cm)
BARREL—20 in (50.8 cm)
SIGHT RADIUS—19.72 in. (50.1 cm)
These weapons are among the first of their kind to be used by the Navy. A noticeable characteristic of the early AR-15/M-16 weapons is the shiny appearance of the chromed bolt carrier, visible through the open ejection port, and the green-colored plastic furniture (stocks). Later versions of the weapon had black plastic furniture and the bolt carrier was parkerized a dull grey.

A group of SEAL Team Two operators in the early 1960's. They are wearing uniforms that were part of a large open-purchase of commercially-produced equipment that was made to get the newly commissioned SEAL Teams operational as quickly as possible. The groups weapons are early-model Colt AR-15 rifles. The early style, fully chromed bolt carrier is readily visible through the open ejection port of the weapon held by the SEAL at the left of the picture. The smooth right side of the upper receivers show that these weapons do not have the forward bolt assist required by the Army in the later M16A1 rifle. Additionally, these weapons have the first model, stepped-down, double diameter open-prong flash hiders that were part of the early production units in the series. The SEAL at the lower right in the photo is holding the very rare AR-15 carbine with its flash suppressor mounted just ahead of the front sight.
PHOTO CREDIT: RYAN McCOMBIE COLLECTION

World War II. Photographs of NCDUs at Fort Pierce exist showing at least one man of the six man NCDU armed with a BAR. Training was given on the M1918A2 BAR at Fort Pierce and it is likely that additional training with the weapon was conducted at Maui late in the war. The commander of the UDT school at Maui towards the end of World War II, Commander John T. Koehler, could see the mission of the UDTs expanding inland if the war continued. To account for such a situation, and to expand the capabilities of the UDTs, Commander Koehler added further small arms training and other skills to the UDT training curriculum.

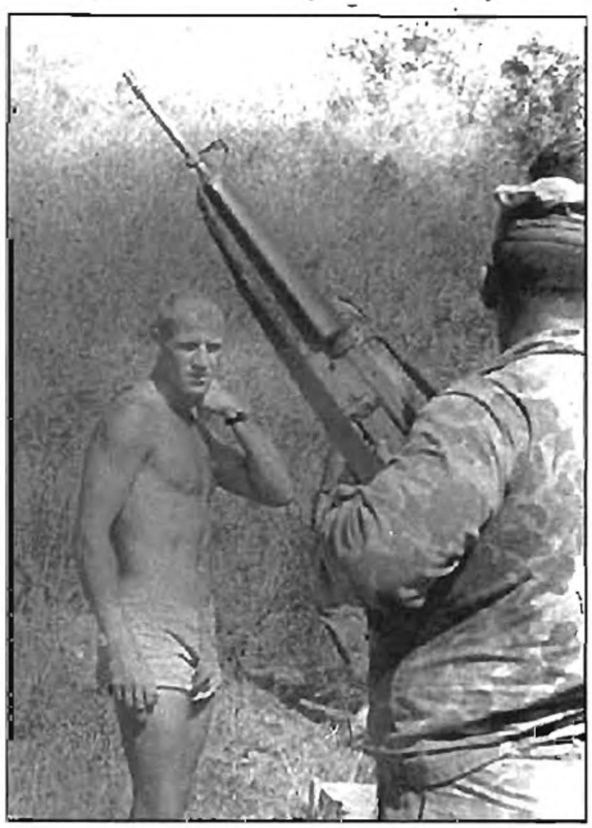
During the Korean War, the land combat application of the UDTs became much more than just a possibility. Guerrilla infiltration and exfiltration, clandestine resupply ops, and behind-the-lines demolition raids all were conducted by the men of the UDT. The M1 and M2 Carbines and BARs again saw duty with the UDTs, only their use was much more serious than simple guard duty. The submachine gun was considered the favorite shoulder weapon, but the carbine, BAR, and even the M1 Garand were seen in UDT hands. Though the UDTs had few small arms of their own, the facilities of a base armory or ship's stores were available to the Teams when necessary.

A watershed event in the weapons of the UDT took place shortly after the commissioning of the SEALs in January 1962. SEAL Team Two on the east coast at Little Creek, Virginia, was faced with the very real possibility of seeing combat operations in Cuba within a short time after its commissioning. Not being satisfied with what was available through Navy supply channels or in the base armory, Lieutenant Roy Boehm, the first officer-in-charge of SEAL Team Two as well as the Team's founder, sought out the best firearms on the market he could then find. Desiring high-firepower, light weight, dependability, and increased lethality over the M1 Carbine, LT. Boehm was highly interested in a very new firearm just available commercially, the AR-15 rifle.

AR-15 Model 601

Early in 1962, LT Boehm and some of his new SEALs traveled to Baltimore, Maryland to visit the Cooper-MacDonald offices. The Cooper-MacDonald firm had been representing the AR-15 rifle to the military for several years. The original manufacturers and developers of the AR-15, the Fairchild Stratos Corporation, had sold the license to produce the ArmaLite AR-15 to the Colt Firearms Corporation in 1959. Though the AR-15 had received praise from many of the people who had fired it, the US Military and especially the Army Ordnance Corps were adamantly not interested.

The Army, then responsible for small arms acquisition for the Air Force and Marines as well, had just adopted the M14 as the new service rifle in May, 1957. Difficulties in production and other delays had kept the M14 from being produced in the quantities needed by the military. It was only in 1961 that productions volume had finally started reaching the numbers needed for full issue. In this atmosphere, the Army Ordnance Corps was very much against any new weapon being even remotely



On the range at Little Creek in the early 1960's, these SEALs from SEAL Team Two are firing their 01 model AR-15 rifles. The unloaded weapon visible has the first model, stepped-down, double diameter, open-prong flash suppressor. The fairly light color of the handguards of this AR-15 comes from the very early weapons having light green rather than black stocks. The SEAL holding the weapon is wearing faded Marine camouflage fatigues.
PHOTO CREDIT: RYAN McCOMBIE COLLECTION

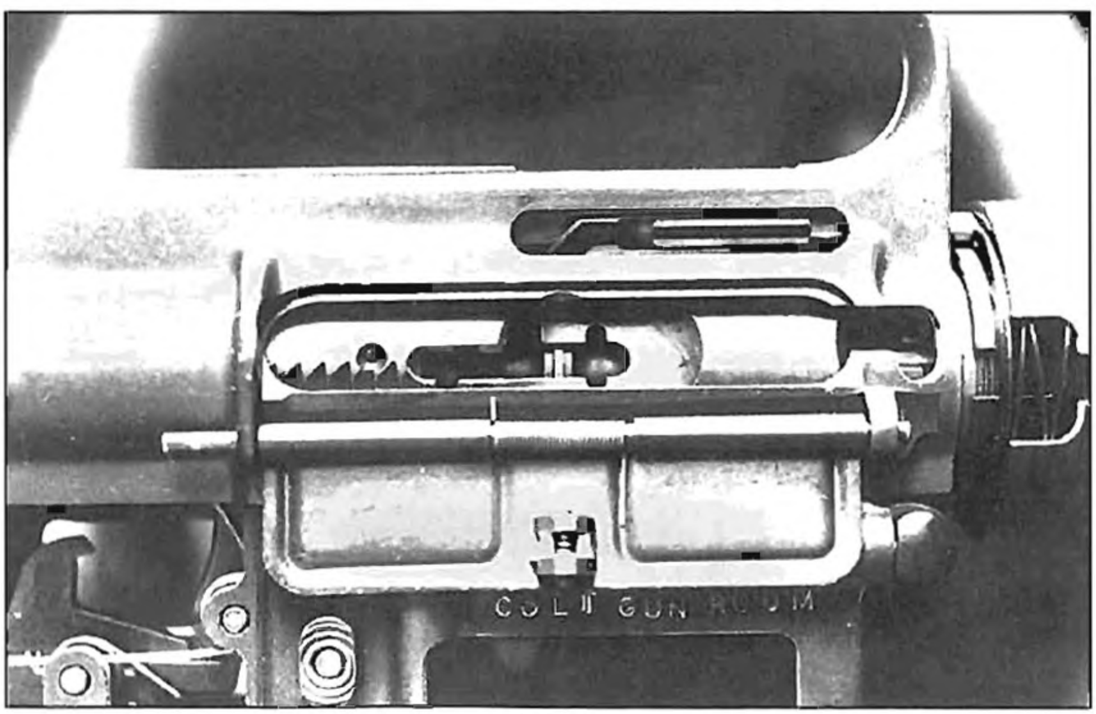
considered for adoption. This was particularly true for a weapon that would also add a new caliber of ammunition into the supply system.

The Army had just managed to start coming on line with a new family of weapons, the M14 and the M60 machine gun, that were both chambered for the same 7.62mm NATO round. One of the selling points of the new weapons was that they would eliminate at least one caliber, the .30 Carbine, as well as several weapons, the submachine gun, M1 Carbine, M1 rifle, and BAR. The AR-15 was chambered for the unique .222 Special developed especially for it. In 1959, the new round was renamed the .223 Remington.

The lightweight .223 bullet did not seem at all a proper projectile for a military weapon according to several prominent people in the Army small arms field. These same people set out to disprove any possible advantages the .223 round might have in the military. The most obvious advantage of the new round was its light weight, at the time two loaded 20- round AR-15 magazines weighed less than a single 20 round- M14 magazine.

A rare cutaway AR-15 rifle from the Colt Gun Room. This photo shows all of the major internal workings of the AR-15/M16 weapon system. The hammer is forward in the uncocked (fired) position.
PHOTO CREDIT: KEVIN DOCKERY/ KNIGHT ARMAMENT COMPANY

A closeup of a cutaway AR-15 rifle from the Colt Gun Room. The gas tube can be seen inside the bolt carrier key in the slot just below the top of the upper receiver. Gasses from the barrel would be guided through the gas tube, down the bolt carrier key, and into the bolt carrier, behind the bolt itself. The pressure of the gases would drive the bolt carrier to the rear with the bolt itself acting as a piston. The cam pin that locks the bolt to the bolt carrier would be guided through a cam track that would force it to rotate and unlock/lock the bolt depending on the direction of travel. Three thin metal discs on the bolt are the bolt rings and they insure a gas-tight seal between the bolt and bolt carrier.
PHOTO CREDIT: KEVIN DOCKERY/KNIGHT ARMAMENT COMPANY



One problem with the small bore of the AR-15 rifle was strongly pointed out by the Army board examining the weapon. During trials of the AR-15 at the Aberdeen Proving Grounds in 1958, the barrel of one test weapon split while firing during a rain test. Modifications to the barrel were completed by Gene Stoner, the AR-15's designer. But rumors persisted about the danger of the .223 bore retaining water droplets due in part to capillary action.

If the SEALs were to use the new rifle and there was a problem with water retention in the bore, it would be proved useless given the environment of their missions. Not particularly trusting anyone else's tests, Lieutenant Roy Boehm conducted his own examination of the AR-15.

"... Wanting to test the AR-15 himself before making his purchase, Roy took some Team Two men up to Baltimore with him to check out the weapons the dealer had available. Roy and the guys shot the AR and fully tested it. They even tossed the weapon into the surf zone, covering it with sand, silt, and salt water, and it continued operating. With proper care, the AR-15 was able to pass any abuse Roy gave it. Team Two now could issue one of the newest weapons available on the market."

Lt. Boehm found no problem with water retention in the bore of the AR-15. He was in a unique situation where he had to outfit his men and did not have the time to wait for channels. The funds necessary for the equipping of SEAL Team Two were already at Roy Boehm's disposal in the form of open purchases he could make in any market he saw fit. The men of the SEAL Team quickly agreed with "The Boss's" decision.

"The best package of firepower and weight we had were the new AR-15 rifles. This was several years before the Army was to adopt the AR-15 as the M-16, even in limited numbers. But Roy had used his open purchase system and gotten us 66 brand new AR-15's fresh from the Colt factory.

Roy had ordered 136 of the new AR-15 rifles, the selective fire models [Colt Model 601] with green stocks. Half of the weapons were sent to Team One along with instructions, magazines, and spare parts."

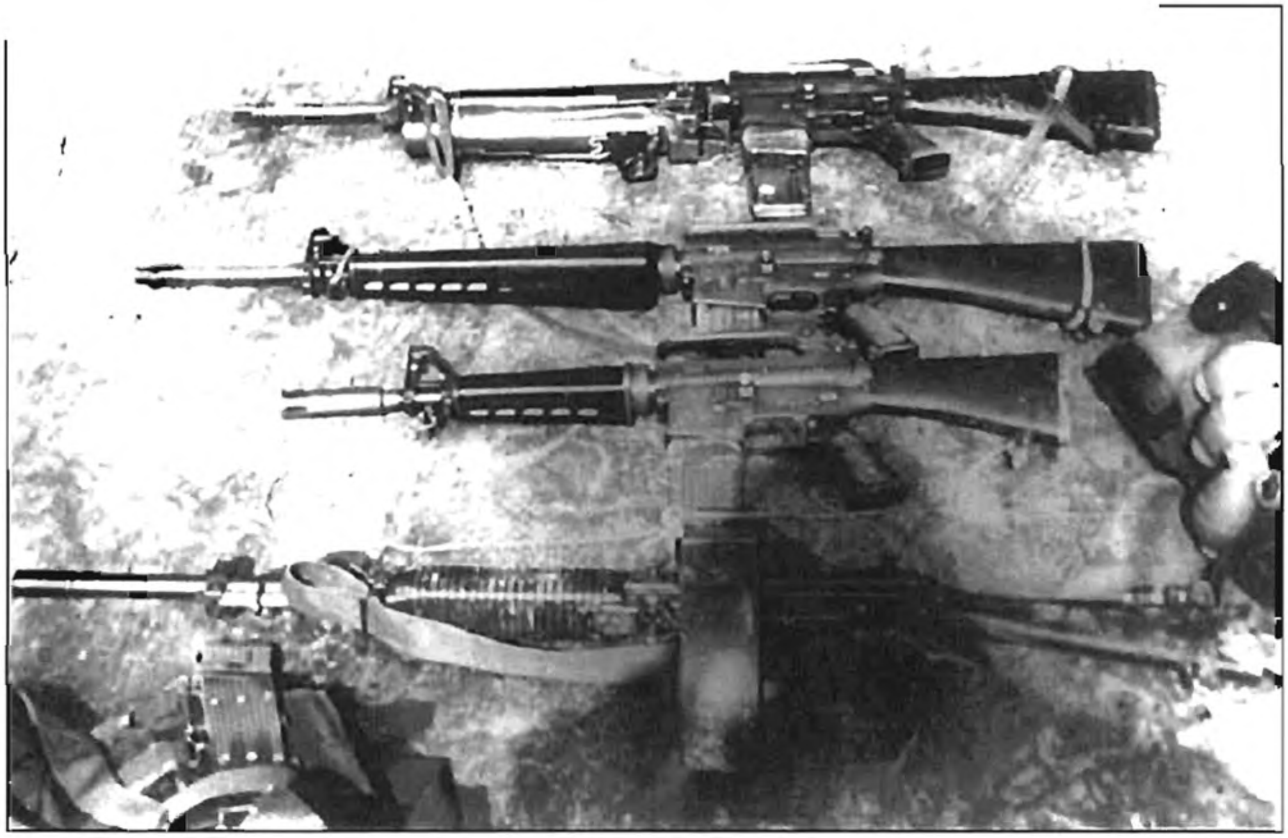
Shortly after the new weapon's arrival, the situation in Cuba began heating up. It looked as if the AR-15 would get combat tested on the beaches of that Caribbean island.

"As the men came in, we issued what we had. Watches, pistols, and other gear was given out. Then when Cuba calmed down, the additional men went back to their parent units, and a lot of our gear went with them. One of the items we had before any one else in the Navy were the AR-15 rifles ...Half of the weapons went to the West coast and SEAL Team ONE with the remainder staying with us. Those were the first rifles of their kind in the Navy and were later adopted by the military as the M-16. We had them first because we needed them."

The new weapons were well and enthusiastically received by the SEALs. For the first time, a light weight, highly-lethal, selective fire weapon was available. Though the M2 Carbine had been both light weight and capable of automatic fire, the round it fired was considered underpowered and had proved itself to have less than ideal stopping power. In defense of the Carbine, it must be remembered that the weapon was designed to be a replacement for the pistol as a secondary arm generally for support troops.

Though the M-14 was the intended standard issue shoulder weapon of the early 1960's, it was considered too large and ungainly for use by the SEALs who might easily have to transport the weapon underwater. Another factor in favor of the AR-15 was its intentional design for controlled automatic fire. The M-14 could have a selector switch easily installed, but the weapon is built along traditional lines. The recoil of automatic fire in the M-14 violently pushes the muzzle up and to the right, especially when fired from the shoulder.

A pair of UDT operators set up flags to line up swimmers during a beach survey in Vietnam. The UDT man closest to the camera has a Colt Model 01 AR-15 slung diagonally across his back. His partner closer to the water is apparently unarmed except for the Mark 2 Ka-Bar at his right hip.
PHOTO CREDIT: UDT-SEAL MUSEUM



A selection of SEAL shoulder weapons in Vietnam circa late 1967-68. The bottom weapon is a Stoner 63A light machine gun fitted with a left-hand feed mechanism and a 150 round aluminum belt drum. Over the muzzle of the Stoner is a black plastic cap developed at China Lake to help keep the barrels of M16 and Stoner weapons clean and clear of mud. The caps can be easily fired through with no damage to the weapon. Second from the bottom is a Colt Model 07 submachine gun loaded with a 20 round magazine and having the sliding buttstock in the forward (collapsed) position. This specimen has been fitted with a 2nd model flash/noise suppressor on its muzzle. Second from the top is a Colt M16-series rifle with a 2nd type open-prong, conical flash suppressor on the muzzle. The weapon at the top is a M16-series weapon also with a 2nd model flash suppressor and a 40mm XM148 grenade launcher mounted underneath the barrel. The curved cocking lever for the XM148 can be seen just ahead of the magazine in the rifle. This rifle is loaded with two butt-taped 20 round magazines. The bottom magazine is loaded with tracer ammunition (not identifiable in this black-and-white illustration). On the right side of the photo is an unusual set of leather and canvas field gear with three M26 fragmentation grenades attached to it.
PHOTO CREDIT: US NAVY

This SEAL is wearing the so-called black pajama tops that were very popular with some members of the Teams in Vietnam. He is armed with an M16A1 rifle loaded with a 20 round magazine. His web gear is mostly M1956 pattern Load Carrying Equipment with several universal small arms ammunition cases on his belt. A number of M26 fragmentation grenades are secured to the mounting straps on the outside of the ammunition cases. At his left shoulder, this SEAL has secured a Mark 2 Ka-Bar with a painted-over Mark 13 day/night flare taped to the scabbard. Slipped though a loop at his right shoulder is an M18 colored smoke grenade.
PHOTO CREDIT: FRANK THORNTON COLLECTION

The AR-15 has the stock in line with the barrel of the weapon. This causes the AR-15 to have less tendency to climb up and right when fired on automatic, though the weapon still takes a good deal of training to properly control. The training is considered very worthwhile as full automatic fire is very much an advantage for sudden close-in fire fights or the overwhelming fire needed for an ambush. The SEALs liked the fact that the AR-15 could be fired on full automatic with just the flip of a selector switch. Sometimes, the SEALs liked full automatic fire a little too much. The first range practice with the new AR-15s for SEAL Team Two took place at a Marine range since they had the proper firing facilities and the fledgling SEAL Teams did not.

> "As we were getting down into the firing position the [Marine] Lieutenant sounded off. "There will be no automatic fire on this range," he said, "Everything will be semiautomatic fire only." That was a bit of a mistake on his part.
>
> "Lock and load one magazine. Ready on the left? Ready on the right? Ready on the firing line! Shooters, you may commence fire!" We all just raised our heads a little bit and looked up and down at each other. At the command "Commence fire" all of us switched over to automatic and let that magazine rip. The Lieutenant immediately confiscated all of the weapons and threw us off the base."

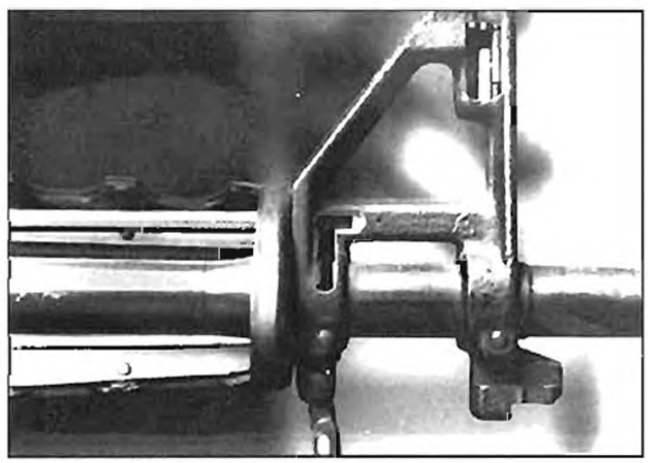
One problem that the SEALs did not have was with the lethality of the AR-15. Being the early 601 models, the AR-15s purchased directly by the Teams had barrels rifled with six grooves having a right-hand twist rate of one turn in fourteen inches. This rifling twist rate was the firearms industry standard when Gene Stoner had first designed the AR-15. Since the 55-grain .223 bullet was the same weight as commercial .22 bullets fired in high-velocity center fire rifles, the commercial twist rate was thought to be correct to stabilize the .223 bullet for accuracy.

The problem was that the commercial 55-grain bullets then in use were shorter and blunter than the full jacketed projectile designed for the .223 Remington military round. Standard M193 ball ammunition, when fired from the early AR-15, launched a projectile that was just barely stable in flight. When the bullet struck a target, or entered flesh, it began tumbling wildly, expending its energy rapidly. This rapid energy release resulted in the near-explosive wounds coming out of Vietnam in mid-1962.

Almost 1,000 AR-15 rifles, all early model 601s, and over half a million rounds of ammunition had been purchased by the Defense Department in late December 1961. These weapons and ammunition were part of Project AGILE being conducted by the Advanced Research Projects Agency (ARPA). The project intended, in part, to examine new weapons for use by "the small-stature... Vietnamese soldier and to evaluate the weapon under actual combat conditions."

Project AGILE resulted in the first operational tests of the AR-15 in combat being conducted by selected units of

These two SEALs crouch down and watch a helicopter come into their area during a training operation. The SEAL to the left is holding an M16A1 rifle with a plastic mud cap over the flash suppressor. The rifle is loaded with a pair of butt-taped 20 round magazines. He is wearing the early model Type 1 Rifleman's buoyant ammunition carrying vest.
PHOTO CREDIT: UDT-SEAL MUSEUM



A cutaway view of the front sight assembly of the M16A1 rifle. The open port that directs the propellant gases from the barrel into the gas tube can be seen just above the sling swivel and in front of the handguard mount. At the upper right portion of the sight assembly can be seen the threaded front sight post and the spring-loaded detent that helps hold it in place. The aluminum reflector that helps keep the handguards cool can be seen riveted to the inside of the left-side handguard.
PHOTO CREDIT: KEVIN DOCKERY/KNIGHT ARMAMENT COMPANY

The author firing an M16A1 rifle with a Mark 2 Blast Suppressor mounted on the muzzle. The weapon is firing a short burst on full automatic, two ejected cartridge cases visible as the elongated blurs above the firer's left hand and the weapon's front sight. It is interesting to note the lack of muzzle climb on the weapon, even when fired on full automatic. This lack of rise is a by-product of having the extra weight of the suppressor on the muzzle.
PHOTO CREDIT: KEVIN DOCKERY

TECHNICAL DATA—M16E1 (M16A1) (Colt Model 603)
NSN 1005-00-939-0584 (M16A1) 1005-00-073-9421
CARTRIDGE—.223 Remington (5.56x45mm)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 45 to 65 rpm, A 150 to 200 rpm, Cyclic 700 to 800 rpm
MUZZLE VELOCITY—3250 fps (991 m/s)
MUZZLE ENERGY—1313 ft/lbs (1780 J)
SIGHTS—Open, Flip-type aperture/post, Adjustable, battle aperture 0 to 300 meters, long range aperture 300 to 500 meters
FEED—20 or 30 round removable box magazines
WEIGHTS
WEAPON (EMPTY)—6.5 lbs (2.95 kg)
WEAPON (LOADED)—7.61 lbs (3.45 kg) w/sling & 20 rd mag
Sling 0.40 lbs (0.18 kg)
MAGAZINE (EMPTY)—20 round aluminium 0.19 lb (0.08 kg)
30 round aluminium 0.24 lbs (0.11 kg)
MAGAZINE (LOADED)—20 round 0.71 lb (0.32 kg)
30 round 1.02 lbs (0.46 kg)
SERVICE CARTRIDGE—M193 Ball 182 gr (11.8 g)
PROJECTILE—56 gr (3.6 g)

LENGTHS
WEAPON OVERALL—39 in. (99.1 cm)
BARREL—20 in (50.8 cm) w/o flash suppressor
21 in (53.3 cm) w/flash suppressor
SIGHT RADIUS—19.75 in. (50.2 cm)
Modifications from the original AR-15 (M-16 rifle for the A1 version included:
Chrome plating the chamber and later the entire bore
Addition of a forward bolt-assist for forcing the bolt closed
A heavier recoil buffer to slow the cyclic firing rate, this buffer was quickly retrofitted to all M16 rifles
A buttstock compartment for holding a set of cleaning gear
A closed "bird-cage" flash suppressor
A wider charging handle
Index lines (windage) on the rear sight
A 30 round magazine was introduced to replace the 20 shot version used in the field. This size magazine had been available since the earliest Colt manufactured weapons but had been available on a very limited basis. Prior to this (about 1968) only the Air Force had been issuing 30 round magazines as a normal item. These larger magazines were a valued "scrounge" item among the SEALs. 20 round magazines remained the norm throughout the Vietnam war.

the South Vietnamese Army supported by American advisors. The tests ran from 1 February to 15 July, 1962. Besides being well-liked by the Vietnamese troops for its size and light recoil, the AR-15 had shown itself to be a very lethal combat weapon. Reports told of almost incredible wounds being caused by single .223 bullets. Amputations of limbs, massive body wounds, and decapitations had all been caused by the very high-velocity AR-15 projectiles.

But there was a drawback that came with the near-instability of the AR-15 bullets being fired in 1-in-14 twist barrels. When the ambient temperature dropped below freezing, the air density changed. In cold air, the AR-15 bullets became unstabilized and accuracy dropped off badly. In independent, unbiased tests run by the National Rifle Association, it was found to be impossible to keep ten rounds on a 3 foot by 4 foot target at 300 meters range with the air temperature below 32 degrees Fahrenheit.

Since SEAL Teams Two did few operations in a cold environment during its first years, the drawback of the AR-15s rifling was not noticed as a problem. By July, 1963, orders had gone out from the Department of Defense that no further AR-15s would be accepted with the old rifling twist rate. The new twist rate, which stabilized bullets in below-freezing temperatures, was 1 turn in 12 inches. All subsequent AR-15s, M-16s, and M16A1s were all made with the 1-in-12 rifling twist rate, including those used by the SEALs.

A SEAL Team Two MTT (Mobile Training Team) 10-62 went to Vietnam to continue training the Beit Hai commandos of the South Vietnamese Navy. The training program had been begun by an MTT primarily from SEAL Team One earlier in the year. Along with "3 to 4 tons" of other equipment, the Team Two MTT took along with them a number of the Team's AR-15s. At the time the AR-15 and its use by the SEAL Teams was still classified. Again, the men of the South Vietnamese military greatly liked the AR-15. In fact the MTT soon ran out of the .223 ammunition they had brought along with them. At the time, the .223 military ball was loaded by Remington Arms and came packaged in a white 20-round cardboard box. As the ammunition was gone, the MTT turned to training the Vietnamese with available weapons including the M1 Garand, M2 Carbine, and BAR. It would be some years later that .223 ammunition would be available in huge numbers in Southeast Asia.

In June, 1963, President John F. Kennedy came to Norfolk and visited SEAL Team Two. While on his tour, President Kennedy saw a number of SEALs who were demonstrating the equipment they used. One man, GMG2 A.D. Clark was holding one of the Team's AR-15 rifles. When President Kennedy approached Clark he asked, "What have you got there, son?"

"This sir," answered Clark, "is the AR-15 rifle, made by ArmaLite."

At that point, one of the officers escorting President Kennedy, an Army Colonel, interrupted, commenting about how the AR-15 was only a limited duty, special-purpose weapon as compared to the issue M-14.

The President cut off the Colonel with a curt, "I am speaking to this gentleman here," and he resumed his conversation with Clark.

That action probably did as much to endear the President with the men of the SEALs as did his signing their commissioning orders only sixteen months before. But A.D. Clark continued with his praise of the AR-15 stating that it was exactly the weapon the SEALs wanted and no other. In a way it is very proper that A.D. Clark is the SEAL who spoke to the President in regard to the AR-15 rifle. Clark had been one of the SEALs who had accompanied Lt. Roy Boehm the year before when he had gone to Cooper-Macdonald in Baltimore to first test the AR-15.

M16 Model 602

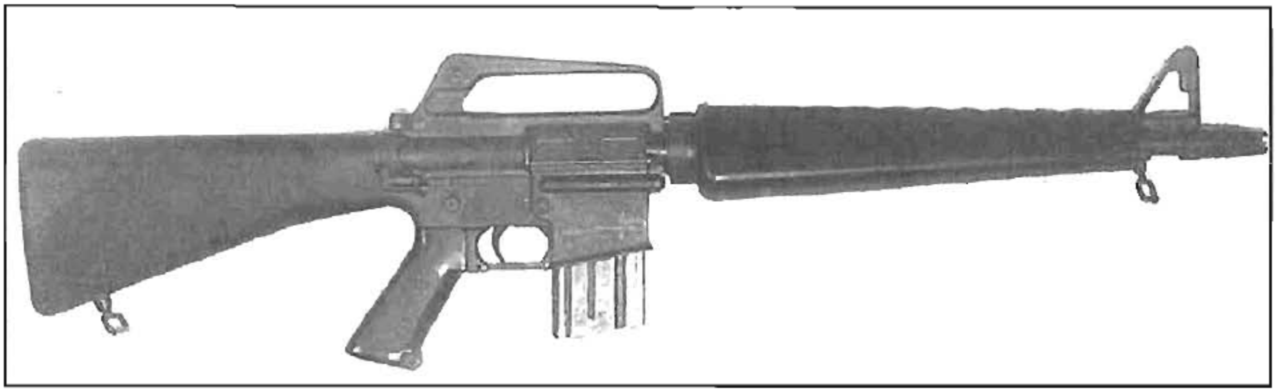
By 1965, even the UDTs had at least some AR-15s in their inventory for issue to operating platoons. By this time, the AR-15 had been purchased in some numbers by

Two SEALs during a training exercise. The front SEAL is carrying an M16A1 rifle loaded with a 30-round magazine and with the flash suppressor replaced with a China Lake blank adaptor. He is wearing a later-model SRU-21/P survival vest over his camouflage fatigues. The rear SEAL is armed with one of the XM177 series weapons also loaded with a 30 round magazine. He is carrying an AN/PRC-77 radio on his back with the coiled feed wire of the handset down over his right shoulder. To minimize his silhouette, the radioman has the short antenna to his radio folded down over his left shoulder and secured to his web gear.
PHOTO CREDIT: US NAVY

TECHNICAL DATA—CAR-15 Carbine (Colt Model 05)
CARTRIDGE—.223 Remington (5.56x45mm)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 45 to 65 rpm, A 150 to 200 rpm, Cyclic 700 to 950 rpm
MUZZLE VELOCITY—3050 fps (930 m/s)
MUZZLE ENERGY—1157 ft/lbs (1569 J)
SIGHTS—Open, Flip-type aperture/post, Adjustable, battle aperture 0 to 300 meters, long range aperture 300 to 500 meters
FEED—20 or 30 round removable box magazines
WEIGHTS
WEAPON (EMPTY)—6.0 lbs (2.72 kg)
WEAPON (LOADED)—6.71 lbs (3.04 kg) w/20 rd mag w/o sling
Sling 0.40 lbs (0.18 kg)
MAGAZINE (EMPTY)—20 round aluminium 0.19 lb (0.08 kg)
30 round aluminium 0.24 lbs (0.11 kg)
MAGAZINE (LOADED)—20 round 0.71 lb (0.32 kg)
30 round 1.02 lbs (0.46 kg)
SERVICE CARTRIDGE—M193 Ball 182 gr (11.8 g)
PROJECTILE—56 gr (3.6 g)
LENGTHS
WEAPON OVERALL—33.6 in. (85.3 cm)
BARREL—15 in (38.1 cm)
SIGHT RADIUS—19.72 in. (50.1 cm)

"The CAR-15, for Colt Automatic Rifle, carbine was the same as the AR-15 rifle except that the barrel had been cut off to just in front of the front sight and the flash suppressor reinstalled."

These SEALs are demonstrating techniques used when landing on a beach with a Combat Rubber Raiding Craft (CRRC). All three of the SEALs are wearing the same type of camouflage uniforms and floppy bush hats. The two visible weapons are M16A1 rifles with the crouching SEAL having loaded his weapon with two butt-taped 30 round magazines. The standing SEAL, with his weapon in his left hand, has his M16A1 loaded with a single 30 round magazine. The bottom of the magazine has been wrapped with tape for additional strength and a small tape tab extends from the bottom of the magazine to assist in drawing it from an ammunition pouch. All of the load bearing gear worn by these SEALs is of the nylon ALICE (All-purpose Lightweight Individual Carrying Equipment) type adopted by the Army in 1974.
PHOTO CREDIT: UDT-SEAL MUSEUM



A right-side view of the Colt Model 05 carbine. The weapon is an 01 model AR-15 with its barrel cut back to the front sight assembly. This specimen has the 2nd type conical, open-prong flash suppressor.
PHOTO CREDIT: KEVIN DOCKERY

the Air Force as the M16 rifle. The Navy had purchased an additional 240 M16 rifles, announcing the contract in October, 1964. In the week of 18-22 January 1965, Colt received a priority 04 MIPR from the Navy for an additional 50 M16 rifles. At the time, rifles were shipped with seven 20-round magazines, spare parts and additional materials were shipped separately. The Army was also purchasing thousands of XM16E1s at this time, primarily for use with US Army maneuver battalions in Vietnam.

The AR-15 had been advertised by Colt as an almost self-cleaning weapon needing only "an occasional simple cleaning... [to] keep the weapon functioning indefinitely. Working parts can be cleaned by wiping with a cloth." But in the SEAL Teams and UDTs, maintenance procedures take on an importance close to that of a religion. This attitude stems from the Teams working underwater with Underwater Breathing Apparatus (UBAs). If a diver does not take meticulous care of his UBA, it will fail on him at some point, either killing him outright or causing him to drown. With something like that for a background, it is easy to see how the SEALs and UDTs keep their mania for maintenance.

In the first edition of the UDT Handbook (1965) are listed the cleaning instructions for the AR-15 (M-16) that state; "...all excess carbon [be] simply wiped off the working parts." But with the Team's tradition for complete maintenance, weapons, including the AR-15 were cleaned thoroughly and completely. Because of this situation, the SEALs did not suffer the large numbers of malfunctions experienced by Army personnel when the rifle was fielded in Vietnam.

CAR-15 Carbine Model 605

Several variations of the AR-15 were also obtained by the SEALs in early 1962 in addition to a number of accessories. Very early in 1962, SEAL Team Two had at least one of the rare AR-15 carbines, the Model 605. The CAR-15, for Colt Automatic Rifle, carbine was the same as the AR-15 rifle except that the barrel had been cut off to just in front of the front sight and the flash suppressor reinstalled. It is possible that only one of the CAR-15 carbines was ever procured as the weapon was not very successful and very few were manufactured by Colt. The AR-15 carbine was offered by Colt for situations "where stowage is a problem," which would of course hold appeal to the size-conscious SEALs. Though it shows up in a number of photographs of field exercises conducted by Team Two in 1962 and in a 1964 weapons display, the AR-15 carbine was little used and probably never fielded in Vietnam.

Several accessories for the AR-15 were experimented with by the SEALs prior to the Vietnam War. At least one removable telescopic sight was tried out by SEAL Team Two. The telescopic sight was a Delft Optics 3x25 power telescope (weight 0.875 lbs. [0.397 kg]) adapted from the earlier AR-10 rifle. Though it could be easily mounted and dismounted from the carrying handle of the AR-15, the early scope sight simply would not remained zeroed to the weapon. When mounted on the rifle, hand pressure was enough to push the sight out of alignment with the rifle. Other accessories obtained included AR-15 bayonets, clip-on bipods, and a small number of early model 30-round magazines.

XM16E1 (M16A1) Model 603

In 1965, the Army had begun receiving quantities of the XM16E1 rifle and several elite Special Forces and Airborne units were equipped with the new weapon. For Army use a number of modifications had been done to the original Model 601 AR-15. Most of these modifications had also been included in the Air Force issue M16. For the Army XM16E1, the major visible change was the addition of the forward bolt assist, a bolt closure mechanism on the upper receiver of the rifle that allowed the bolt to be pushed forward. To accommodate the new changes, Colt manufactured the M16 and the XM16E1 as their Models 602 and 603 respectively.

In the Spring of 1965, the SEALs were given the opportunity to employ their AR-15s in combat. By April, the rebels in the Dominican Republic had escalated the situation to a crisis point. U.S. Forces were finally called

A group of SEALs establish perimeter security while demonstrating a desert mission. The men are all armed with M14 rifles, preferred for the desert due to their longer effective range than the standard M16 series weapons. The SEAL to the left rear in the photo is removing a Compact Laser Designator (CLD) from the pack of the SEAL keeling in front of him. The CLD will be used to illuminate or "paint" a target with laser light for an incoming air strike. These men are all wearing the most recent pattern desert camouflage uniforms.
PHOTO CREDIT: KEVIN DOCKERY

TECHNICAL DATA—M14
NSN 6D1005-00-770-3559
CARTRIDGE—7.62mm Nato (7.61x51mm)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 20 to 40 rpm, A 40 to 60 rpm, Cyclic 700 to 750 rpm
MUZZLE VELOCITY—2800 fps (853 m/s)
MUZZLE ENERGY—2593 ft/lbs (3516 J)
SIGHTS—Open, Aperture/blade,
Adjustable 100 to 1200 meters in 100 meter graduations
FEED—20 round removable box magazine
WEIGHTS
WEAPON (EMPTY)—8.6 lbs (3.90 kg)
WEAPON (LOADED)—11.21 lbs (5.08 kg) w/sling, cleaning kit (in buttstock), & 20 rd mag
Sling 0.31 lbs (0.14 kg)
Cleaning kit/combination tool .67 lbs (0.30 kg)
MAGAZINE (EMPTY)—0.51 lb (0.23 kg)
MAGAZINE (LOADED)—1.63 lb (0.74 kg)
SERVICE CARTRIDGE—M80 Ball 393 gr (25.5 g)
PROJECTILE—149 gr (9.7 g)
LENGTHS
WEAPON OVERALL—44.33 in. (112.6 cm)
BARREL—22 in (55.9 cm)
SIGHT RADIUS—26.69 in. (67.8 cm)

TECHNICAL DATA—M14 w/folding stock
MAGAZINE (EMPTY)—0.51 lb (0.23 kg)
MAGAZINE (LOADED)—1.63 lb (0.74 kg)
SERVICE CARTRIDGE—M80 Ball 393 gr (25.5 g)
PROJECTILE—149 gr (9.7 g)

Wearing first-pattern desert camouflage uniforms, these SEALs are patrolling near Kuwait City during Desert Storm. The SEAL in the passenger seat is holding on to his M14 rifle, used in place of the M16 due to its greater range. The action of the M14 has been wrapped in a rag to keep the constant desert dust and sand from the action of the weapon. The large pouch hanging at the SEAL's hip is the M17A1 protective mask carrier with spatters of light paint on the cover in order to help camouflage it.
PHOTO CREDIT: US NAVY

A SEAL equipped for a rescue in a desert environment. He is carrying an M14 rifle, used for its greater effective range in the open spaces of the desert. The dark goggles he is wearing will protect his eyes from the glare of the sun as well as the sudden flash of a flash-bang (stun) grenade. Taped to the top of his PRO-TEC helmet is a strobe light that can be used to identify the wearer to friendly overhead aircraft. For pickup, the modified parachute harness this SEAL is wearing over his desert-camouflage uniform is an integral part of the Special Purpose Insertion and Extraction (SPIE) rig. For a SPIE extraction, a line lowered down from a helicopter would be attached to the carabiner seen just forward of this SEAL's right shoulder. Just above the trigger finger can be seen the cylindrical selector lock that prevents this particular M14 from firing on full automatic.
PHOTO CREDIT: KEVIN DOCKERY

in to protect US interests and help control the fighting in the streets. Two platoons of SEALs from Team Two arrived in the Dominican Republic complete with their equipment, including the AR-15 rifle. At the same time, components of the US Army's 82nd Airborne Division were also conducting operations on the island. The airborne troops were armed with their new XM16E1s.

One drawback of the AR-15 stood out very quickly for the SEALs after their arrival. As the existence of the SEALs was still considered classified at the time and their presence in the Dominican Republic something the military command wanted to keep secret, the SEALs moved about in civilian clothes for at least part of their duties.

But the SEALs were carrying their AR-15 rifles, a very distinctive appearing weapon to say the least. In this instance, the SEAL's penchant for camouflage didn't quite work out.

Combat employment of the AR-15 against the rebels in the Dominican Republic proved out the AR-15 to a number of SEALs' satisfaction. Incidents of combat for the SEALs was limited during the crisis, but few complaints were voiced against the new rifle.

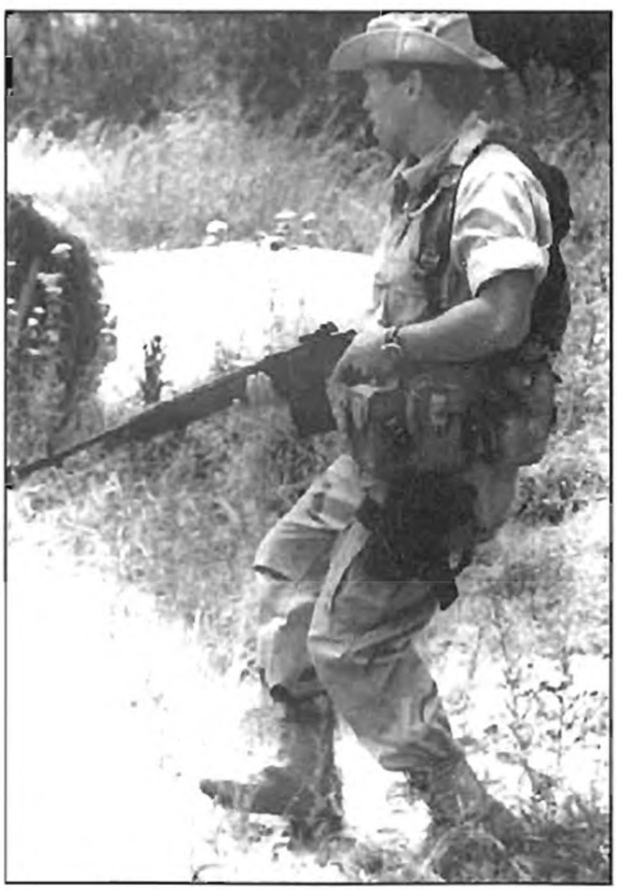
In addition to the AR-15, the SEALs had at least one additional type of rifle with them during their deployment. Having been issued one of the new AN/PVS-2 starlight scopes for night work, the SEALs mounted the device on an M14 rifle. The power and range of the 7.62mm bullet fired by the M14 proved itself very effective, especially against snipers. Though heavy in comparison to the AR-15, the M14 had a good deal of appeal due to the added range it gave the SEALs. In one instance, the M14 - AN/PVS-2 combination was able to provide security against sniper activity along a beach area at night, something no other weapon system available at the time could have done as well.

M14

The M14 was the last "full-sized" rifle to reach standard-issue status with the US military. An improved version of the M1 Garand, the M14 is chambered for the 7.62mm NATO round. The 7.62mm NATO ammunition, also identified as the 7.62x51mm or .308 Winchester (civilian), came out of the old school of thought as to what constituted an ideal battle rifle. Old-school opinion held that a military rifle must be effective at what we now consider a very long range. One thousand yards would only be considered a medium long range to earlier military planners, even though a soldier who could effectively use his rifle at that range was very rare.

Modifications to the gas system, a provision for full-

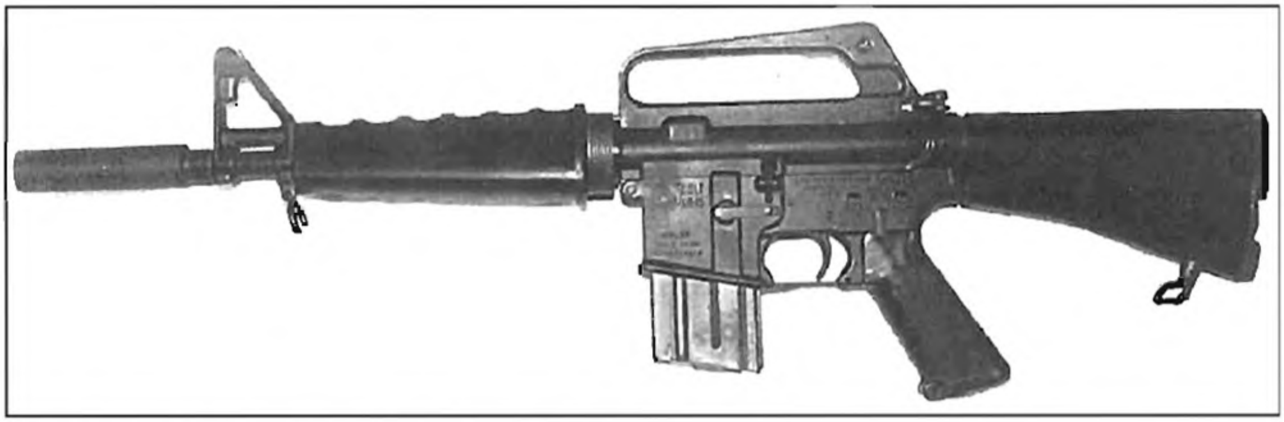
This SEAL takes a break during a demonstration at the UDT-SEAL Museum in Fort Pierce, Florida. He is wearing the first pattern desert camouflage Battle Dress Uniform (BDUs) as well as a set of nylon web gear (ALICE). He has two LC-2 canteen carriers on his belt on either side of his combat field pack. His weapon is an M14 rifle with the bolt locked in the open position.
PHOTO CREDIT: KEVIN DOCKERY



This SEAL operates as part of a patrol during a demonstration. He is wearing the most recent pattern of desert camouflage BDUs. His nylon web gear is the 1974 pattern All Purpose Lightweight Individual Carrying Equipment (ALICE) with several small arms ammunition cases at the side and front of his belt and an LC-2 canteen cover with its 1-quart plastic canteen at the rear of his left hip. The weapon this SEAL is armed with is the standard M14 rifle, preferred for the desert environment due to its greater range over that of the M16 series. The curved attachment on the muzzle of this M14 is a late production M12 blank firing attachment that allows the weapon to operate with blank ammunition. A low-slung holster on his left hip and the way he is carrying his M14 indicate that this SEAL is left-handed.
PHOTO CREDIT: KEVIN DOCKERY

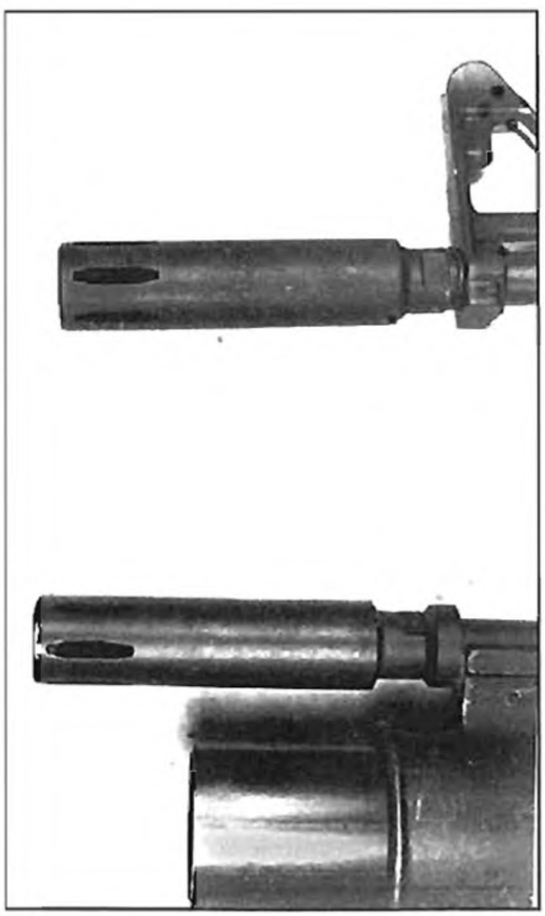
A group of SEALs awaiting their turn in a demonstration of SEAL abilities. They are all wearing the latest pattern of desert camouflage Battle Dress Uniforms (BDUs) as well as a mix of different types of load bearing equipment. The SEALs at the center and left of the photograph are both armed with M14 rifles fitted with late-pattern M12 blank firing attachments. The SEAL at the left is wearing a set of chest pouches for 20 round M14 magazines in addition to his regular web gear. The SEAL at the far right is armed with an M60E3 light machine gun, a belt of ammunition for which can be seen just above his left forearm.
PHOTO CREDIT: KEVIN DOCKERY

At a demonstration of SEAL abilities, this operator is walking across a beach equipped for winter warfare. He is wearing a white camouflage shell over his uniform, complete with hood, gloves, and cover for his pack. Strapped to the sides of his pack are aluminum-framed snowshoes. He is also wearing dark goggles to protect his eyes from the cold and glare off the snow and ice. His weapon is a folding-stock M14A1, unique to the SEALs. The stock on this particular weapon has been partially camouflaged with white tape.
PHOTO CREDIT: KEVIN DOCKERY



A left-side view of the Colt Model 07 CAR-15 submachine gun. The weapon is loaded with a 20 round magazine and the sliding buttstock is in its fully-forward position. The selector lever, directly above the pistol grip, is set to the semiautomatic fire position. This specimen has the longer, second type noise/flash suppressor.
PHOTO CREDIT: KEVIN DOCKERY

TECHNICAL DATA—CAR-15 Submachinegun (Colt Model 07)
CARTRIDGE—.223 Remington (5.56x45mm)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 45 to 65 rpm, A 150 to 200 rpm, Cyclic 700 to 950 rpm
MUZZLE VELOCITY—2750 fps (838 m/s)
MUZZLE ENERGY—940 ft/lbs (1275 J)
SIGHTS—Open, Flip-type aperture/post, Adjustable, battle aperture 0 to 300 meters, long range aperture 300 to 500 meters
FEED—20 or 30 round removable box magazines
WEIGHTS
WEAPON (EMPTY)—5.3 lbs (2.40 kg)
WEAPON (LOADED)—6.01 lbs (2.73 kg) w/20 rd mag, w/o sling
Sling 0.40 lbs (0.18 kg)
MAGAZINE (EMPTY)—20 round aluminium 0.19 lb (0.08 kg)
30 round aluminium 0.24 lbs (0.11 kg)
MAGAZINE (LOADED)—20 round 0.71 lb (0.32 kg)
30 round 1.02 lbs (0.46 kg)
SERVICE CARTRIDGE—M193 Ball 182 gr (11.8 g)
PROJECTILE—56 gr (3.6 g)
LENGTHS
WEAPON OVERALL—26/28.7 in. (66/72.9 cm)
BARREL—10 in (25.4 cm)



Two examples of the second model noise/flash suppressor. The upper specimen is on a Colt Model 07 submachine gun (CAR-15). The longer body of the second model suppressor and the six elongated ports at the muzzle separate the design from the shorter first model suppressor. The lower specimen is mounted on an XM177E2 with an XM148 40mm grenade launcher mounted underneath the barrel. What appears to be a second part of the suppressor, behind the reduced-diameter section, is actually a shaped metal washer. The large washer acted as a gas check and would allow rifle grenades to be launched from the suppressor if desired. Except for slight manufacturing changes that came over time, the two noise/flash suppressors are the same.
PHOTO CREDIT: KEVIN DOCKERY

automatic fire, a 20 round box magazine, and other mechanical improvements made the M14 a better overall battle rifle than the earlier M1 Garand. The long range capability and overall dependability of the M14 kept it held in reserve in the military supply system long after it had been supplanted by the M16A1 as the standard-issue US shoulder arm. Hand fitted and tuned to match specifications, the M14 became a highly accurate base for a later family of sniper rifles for the Teams and the Army.

CAR 15 Model 607

An additional AR-15 based weapon was used by the SEALs prior to their major deployment to Vietnam. The CAR-15 submachine gun was a shortened version of the AR-15, offered by Colt as their Model 607 early in 1965. Originally part of the CAR-15 weapons family, which included the Model 605 Carbine, the CAR-15 submachine gun was a very shortened version of the AR-15 rifle. Since the action of the AR-15 requires that the bolt carrier be able to recoil into the stock when the weapon is fired, a folding stock won't work. For the Model 607, a sliding buttstock of generally standard shape was devised.

The sliding buttstock has a switch on the buttplate to lock or unlock the stock system. Using the switch, the buttstock can be slid in or out and locked firmly into either the extended or collapsed position. With the stock in the collapsed position, the CAR-15 can be easily employed for instinctive shooting while held in the underarm position. Since the weapon was so handy when collapsed, many SEALs never bothered extending the stock.

> "... For myself, I preferred the CAR-15, the short submachine gun version of the M16. Using the CAR, I would rarely extend the stock as most of our fighting was done close-in with instinctive firing from the hip being the norm."

The barrel of the Model 607 was cut down to only ten inches and the standard flash hider installed. The front sight was also moved back and the gas system modified as needed. The handguards of the Model 607 were of the same triangular style as those on the AR-15, only roughly half as long. Well liked by the SEALs for its short size and fast handling characteristics, the Model 607 CAR-15 was available in very limited numbers. Those weapons that were available were used in Vietnam until they were effectively worn out.

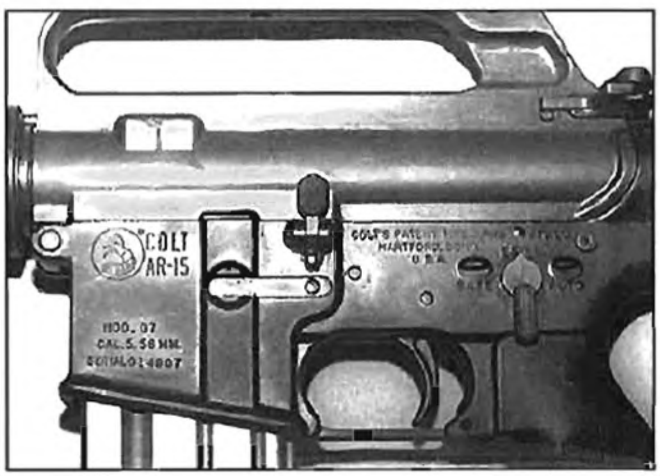
To increase the number of possible military sales of the CAR-15 to the military, especially the Army, Colt made a number of changes to the weapon while it still retained the designation CAR-15 submachine gun. The addition of the XM16E1 model forward bolt assist to the CAR-15 added about 0.2 pounds (0.09 kg) to the overall weight of the weapon. Though the forward bolt assist was not particularly desired by the SEALs, the CAR-15 certainly was. This resulted in a number of slightly different CAR-15 submachine guns being used in the Teams through the Vietnam War.

By late 1966, the Army and the Air Force had shown enough interest in the CAR-15 to have ordered several thousand from Colt. The first weapons examined for the Army were standard model 607s with the forward bolt assist added. During Army testing one serious drawback did stand out immediately when the CAR-15 was fired. The short barrel and standard flash hider gave the weapon a tremendous muzzle blast and loud report accompanied by a large fireball. At night, the muzzle blast from the Model 607 was dazzlingly bright.

To reduce the muzzle blast and report of the CAR-15 submachine gun, Colt developed a combination flash/noise suppressor in September 1966. The first model flash/noise suppressor added only 1.3 inches (3.3 cm) to the overall length of the CAR-15 and about 0.1 pounds (0.045 kg) to its weight. The internal configuration of the combination suppressor eliminated a good deal of the muzzle flash and, when new, reduced the report of firing the CAR-15 to near that of the standard M16 rifle.

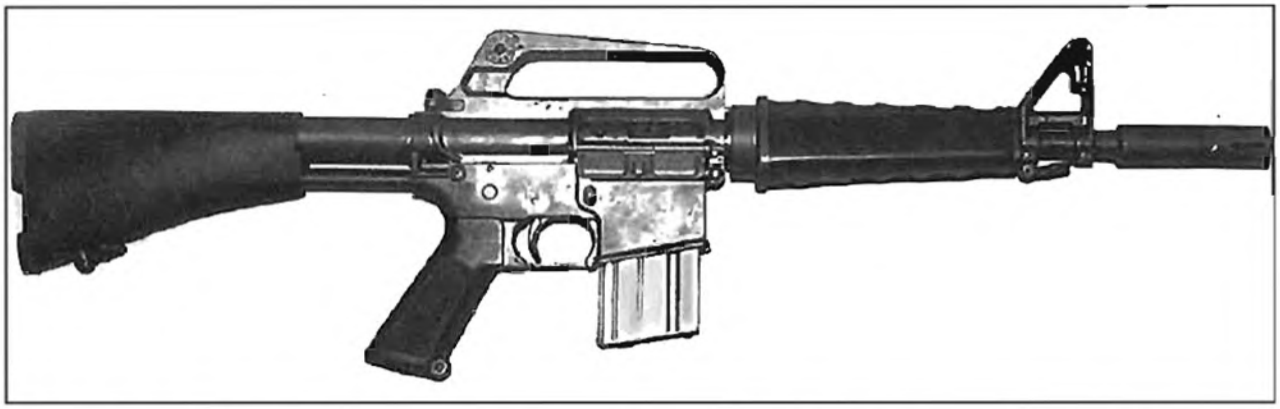
Though a number of the first-model flash/noise suppressors were made in the Fall of 1966, the design was not considered completely satisfactory. In order to cut down on the sound and flash of firing, the first model noise/flash suppressor had a tight muzzle hole, only slightly larger than the .223 projectile. Though the design of the suppressor did reduce the muzzle blast of the CAR-15 it also increased the amount of fouling deposited in the barrel of the weapon. The tight exit hole also caused tracer bullets to yaw badly when fired, destroying their accuracy. To limit the barrel fouling and allow tracer bullets to be accurately fired, a new flash/noise suppressor was developed.

The second model flash/noise suppressor had an overall length of 4.25 inches (10.8 cm) and a weight of



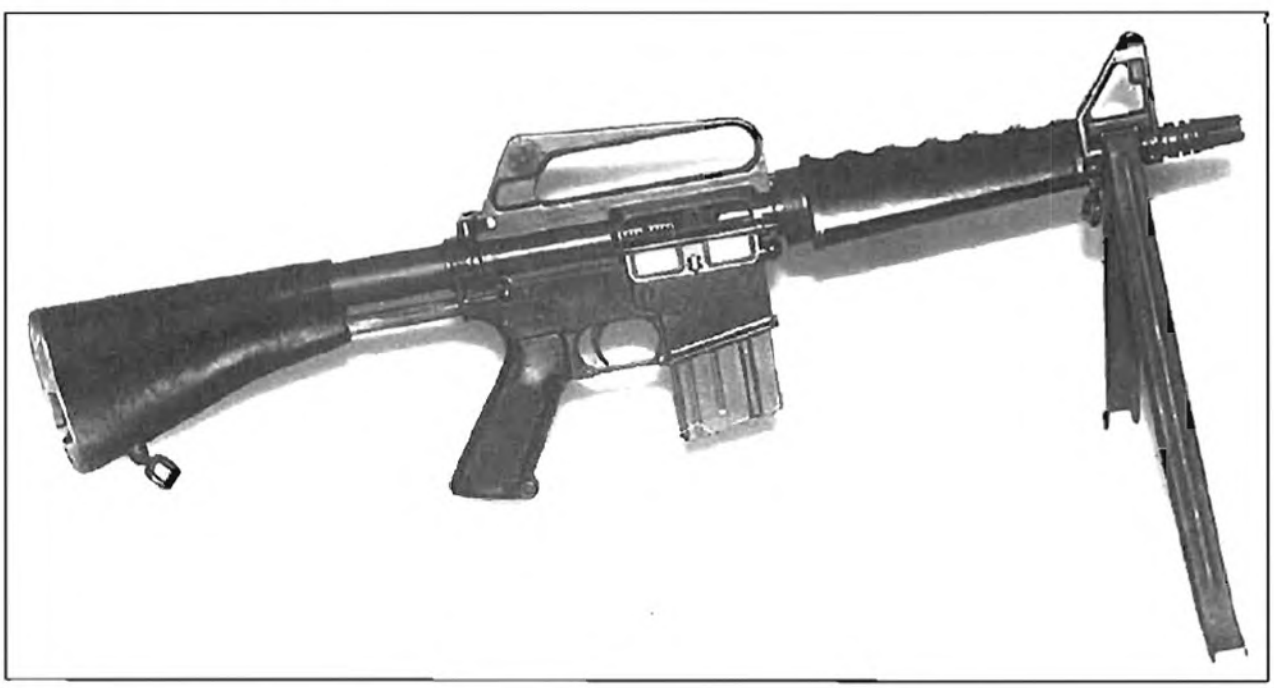
A left-side view of the Colt Model O7 submachine gun (CAR-15). The selector switch can be plainly seen, set at semiautomatic fire, directly above the pistol grip where it can be manipulated by the operator's thumb. The small rectangular part above and in front of the trigger guard is the retaining portion of the magazine catch. Above the rear of the magazine catch is the bolt stop. Pressing in on the serrated portion of the bolt stop releases the bolt allowing it to move forward.

PHOTO CREDIT: KEVIN DOCKERY/KNIGHT ARMAMENT COMPANY



The Colt Model 07 CAR-15 submachine gun. This specimen has the sliding stock fully extended and locked into place. The additional guide rod needed by this design of sliding stock can be seen as the small tube beneath the action spring guide at the rear of the receiver. The noise/flash suppressor on the muzzle of this weapon is the more common second type. This weapon also has an early-type of upper receiver with no allowance for a forward assist mechanism and a lower receiver with no raised guard ridge around the magazine release. The smooth bolt carrier, with no serrations for the forward bolt assist, is visible through the open ejection port.
PHOTO CREDIT: KEVIN DOCKERY

The right side of a Colt Model 07 CAR-15 submachine gun with the spring-operated M3 "clothespin" bipod clamped into place under the front sight. The buttstock is slid back to its open position and the smaller guide rail necessary for this model stock can be seen just below the larger action spring guide. The bolt carrier, visible through the ejection port, is a later model intended for the M16A1 with a bolt closure device. The notches seen on the rear section of the bolt carrier are where the plunger of the closure device would contact the carrier. This specimen has the second-model conical, open-prong flash hider which was mounted on some of the first examples of this model.
PHOTO CREDIT: KEVIN DOCKERY



TECHNICAL DATA—XM177E1 (Colt Model 609)
NSN 1005-00-930-5595
—XM177E2 (Colt Model 629)
NSN 1005-00-021-2429
CARTRIDGE—.223 Remington (5.56x45mm)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 45 to 65 rpm, A 150 to 200 rpm, Cyclic 700 to 800 rpm
MUZZLE VELOCITY—2750 fps (838 m/s)
MUZZLE ENERGY—940 ft/lbs (1275 J)
SIGHTS—Open, Flip-type aperture/post, Adjustable, battle aperture 0 to 300 meters, long range aperture 300 to 500 meters
FEED—20 or 30 round removable box magazines
WEIGHTS
WEAPON (EMPTY)—XM177E1 5.2 lbs (2.36 kg)
XM177E2 5.35 lbs (2.43 kg)
WEAPON (LOADED)—
XM177E1 6.62 lbs (3.0 kg) w/sling & 30 rd mag
XM177E2 6.77 lbs (3.07 kg) w/sling & 30 rd mag
Sling 0.40 lbs (0.18 kg)
MAGAZINE (EMPTY)—20 round aluminium 0.19 lb (0.08 kg)
30 round aluminium 0.24 lbs (0.11 kg)
MAGAZINE (LOADED)—20 round 0.71 lb (0.32 kg)
30 round 1.02 lbs (0.46 kg)
SERVICE CARTRIDGE—M193 Ball 182 gr (11.8 g)
PROJECTILE—56 gr (3.6 g)
LENGTHS
WEAPON OVERALL—XM177E1 28.3/31 in. (71.9/78.7 cm)
XM177E2 29.8/32.5 in (75.7/82.6 cm)
BARREL—XM177E1 - 10 in (25.4 cm)
XM177E2 11.5 in (29.2 cm)
The combination flash/noise suppressor adds about 3.5 inches to the overall barrel length
SIGHT RADIUS—14.72 in. (37.4 cm)

0.14 lbs. (0.6 kg). Threading the suppressor onto the 0.635 inch long threaded portion of the barrel muzzle, including a 0.1 inch thick lock washer, increased the overall length of the weapon by 3.72 inches (9.4 cm). The second model flash/noise suppressor was identified by Colt as part #62370. The inside of the second model noise/flash suppressor had a small expansion chamber surrounding a ported barrel extension much the same as the first model device, but the new suppressor had a longer body that incorporated a six-slotted end piece with a large internal diameter, like a standard flash suppressor.

The second model flash/noise suppressor was fitted onto all subsequent models of the CAR-15 and retrofitted onto older weapons as parts became available. Though at least somewhat effective at cutting down the sound and flash of firing the short-barreled AR-15 variations, the suppressor was still easily clogged with fouling and would quickly lose its effectiveness in a combat environment.

XM177, E1, E2 Models 610, 609, 629

The original sliding buttstock assembly of the Colt model 607 was considered too complex and costly for fielding with the Army. A new type of sliding buttstock was designed and put into production. The new stock was a more skeletal, tubular design while still retaining a full-sized buttplate. To extend or collapse the stock a lever underneath the sliding section was squeezed with the operators fingers, unlocking the rear portion of the assembly. A spring would engage to lock the stock in the extended or collapsed position when the operating lever was released. Lastly, the triangular handguards, which were found to be fragile, were replaced with short, cylindrical handguards with raised reinforcing ribs.

The new weapon, named the "Commando" by Colt, began to be delivered to the military on 7 November 1966 with an initial shipment of 1190 weapons out of a 2815 weapon contract. By January 1967, the Commando had been tentatively type-classified as the XM177 submachine gun (Air Force version) without a forward bolt assist and

This SEAL is holding an XM177E2 with an XM148 40mm grenade launcher mounted underneath the barrel. The XM177E2 is loaded with an early Colt extended magazine for the M16 weapon series. This magazine is three 20 round magazines welded together to feed straight through. This magazine did not work well in the field and only 35 were reported to have been made at the special request of SEAL Team Two. Hanging from around this man's neck is a hand-held AN/PRT-4 transmitter. The companion AN/PRR-9 receiver can be seen as the box with the spiral part at his left shoulder. The small radios were not well received by the Teams as they soon proved to have a very short range, as little as 40 meters, out in the field.
PHOTO CREDIT: FRANK MONCRIEF COLLECTION

Two SEALs coming out of the water after a training swim. Both men are armed with XM177E2 submachine guns. The weapon on the left has an early (2nd) model open-prong flash suppressor. The weapon on the right has the standard M16A1 (3rd model) "Birdcage" flash suppressor. Both weapons have their extra-long slings attached to the front sight, allowing them to be carried in a sights-up, muzzle-forward position ready for immediate use. The swimmer on the left has an older pair of UDT "Duck feet" swim fins hanging from his left arm. The swimmer on the right has a newer pair of "rocket" fins developed for the sport-diving industry. Both men are using Mk VI semi-closed circuit breathing rigs.
PHOTO CREDIT: UDT-SEAL MUSEUM

Going out on an operation in Vietnam, this SEAL is armed with an XM177E2. The additional 1.5 inches of barrel on the XM177E2 as compared to the XM177E1 is easily visible in this photo. This weapon has the second model noise/flash suppressor on the muzzle with the additional formed sheet metal washer between the suppressor and the barrel of the weapon. At his left shoulder, this SEAL is carrying a Navy Pilot's Survival knife with the grip covered in tape for additional waterproofing.
PHOTO CREDIT: RYAN McCOMBIE COLLECTION

the XM177E1 (Army version) with a forward bolt assist. The XM177E1 was sent to Vietnam beginning with the first shipments in November 1966 with the Army's distribution of 2800 weapons being completed by March 1967.

SEALs had been using the model 607 CAR-15 submachine gun from the time of their first combat deployments in Vietnam, circa 1966-1967. As the XM177E1 became available, it was picked up for use with the Teams. Development of the XM177 system continued with the Army, the intention being the future replacement of all M3 and M3A1 submachine guns in service as well as the M1911A1 .45 pistol and M16A1 rifle on a selective basis.

After extensive field testing, the XM177E1 was found to not be completely satisfactory. Problems in accuracy were noted and a number of improvements made. In mid-April 1967, the new Colt model 629 Commando was type-classified as the XM177E2. A contract for 510 XM177E2s was signed with Colt with the weapons to go to the Studies and Observation Group, Vietnam (MAC-V SOG). Delivery of the new weapons was to begin in late September, 1967.

Two noticeable aspects of the XM177E2 stand out in photographs of the weapon. The barrel was extended an additional 1.5 inches (3.8 cm) giving the XM177E2 a barrel length of 11.5 inches (29.2 cm). The additional barrel length was found to help cut down on the muzzle blast and increase the stability, and accuracy, of projectiles. Additionally, the longer barrel allows the XM148 40mm grenade launcher to be more easily attached to the XM177E2. Many elite units, including the SEALs, greatly liked the additional firepower of the XM148 launcher, but adding the weapon to the earlier CAR-15 and XM177E1 was difficult and required modifications to both weapons.

In addition to the longer barrel, the XM177E2 appears to have a third model flash and noise suppressor, one with a noticeable raised boss at the barrel end of the device. The boss is actually a stamped metal washer with an elongated cross section. The washer acts as a forward stop for the XM148 40mm grenade launcher and also allowed rifle grenades to be launched from the XM177E2, something that was rarely, if ever, done.

Since the XM177E1/E2 weapons incorporated all of the up-to-the-minute changes and improvements developed for the XM16E1/M16A1, the Commando was noticeably more reliable than many of the M16-type weapons already in Vietnam. By July 1967, thirty XM177E1 barrels with chrome plated chambers arrived in Vietnam. Later production XM177E2s were all produced with chrome plated chambers to help limit corrosion.

Accuracy of fire with the XM177E2 continued to be a problem throughout the life of the weapon, especially when firing tracer ammunition. In November 1968, Colt estimated that a complete ballistic and kinematic study of the XM177E2 would cost $400,000 and take six months to complete. Recommendations in December 1968 were for the XM177E2 to be reoriented to a $635,000, 29-month long R&D program. Due to the winding down of the US forces in Vietnam after 1970, no action was taken on the XM177E2 program and the weapon went out of production in 1970. Though thousands of the XM177E1/E2 weapons had been built, only a few hundred remained in use by the elite forces who strongly desired them. Cannibalization of damaged XM177s to keep the remaining weapons operational became quite common during the 1970's in the SEAL and UDT Teams.

The strong desire to keep the XM-177E1/E2 weapons operational with the SEALs is clearly shown in the mention of the production model weapons first arrival in the Teams. The excerpt is from SEAL Team Two's Command and Control History for 1969, page 14;

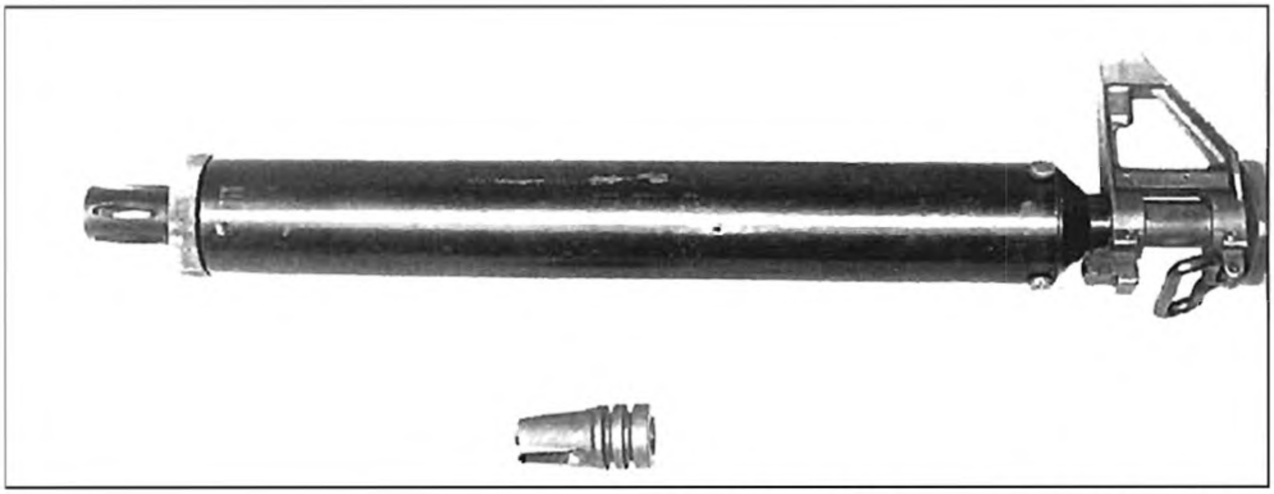
> "3. (U) The XM177E1 submachine gun, better known as the CAR 15, appeared at the SEAL Team late in the year [1969]. This weapon is a welcome addition to the Team's family of weapons, because it fills a size gap that had been left open by all our other weapons. Its main characteristic is its relatively short length which makes it perfect for those people in a patrol such as the patrol leader, radio man, and assistant patrol leader, who find the shorter weapon ideal for close-quarter searching and surveillance of prisoners."

On 23 February, 1967 the XM16E1 was adopted by the US Army as the M16A1 rifle. The weapon had received a number of improvements during its testing by the Army, some of which were necessitated by the Army changing the type of powder allowed in loading .223 ammunition. Among other changes the inside of the bolt carrier was chrome plated and the exterior parkerized with a dull finish. The chrome plating minimized corrosion while giving the carrier a non-reflective finish. Earlier bolt carriers had been entirely chromed and could be seen shining through an open ejection port.

A third model flash suppressor was added to the M16A1, this one having a closed muzzle giving it a "bird cage" appearance. The earlier open prong flash suppressors were reported by the Army to hang up on vines, tall grass, and brush, something not noticed by the SEALs. Other changes in the M16A1 included chrome plating the chamber, and later the entire bore, of the weapon. The SEALs simply liked the M16 family completely and used them interchangeably. In a single SEAL platoon in Vietnam could sometimes be seen AR-15s, M16A1s, CAR-15s (model 607s), XM177E1s, and XM177E2s. On the muzzles of the weapons could be found first, second and third model flash hiders, on both long and short barreled weapons, as well as first and second model flash/noise suppressors on the "shorty" weapons.

The SEALs' opinion of the M16E1 shows clearly in the following quote taken from the official Command and Control History for SEAL Team Two, 1967;

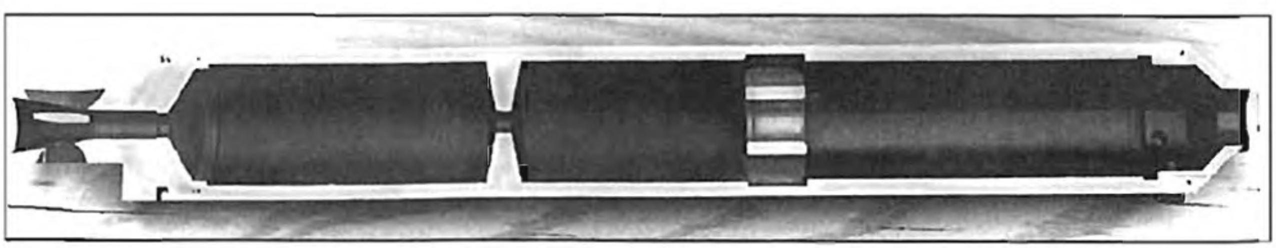
> "The M16E1 has proven a welcome addition to the SEAL arsenal. The weapon performs very well as long as it is kept reasonably clean.



This is the Mark 2 blast suppressor (1st model) mounted on a standard M16A1 rifle. The Mark 2 screws onto the muzzle of the weapon in place of the standard flash suppressor. The conical rear mount of the Mark 2 indexes on the bayonet lug. The suppressor body is turned to line up the screw holes, and the rear mounting screws inserted to lock the device into place. The flash suppressor is the 2nd type, conical, open-prong model. This blast suppressor was based on the earlier design of the Human Engineering Labs (HEL) M4 sound suppressor. Filed for a patent on 12 July, 1968 as a gun blast diffuser, the 1st model Mark 2 did not require the modifications to the weapon that the HEL M4 suppressor did in order to operate. A weapon fitted with the Mark 2 blast suppressor, developed for the Mark 4 rifle, worked equally well with our without the suppressor in place.
PHOTO CREDIT: KEVIN DOCKERY

"The HEL M4 suppressor was mounted as a permanent part of a modified M16A1 and was not intended to be removed.... With the suppressor removed, the modified M16A1 wouldn't operate except as a manually loaded repeater."

A sectioned view of the 1st model Mark 2 blast suppressor. This very simple design has two expansion chambers and a single baffle. The angular piece to the left of center is the threaded cruciform mounting plate that screws onto the barrel of the using weapon. Though outwardly resembling the HEL M4 suppressor, the Mark 2 blast suppressor is greatly more simplified, having only five major parts as compared to the over 16 parts in the HEL M4. The internal design of the Mark 2 blast suppressor allowed water in the system to easily drain out, something that could not be quickly done with the HEL M4.
PHOTO CREDIT: KEVIN DOCKERY



The chrome [plated] chambers and barrels should substantially lengthen the life of the barrel. It is believed that the bolt assist should be eliminated from the weapon."

For the SEALs' operations in Vietnam surprise was as much of a weapon as any ordnance that could be carried. Specialized weapons could sometimes give an additional edge to an operating group of SEALs deep in the bush. Normally, weapon specialization extended into giving the SEALs as much concentrated firepower, in terms of volume of fire, that they could effectively carry. But other types of weapons could increase the "surprise" factor in the SEALs' favor. And foremost among these weapons are suppressed guns where the sound of firing is eliminated as much as possible.

A suppressor, commonly called a silencer, cuts down on the noise of a weapon's firing, suppressing the sound of the shot. Usually, a suppressor does not effect the velocity of a fired projectile which, if it is moving faster than the speed of sound, causes a sonic "crack" as it passes through the air.

During the first years of the SEALs major deployments to Vietnam, few if any suppressed weapons were available to the Teams. Those that were usually consisted of old World War II weapons that were in very short supply. Back in the States, the US Army's Human Engineering Laboratory (HEL) at Aberdeen Proving Grounds was one of several places developing suppressors for the military, The HEL M4 suppressor became available to the SEALs in the summer of 1967. The HEL M4 suppressor was mounted as a permanent part of a modified M16A1 and was not intended to be removed. For proper operation with the HEL M4 suppressor attached, the bolt carrier of the designated M16A1 had an extra gas bleed-off hole drilled into it, centered and behind the two holes already in place. The extra hole allowed the weapon to function properly, firing in both semi and full automatic modes, but only with the suppressor attached. With the suppressor removed, the modified M16A1 wouldn't operate except as a manually loaded repeater.

A gas deflector shield was attached to the charging handle of the modified M16A1 to protect the firer's face and eyes from any excess propellant gases. The HEL M4 suppressor made the modified M16A1 very difficult to locate by sound when fired. At a distance of 50 meters or so, depending on the surrounding area, the sound of the shot could not be heard.

To increase the efficiency of the suppressor, the SEALs obtained a quantity of special downloaded .223 ammunition. The special ammunition would fire a subsonic projectile that did not break the speed of sound, about 1100 feet per second (335 m/s) at sea level, and yet still operate the action of the modified M16A1. Though very quiet and effective, the subsonic ammunition still would not operate the action as dependably as desired. Neither was the terminal effectiveness of the special ammunition as good as the standard round.

The suppressor-equipped M16A1 was used by the SEALs throughout their operations in Vietnam and was considered a valuable asset. As noted in the SEAL Team Two Command and Control history for 1968, page 8;

"A silencer has been produced which when used with special ammunition, has an indistinguishable noise level. The SEAL Team now has silencers for pistols and rifles."

The weapon was especially valuable on those missions that needed the longer range and accuracy of a suppressed rifle over that of a suppressed pistol or submachine gun. Off-duty SEALs sometimes found additional uses for the suppressed M16A1s they had.

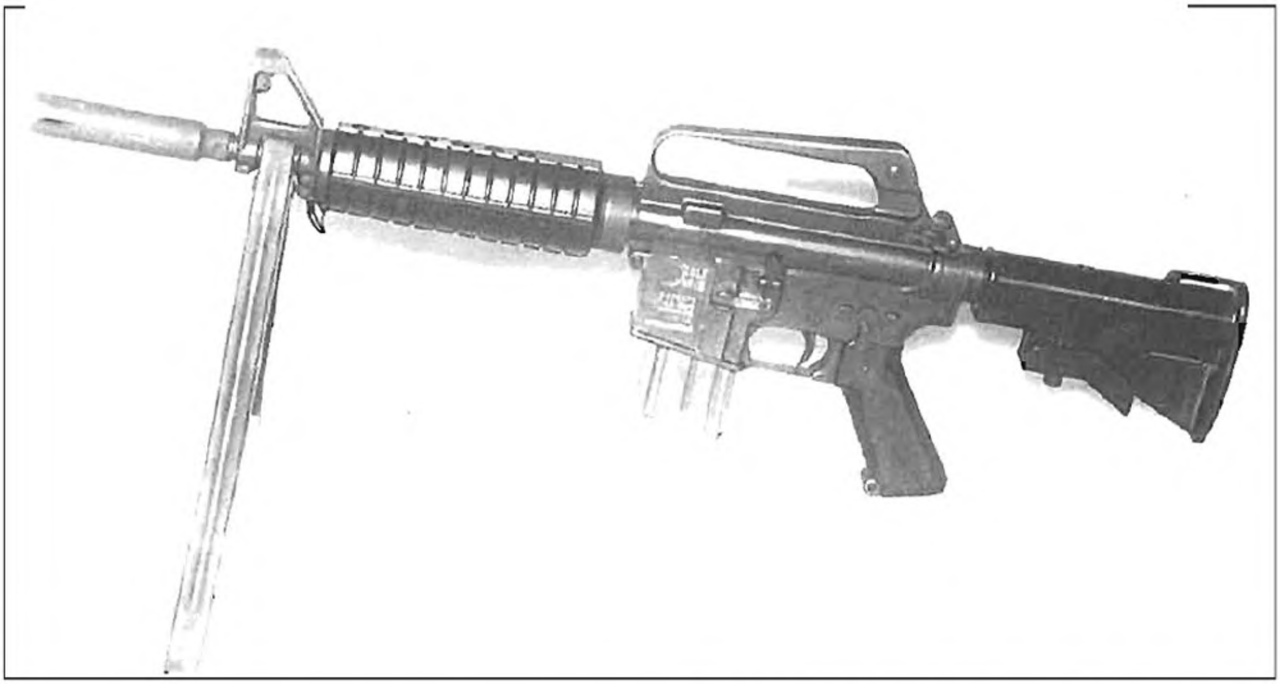
"We shipped out and went on to Song Ong Doc, where we were living on a barge. At night, you'd see groups of rats swimming out from shore in a column maybe twenty feet long, trying to reach the barge and climb up to get into the potatoes that were stacked amidships. When we didn't have operations, the guys would get M-16s with silencers (suppressors) on them and sit out on deck shooting the rats. As long as they used the silencers (suppressors) the officers didn't know what they were doing."

The SEALs were constantly looking for ways to augment the firepower of their small units. This was one of the reasons that the Teams first looked at the AR-15 weapon. One item that was attractive in the AR-15 was that it came outfitted with a twenty-round magazine. Though a thirty-round magazine had been available from Colt since at least 1964, technical difficulties with the large magazines design kept it from being commonly available.

The original Colt thirty-round magazine was a "fully curved" design, that is the magazine had a slight curve, to facilitate feeding rounds, through its entire length. Though the original magazine fed ammunition smoothly, the magazine well of the AR-15 was a straight rectangular hole. Allowances for a curved magazine had not been designed into the weapon. Simply put, not all of the AR-15/M16/XM16E1 weapons made would accept the original thirty-round magazine. If an individual weapon's tolerances were on the large side, it could accept the curved magazine, if not, it could only feed from the standard twenty-round magazine.

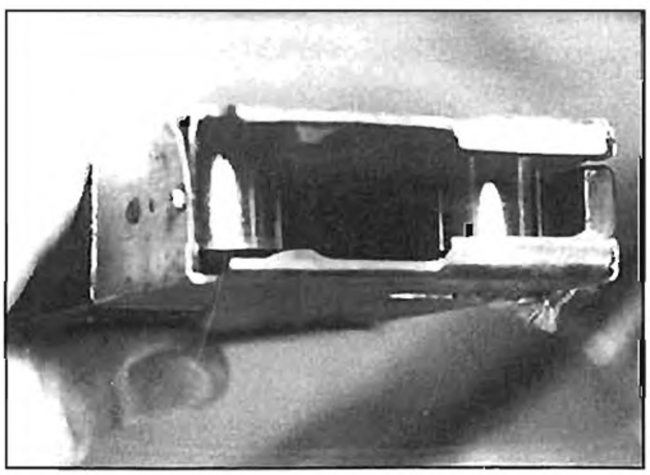
The few thirty-round magazines the SEALs had were carefully hoarded and used for combat duty. Though the Teams had at least a small number of the original thirty-round magazines in 1964-65, there were never enough for general issue. The Air Force also had a limited number of the early thirty-round magazines and occasionally individual mags would be "borrowed" by enterprising SEALs.

In January 1966, a requirement was put out for a thirty-round magazine to be delivered from Colt for the M16/XM16E1 program. The late 1966 contract for the XM177E1 Commando specified that the weapon come issued with seven thirty-round magazines. But the thirty-round magazine project was overshadowed at Colt by



"Later production XM177E2s were all produced with chrome plated chambers to help limit corrosion."

A Colt Model 609 XM177E1 "Commando" submachine gun. This specimen has the longer second model noise and flash suppressor mounted on its muzzle. The production model sliding buttstock is in its forward position in this photo. The weapon is loaded with a 20 round magazine and is supported with an M3 bipod clamped in place under the front sight.
PHOTO CREDIT: KEVIN DOCKERY



A top view of the Mod 3A 50 round M16 magazine. The cartridge follower has been removed in this photo to show the two constant-force extension springs. The constant-force springs resemble a roll of steel tape. The spring steel coils maintain a smooth pressure on the cartridge follower as the rounds are fed into the weapon with the same pressure driving the first cartridge as the last. Most coil spring designs build up pressure as the spring is compressed making the last rounds to be loaded into a long magazine difficult to insert. The constant-force spring design eliminates the spring-loading problem.
PHOTO CREDIT: KEVIN DOCKERY

Produced by the Naval Weapons Center at China Lake, these are commercially available polypropylene plugs used to block the muzzle of an M16, AR-15, or Stoner. The soft plastic plugs slip tightly into the bore of the flash suppressor where they seal the end of the barrel from mud or rain. The plugs could be simply removed by hand or even shot-off with no danger to the weapon or firer. One drawback of the internal-style rain/mud plug was that it would not work on the noise/flash suppressor found on the CAR-15 and XM177 series weapons.
PHOTO CREDIT: US NAVY

other problems and pushed back in priority. XM177E1s were issued with standard twenty-round magazines.

During the initial field testing of the XM177E1 by the US Army in Vietnam, only four early model thirty-round magazines were sent over for testing. This was along with the 2800 XM177E1s being issued. The four magazines ended up with the 5th Special Forces Group. Though the number of magazines available for testing was laughably small, ninety percent of the people asked in the survey that was part of the XM177E1 testing, stated they preferred the thirty-round magazine if available.

By June 1968, Colt had signed a contact with the Army to supply 1,000 new-model thirty-round magazines with delivery expected in 26 weeks. By 1969, the new model thirty-round magazines started to become available in Vietnam with the SEALs being among the first units to receive them. The new magazine has a straight top and bottom portion connected by a curved section and fit all of the AR-15/M16/16A1 weapons produced at the time of its adoption in 1969. The thirty-round magazine was enthusiastically received by the SEALs who accepted all that they could get their hands on.

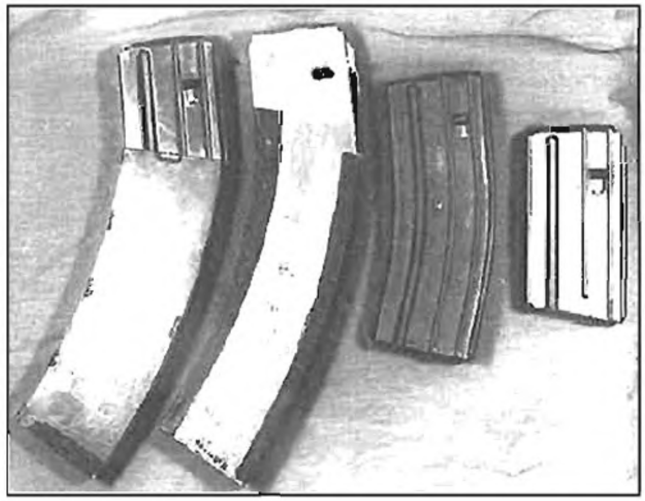
SEAL Team Two Command and Control History, 1969, page 14:

> "8. (U) Another favorite piece of operational gear which is now present on the SEAL TWO inventory is the 30-round magazine for the M16 and CAR 15 weapons. This gives an extra 10 rounds per magazine which is a welcome development to a unit such as the SEAL Team which constantly tries to make up for its lack of numbers with superior firepower."

In 1968, the Naval Research and Development Unit - Vietnam (NRDU/V) sent a representative to Vietnam in order to assess the needs of the Navy units there. During his four-month tour, the NRDU/V representative spent a large portion of his time with the SEALs operating in the Mekong Delta. One of the strong impressions the man came away with was of the SEALs' requirement for sustained firepower with their M16 rifles. This was needed especially to maintain the high volume of fire during the first crucial moments of enemy contact.

There was at least a year's wait before the thirty-round magazine would be available from Colt and the Naval Weapons Laboratory, Dahlgren, decided to address the problem. The first model of a new fifty-round magazine was delivered from Colt in April/May 1969. The Colt magazines were made up from three twenty-round magazines welded together end-to-end. Inside of the magazines were a new follower mechanism designed by the engineers at Dahlgren. Thirty-five of the Colt magazines were made and forwarded to the Navy for testing.

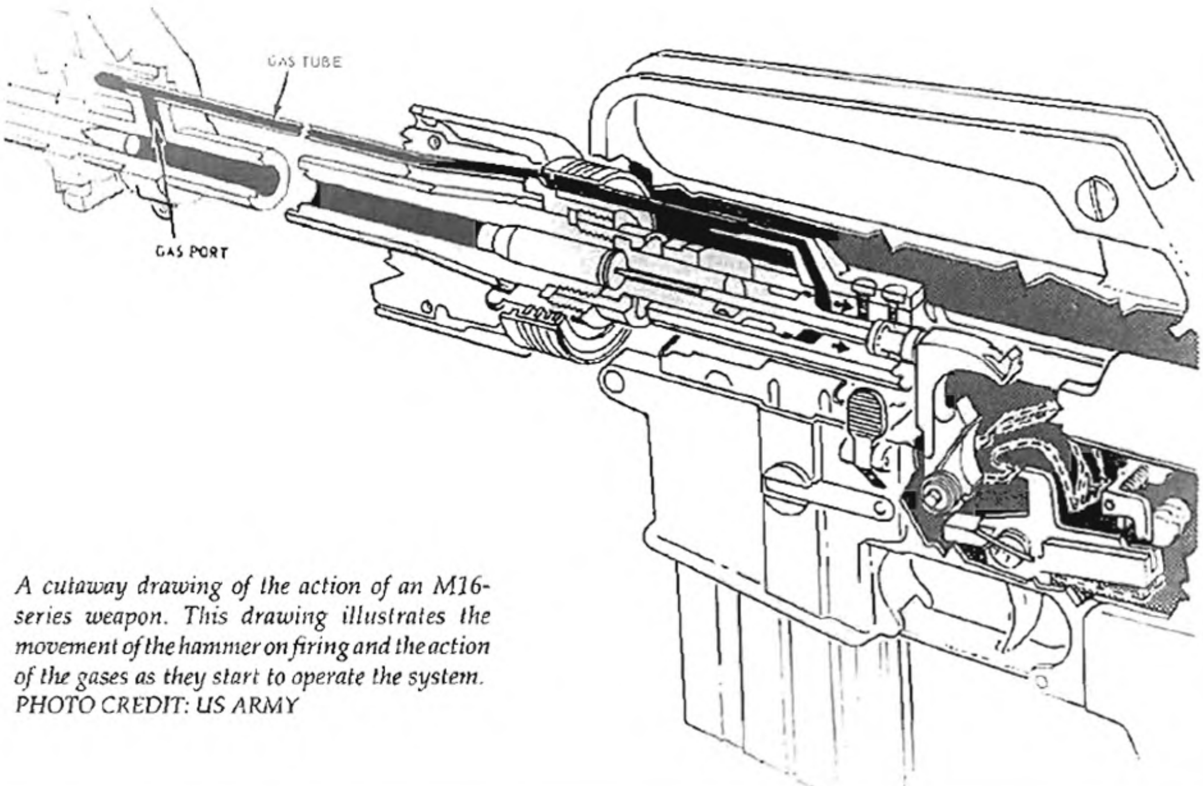
The major engineering problem with such a long magazine is the spring pressure needed to lift the heavy column of cartridges into the rifle. Too heavy a spring and the last rounds loaded will be difficult to insert into the magazine, too light a spring and all of the ammunition will not feed into the weapon. A normal coil spring, such



Four of the magazines used by SEALs in Vietnam in the M16-series of weapons. The magazine to the far right is a standard, aluminum 20 round box magazine used in the M16 from its very early days. An earlier steel 20 round magazine was available for the AR-15 but was dropped in favor of the improved aluminum model. Second in from the right is the production-model aluminum 30 round magazine that started becoming available to the SEALs in some numbers in 1969. The production 30 round magazine has two straight sections connected by a curved portion of the body. An earlier 30 round magazine was available in small numbers but had a fully-curved body that did not fit all M16-series weapons due to tolerance differences between magazine wells. The magazine to the far left is the Childers/Monolo Mod 1 50 round magazine produced by the Naval Weapons Laboratory, Dahlgren in 1969. In the Mod 1 design, a curved extension was attached to a standard 20 round magazine body. In addition, a special constant-force extension spring and Teflon follower were part of the design. The Mod 1 design was not successful and only 10 specimens were produced with several being tested in Vietnam. The center magazine is the Mod 3A design, considered the most successful of the series. Ten of the Mod 3A magazines were made and tested by the SEALs in Vietnam and found a valuable addition to the initial volume of fire that could be put out on contact with the enemy. Though the 50 round magazine project was considered a success, the design was shelved in 1970 and no further work was done.
PHOTO CREDIT: KEVIN DOCKERY

as is used in the twenty-round magazine, "loads up", that is increases its spring tension as the magazine is filled. For the proposed fifty-round magazines, the pressure needed to load the final rounds against a coil spring would likely need a loading tool for assistance. In addition, the spring pressure could keep the first rounds in a full magazine from being stripped into the barrels by the weapon's bolt.

To answer this problem, the NRDU/V came up with a new method of pushing the rounds through the long magazine. The follower for the fifty-round magazines, the platform that actually pushes the ammunition itself,



A cutaway drawing of the action of an M16-series weapon. This drawing illustrates the movement of the hammer on firing and the action of the gases as they start to operate the system.
PHOTO CREDIT: US ARMY

The rarely seen patch of the NWC Special Projects Division at China Lake, California. This facility produced many specialized pieces of equipment on a quick-reaction basis for use by the SEALs during the Vietnam War and into the 1970's under the sponsorship of the Vietnam Laboratory Assistance Program (VLAP). The figure wearing the cloak and holding a dagger symbolizes the clandestine nature of much of the SEALs' work. The cactus represent the desert where China Lake is located and the background explosion the end effect of much of the material produced for the SEALs.
PHOTO CREDIT: US NAVY

was made of a low-friction plastic. In the base of the follower were placed two constant-force springs, much like the coiled springs in a clock movement. The ends of the springs were attached to the mouth of the magazine rather than pressing against the magazine's bottom. The constant-force springs would unwind as the magazine was loaded, keeping the same pressure on the last rounds loaded as on the first.

The Colt manufactured (first generation) magazines were made at the special request of SEAL Team Two as an interim measure prior to a magazine becoming available from Dahlgren. Results from using the first generation magazines in the field were poor as the magazines were particularly susceptible to mud and damage from the environment. All the first generation magazines were replaced as new designs became available.

The Naval Weapons Laboratory, Dahlgren (NWL) made a Mod 1 magazine consisting of a twenty-round magazine body attached to a curved magazine extension. The Mod 1 magazine used the constant-force springs and follower and operated much better than the Colt magazine. A further nine Mod 1 magazines were made for testing but remained in the United States.

To eliminate some of the problems noted in testing, a Mod 2 magazine was designed. In the Mod 2 magazine, the follower remained much the same as in the Mod 1 but the body of the magazine was made up of two machined halves rather than an extension being attached to an existing magazine. In the Mod 2 design, the curve of the magazine remained the same but the angle where the curved portion met the straight section was increased. The straight section of the magazine had to be retained for easy insertion into the M16 magazine well

The Naval Ordnance Station in Forest Park, Illinois fabricated forty-two Mod 2 magazines according to the NWL design. Testing established the viability of the magazine and the unusual follower design. Ten magazines were found to not operate properly and were removed from the test. Five of the Mod 2 fifty-round magazines were sent to other units in Vietnam and the majority of those remaining, twenty-seven units, were distributed to the members of SEAL Team Two operating in the Mekong Delta.

One difficulty with fifty-round box magazines was noted in particular by 8th Platoon in My Tho. The comment made was that the fifty-round magazine was too bulky and too long. When the platoon was operating from a defensive position, the men would have to expose 50% more of their bodies when firing with the fifty-round magazines from the prone position. It was also pointed out that the magazines operated best when only loaded with forty-five rounds rather than fifty.

All told, the fifty-round magazines were considered an effective and valuable piece of equipment by most of its users. A Mod 3 magazine incorporating several improvements over the Mod 2 design was developed. One improvement on the Mod 3 was the addition of a bolt stop to the follower. Now the weapon's bolt would lock open on an empty magazine when the last shot was fired. Ten of the Mod 3 magazines were made and seven were sent to SEAL Team Two elements in Vietnam.

By February 1971, a final report on the fifty-round magazine project was written as NWL Technical Report TR-2536 by Carroll D. Childers and Joseph C. Monolo. The report listed the recommendation put forward by the SEALs that the fifty-round magazine (Mod 3) be adopted for use and issued one per man as a weapon-ready magazine for deployed platoons. It was suggested that such magazines be serial numbers for positive control and not be considered a consumable item. Cutbacks in the post-Vietnam military kept any funding from being made available for the fifty-round magazine program and the project was shelved.

Other methods were used by the SEALs to extend the firepower of their firearms. The most common technique was to tape together two or more magazine together, upside down to one another. This method allows for a fast reload as the magazine assembly only has to be pulled from the weapon, flipped over, and reinserted. One strong drawback of this technique is that the bottom magazine has its first cartridges exposed to the environment. It is very easy for dirt or mud to enter the exposed magazine and cause a jam when it is used. This problem keeps the technique from being as widely used as it might be.

The problem of dirt and especially mud entering their magazine was one the SEALs discovered very soon after beginning operations in Vietnam. To answer this problem, the Special Operations Branch of the Navy Weapons Center at China Lake, California came up with plastic M16 magazine caps. The caps were simple, black plastic devices, one to fit on the bottom and the other over the top of any size M16 magazine. The caps effectively sealed the magazine against dirt and mud. The top magazine cap had a tab sticking out from one end. The tab could be pulled, with an operator's teeth if necessary, tearing off the cap and clearing the magazine for insertion into a weapon.

In addition to the magazine caps to keep out the mud, China Lake came up with two items to help keep the rain and mud of Vietnam out of the bore of an M16. One device was a simple white plastic plug that could be inserted into the flash suppressor of an M16. The plug was made of a soft plastic and was hollow. The tight fit of the plug into any of the three flash suppressors then in use would effectively seal the bore against rain or mud. But the plugs would not make the weapon waterproof from a full immersion, such as from an underway insertion.

The plugs were just large enough to be pulled from the muzzle with the fingers, or the tip of a knife. The fit was such that the weapon could even be fired with the plug still in place, blowing out the plug with no damage to the weapon.

The other device China Lake found to help keep rain and mud out of the bore of a .223 caliber weapon was a plastic cap. The cap, resembling a plastic film container, could be pressed over any standard-sized flash suppressor on any .223 caliber weapon in the SEALs

TECHNICAL DATA —T 223 Rifle (Heckler & Koch HK33)
CARTRIDGE—.223 Remington (5.56x45mm)
OPERATION—Roller locked delayed blowback
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 40 rpm, A 160 rpm, Cyclic 650 to 750 rpm
MUZZLE VELOCITY—3150 fps (960 m/s)
MUZZLE ENERGY—1234 ft/lbs (1673 J)
SIGHTS—Open, Drum-type multiple aperture w/V-notch battle sight/blade, Adjustable, Battle sight 100 meters, apertures at 200, 300, and 400 meters
FEED—20 or 40 round removable box magazines

WEIGHTS
WEAPON (EMPTY)—7.65 lbs (3.47 kg)
MAGAZINE (EMPTY—20 round 0.25 lb (0.11 kg) 40 round 0.35 lbs (0.16 kg)
MAGAZINE (LOADED)—20 round 0.77 lb (0.35 kg) 40 round 1.39 lbs (0.63 kg)
SERVICE CARTRIDGE—M193 Ball 182 gr (11.8 g)
PROJECTILE—56 gr (3.6 g)
LENGTHS
WEAPON OVERALL—36.9 in. (93.7 cm)
BARREL—15.7 in (39.9 cm)
SIGHT RADIUS—18.9 in. (48 cm)

Transporting a captured VC, the SEAL in the center of this picture is armed with a Harrington & Richardson 5.56mm T223 rifle. This weapon is the US imported version of the Heckler & Koch HK33. This particular weapon is loaded with a 40 round magazine and has a China Lake plastic muzzle plug over the flash hider. Slung muzzle forward under the right arm of the center SEAL is an M72 Light Antitank Weapon (LAW). At the left of the photo is a SEAL carrying a radio and armed with an early model 07 CAR-15, the stock of which can be just seen behind his left hand. The CAR-15 is loaded with a early-style curved 30-round magazine. Underneath the radioman's left arm is a late-model Chicom Type 56 (AKM-47). The Type 56 is probably the weapon taken from the black pajama-clad prisoner who is wearing a three-pocket chest-type magazine carrier. PHOTO CREDIT: US NAVY inventory. The cap fit snugly, even on Stoner machine-guns and XM177E1/E2s, sealing out mud, dust, and water. Originally, the caps were made of red plastic but this was soon changed to a black material. As with the muzzle plugs, the weapon could be fired with the cap in place with complete safety to the operator and the weapon. The muzzle cap idea worked so well and had such a universal application that they were adopted by the US Army as the Cap, protective, dust and moisture seal: muzzle, still available today as a standard-issue item.

Other materials produced by China Lake for the SEALs and their M16s predated equivalent Army items. By October 1968, a limited number of M16A1s had been modified by China Lake to have a jungle sling and integral cleaning kit. The jungle sling was simply a side mounted sling that allowed the operator to carry his weapon hanging at his side, muzzle forward, ready for use. To accept the sling, the normal rear sling swivel of the M16A1 was moved from the toe of the buttstock to the rear upper left side. The front sling swivel was moved from below the front sight to a sliding position along a one-piece cleaning rod fitted to the upper left side of the weapons's hand guard, from the front sight to the receiver.

In addition to the sling modifications, a complete cleaning kit was made part of the weapon. A lid was added to the bottom of the hollow pistol grip allowing cleaning materials to be securely stored. In addition, a second storage place was made in the buttstock, covered by a trap door in the buttplate of the weapon. Within a few years, a larger buttstock storage area with a latched cover and a redesigned cleaning kit with a sectioned rod was made part of every M16A1 accepted for US service.

Another accessory was made for the Team's M16s weapons family by China Lake. This item was particularly mundane in nature as it was simply a blank firing attachment. Using standard M200 blanks, the China Lake attachment allowed semi and full automatic functioning on the M16 and all of its variants. The unit screwed onto the weapon's barrel in place of the normal flash suppressor. The attachment would work as well on the XM177E1/E2 as it did on the M16A1. Even ball ammunition could be accidentally fired through the China Lake device without any danger to the firer or the weapon, though the attachment would be destroyed.

The China Lake blank firing attachment was much smaller and lighter than the Army's M15E1 blank firing adaptor. In addition, the China Lake device did not catch on brush and was dark in color as compared to the boxy, bright red M15E1 adaptor.

The Teams were sold on the .223 caliber class of weapons very soon after seeing the round's terminal effects in combat. Along with the M16 family of weapons, the SEALs had a commitment in the .223 round as it was used in their Stoner machine guns. But this commitment did not prevent the SEALs from constantly looking for additional weapons to augment their firepower. But one major requirement was that any new weapons use ammunition available in the US inventory.

T-223 (HK33)

Other countries in the NATO alliance could see a strong future for the .223 round after its official adoption by the US military. Several small arms companies developed a number of weapons chambered for the high-velocity round, known as the 5.56x45mm round in NATO terminology. Heckler and Koch of West Germany designed a version of their G3 rifle to use the 5.56mm cartridge. The new weapon, known as the HK33, was imported into the United States by Harrington and Richardson of Worcester, Massachusetts.

Marked as the H&R T 223 rifle, the weapon was submitted to the US Army's Small-Arms Weapon Systems (SAWS) study for evaluation. The SAWS study ran from December 1964 to the submission of the final report in December 1966. During the study, a number of weapons were examined including the T 223, M14, M16E1, AK47, and Stoner weapons system.

One result of the SAWS study was a number of weapons being brought to the attention of the SEALs. Even though the empty H&R T 223 was 0.9 pounds (0.41 kg) heavier than an empty M16E1, the weapon had a forty-round magazine available for it and that made it attractive to the SEALs.

> "Choice of weapons were left as much as possible up to the tastes of the individual SEAL ...For myself, I had taken a liking to the Harrington and Richardson T223 rifle... One thing that immediately made the T223 appeal to me was the fact that it came with forty-round magazines."

One SEAL from SEAL Team Two carried the H&R T 223 during his first combat tour in Vietnam, April to October 1968:

> "My H&R came with four forty-round magazines which I carried in the leg pockets on my cammies for awhile. The magazines tended to rattle around and make too much noise on patrol but were too long to fit in an American ammunition pouch. I solved my problem by getting one of the chicom AK47 chest-type magazine pouches and carrying my ammo in that..."

One interesting point of the H&R T 223 (HK33) is that it very much resembles a slightly smaller, 3.25 inch (8.3 cm) shorter, version of the 7.62mm NATO G3 rifle. In one much published picture of a number of SEALs in Vietnam, one SEAL is holding a T 223 but the weapon can only be seen from its top side. Since the HK33 and G3 are almost identical when viewed from the top, the weapon was identified as a G3 rifle which the SEALs did not use during the Vietnam war. In an earlier-generation copy of the same picture, the long, curved forty-round magazine can be seen sticking out from the bottom of the weapon.

During the SEALs time in Vietnam, a number of different rifles and carbines were used on an intermittent basis. For the most part, the men of the Teams stuck with the M16 family of weapons as their primary weapon. Unlike the other services, an individual SEAL would be

A group of SEALs preparing to go out on an operation in Vietnam. A number of weapons and equipment are visible in this photograph which has long been misidentified as evidence that the SEALs used the German G3 rifle in Vietnam. The SEAL at the top right corner of the photo is armed with an H&R T223 (HK33) rifle. From this top view, it is almost impossible to see the difference between a G3 rifle and this HK33. In an earlier-generation copy of this photograph examined by the author, the 40 round magazine unique to the HK33 can be made out loaded into this weapon. At the top center of this photo can be seen part of the front handguard and barrel of a Colt Model 07 submachine gun (CAR-15). The SEAL at the right-side center is armed with some form of 40mm grenade launcher as he is wearing an early-model nylon mesh grenade carrier vest.
PHOTO CREDIT: US NAVY

"Even though the empty H&R T 223 was 0.9 pounds (0.41 kg) heavier than an empty M16E1, the weapon had a forty-round magazine available for it and that made it attractive to the SEALs."

The unusual rifle with which this SEAL is armed is the Harrington and Richardson (H&R) 5.56mm T223. H&R was the US importer for the German Heckler and Koch HK33 rifle which H&R designated the T223. The specimen held by the SEAL in this photo is loaded with a 40 round magazine. The large capacity magazines that were available for the T223 are what made the weapon of interest to the Teams.
PHOTO CREDIT: US NAVY

TECHNICAL DATA—SKS (Chinese Type 56 Carbine)	**WEIGHTS**
CARTRIDGE—7.62 Intermediate (7.62x39mm)	**WEAPON (EMPTY)**—8.5 lbs (3.86 kg)
OPERATION—Gas	**WEAPON (LOADED)**—8.86 lbs (4.02 kg)
TYPE OF FIRE—Semiautomatic	**MAGAZINE (LOADED)**—10 rds 0.36 lb (0.16 kg) 10 rds w/stripper clip 0.39 lbs (0.18 kg)
RATE OF FIRE—30 to 35 rpm	**SERVICE CARTRIDGE**—M43 Ball 253 gr (16.4 g)
MUZZLE VELOCITY—2410 fps (735 m/s)	**PROJECTILE**—122 gr (7.9 g)
MUZZLE ENERGY—1573 ft/lbs (2133 J)	**LENGTHS**
SIGHTS—Open, Tangent round-notch/post, Adjustable 0 to 800 meters in 100 meter graduations	**WEAPON OVERALL**—40.2 in. (102.1 cm)
FEED—10 round integral magazine	**BARREL**—20.5 in (52.1 cm)

assigned his weapon while still in the States, carry it with him during his deployment, and return with the same weapon after his tour was over. Other services simply issued a man a weapon when he arrived incountry and he turned it back in for reissue when he left Vietnam. The SEAL system allowed a man to care for his own weapon in such a way as to instill maximum confidence and skill with it. It was when a platoon formed-up for deployment and began pre-deployment training that a man was assigned his weapon and began working with it:

> "At [Camp] Pickett the platoon worked on ambushes, popup target courses, weapons familiarization, and zeroing in your own weapon. Each man would take his own M16 and zero the sights on the 1,000 inch range.
>
> Carefully sandbagging his weapon, the firer would adjust his sights until he held a good three-shot group exactly 1 inch below his point of aim at 1,000 inches. For an M16, that would put the bullet's point of impact on the point of aim at 250 yards. After a man had zeroed his weapon's sights, that weapon would be assigned to him by serial number for his tour incountry..."

SKS

There were times when the SEALs carried foreign weapons in order to help confuse any enemy observers. In one instance in 1968, two SEALs on patrol deep in enemy territory were reported as a pair of Russian advisors due in part to the materials they carried. Some SEALs developed a taste for the AK47 and its variants and carried that weapon as a matter of preference. Sometimes, it was the mission parameters that determined the choice of weapons. This proved particularly true during the waning years of the SEALs combat deployments to Vietnam. The following was stated by a SEAL officer who was part of the last SEAL Team Two deployment to Vietnam:

> "The kind of operations we went on, it would be rare for someone to detect us, let alone fire directly at us. As rare as it would be for us to be shot at, it would be even more rare for us to return fire. With no support, we just didn't let ourselves be seen. With the few men we had, we just didn't have the firepower to take on an enemy unit. This situation greatly affected our choice of weapons. The AK47 and SKS had the same sound signature, muzzle flash and tracer color as the enemy's own weapons. An M-16, M-60, and especially a Stoner, would stand out to the VC and NVA, telling them where and possibly who we were..."

A Soviet-bloc produced AKMS-47 rifle with its folding stock extended. The long selector lever, above the trigger, is set to the mid-position for full-automatic fire. This specimen has the standard laminated wood forend and a plastic pistol grip.
PHOTO CREDIT: KEVIN DOCKERY

TECHNICAL DATA—AKM-47 (AKMS-47)
CARTRIDGE—7.62 Intermediate (7.62x39mm)
OPERATION—Gas
TYPE OF FIRE—Selective - Full automatic/semiautomatic
RATE OF FIRE—Practical SS 40 rpm, A 90 to 100 rpm, Cyclic 600 to 800 rpm
MUZZLE VELOCITY—2329 fps (710 m/s)
MUZZLE ENERGY—1469 ft/lbs (1992 J)
SIGHTS—Open, Tangent round-notch/post, Adjustable 0 to 1000 meters in 100 meter graduations
FEED—30 round removable box magazine
WEIGHTS
WEAPON (EMPTY)—AKM-47 6.46 lbs (2.93 kg)
AKMS-47 6.90 lbs (3.13 kg)
WEAPON (LOADED)—AKM-47 8.27 lbs (3.75 kg) late steel mag
AKMS-47 8.71 lbs (3.95 kg) w/late steel mag
MAGAZINE (EMPTY)—Early steel magazine 0.95 lbs (0.43 kg)
Late steel magazine 0.73 lbs (0.33 kg)
Aluminium magazine 0.37 lbs (0.17 kg)
MAGAZINE (LOADED)—Early steel magazine 2.03 lbs (0.92 kg)
Late steel magazine 1.81 lbs (0.82 kg)
Aluminium magazine 1.45 lbs (0.66 kg)
SERVICE CARTRIDGE—M43 Ball 253 gr (16.4 g)
PROJECTILE—122 gr (7.9 g)
LENGTHS
WEAPON OVERALL—AKM-47 34.5 in. (87.6 cm)
AKMS-47 25.20/35.04 in (64/89 cm)
BARREL—16.3 in (41.4 cm)
SIGHT RADIUS—14.8 in. (37.6 cm)

A right-side view of a late-model Chinese Type 56 rifle with a folding, spike bayonet. This is the Chicom version of the Soviet AK-47 and was the most common weapon of its type encountered by the SEALs in Vietnam.
PHOTO CREDIT: KEVIN DOCKERY

TECHNICAL DATA—AK-47 (AKS-47)
CARTRIDGE—7.62 Intermediate (7.62x39mm)
OPERATION—Gas
TYPE OF FIRE—Selective - Full automatic/semiautomatic
RATE OF FIRE—Practical SS 40 rpm, A 90 to 100 rpm, Cyclic 600 to 800 rpm
MUZZLE VELOCITY—2329 fps (710 m/s)
MUZZLE ENERGY—1469 ft/lbs (1992 J)
SIGHTS—Open, Tangent round-notch/post, Adjustable 0 to 800 meters in 100 meter graduations
FEED—30 round removable box magazine
WEIGHTS
WEAPON (EMPTY)—AK-47 8.53 lbs (3.87 kg)
AKS-47 7.65 lbs (3.47 kg)
WEAPON (LOADED)—AK-47 10.56 lbs (4.79 kg) early steel mag
AKS-74 9.68 lbs (4.39 kg) w/early steel mag
MAGAZINE (EMPTY)—Early steel magazine 0.95 lbs (0.43 kg)
Late steel magazine 0.73 lbs (0.33 kg)
Aluminium magazine 0.37 lbs (0.17 kg)
MAGAZINE (LOADED)—Early steel magazine 2.03 lbs (0.92 kg)
Late steel magazine 1.81 lbs (0.82 kg)
Aluminium magazine 1.45 lbs (0.66 kg)
SERVICE CARTRIDGE—M43 Ball 253 gr (16.4 g)
PROJECTILE—122 gr (7.9 g)
LENGTHS
WEAPON OVERALL—AK-47 34.25 in. (87 cm)
AKS-47 27.52/34.21 in (69.9/86.9 cm)
BARREL—16.30 in (41.4 cm)
SIGHT RADIUS—14.8 in. (37.6 cm)

A left-side view of a Soviet AKMS-47 with its stock folded. The pattern seen just above the buttplate on the wooden foregrip is distinctive of the laminated wood used in many Soviet Block-produced AK-47 series weapons. PHOTO CREDIT: KEVIN DOCKERY

The AK47 and its variations was the primary shoulder weapon of communist forces throughout the world from 1948 until the 1980's. The SKS which preceded the AK47, is a light semiautomatic carbine that was the first production weapon chambered for the 7.62x39mm round or 7.62mm Intermediate as it was called by Vietnam-era SEALs.

The SKS, for Samozaridnya Karabina Simonova, is a relatively simple carbine with a ten-round internal magazine. The magazine can be filled with loose rounds or quickly loaded from a ten-round stripper clip. The physical characteristics of the SKS made it a very good weapon for the small-stature Asian soldier. Manufactured in several variations in at least five countries, the most common model of the SKS captured in Vietnam was the Peoples Republic of China (PRC) Type 56 Carbine with an integral, folding, spike bayonet.

The 7.62x39mm round was proved out in the SKS carbine and has become arguably the most common military cartridge in the world. When fired in the SKS or AK-47, the 7.62x39mm round has a very unique sound signature, distinctly different from US weapons. In addition, the tracer loading of the 7.62x39mm round emits a green trace when fired as compared to the US, and NATO's, red trace.

AK-47, AKS-47

By far the most popular weapon chambered for the 7.62x39mm round is the AK47. The original AK47, for Avtomat Kalashnikov, is a very robust, compact, and powerful weapon well suited for the Southeast Asian environment as well as the guerrilla tactics of the Viet Cong. The AK47 will continue to function with little or no maintenance given to it over extended periods. Though not particularly accurate, especially after years in the jungle, the AK47 is capable of putting out a high volume of effective fire when used on full automatic.

AKM-47, AKMS-47

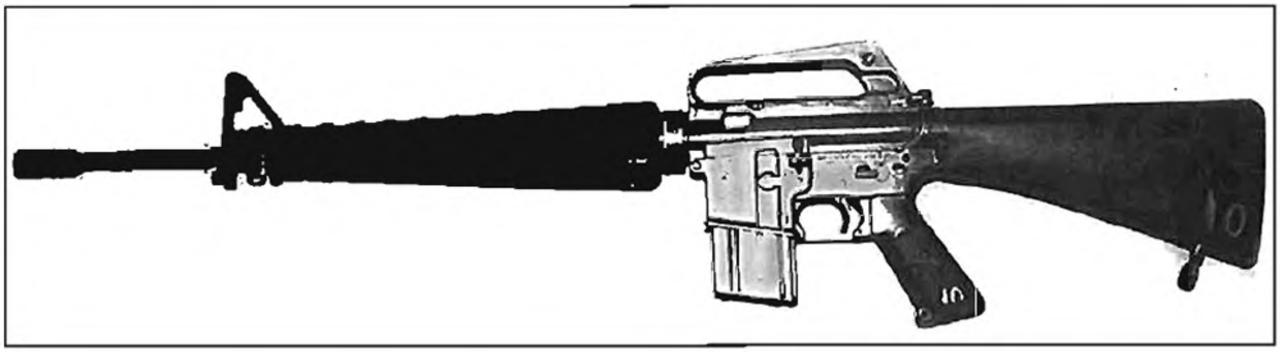
The receiver of the AK47 was manufactured as a complex machining from a solid block of metal. The later, and more common, AKM47 has its receiver made up of sheet metal stampings. Several improvements are incorporated into the AKM47 and it is somewhat lighter, but every bit as rugged, as the original AK47. The AKM47, for Avtomat Kalashnikova Modernizirovanniyi, is also found in a folding-stock version, the AKMS47. The earlier AK47 also had a folding stock version, the AKS47. In both versions, the folding stock swings underneath the weapon and can be locked in the open or closed position. With the stock folded, the AK makes a compact, if heavy, package of firepower.

Literally millions of AK47s have been produced in over ten countries. As found in the SKS, the most common AK47 variant found in Vietnam was the wooden stocked PRC Type 56 assault rifle, found both with and without a folding spike bayonet.

Initially, the AK47 was available in only small numbers to the Viet Cong fighting in South Vietnam. This resulted in the AK47 being something of a prestige weapon among the VC prior to 1968 and the Tet offensive. The SEALs were very quick to notice the importance of finding AK47 armed VC:

> "The AK-47 was in very short supply among the VC in 1967. Only the highest ranking VCI [Viet Cong Infrastructure], number one ichi ban, and their number one bodyguards were seen with the weapon..."

Very soon after deployments began in Vietnam, AK47s were kept in stock in the armories of both SEAL Teams. The weapons acted as both training aids and as a possible source of sterile (non-US) weapons if needed. AK47s and SKSs came from captures in Vietnam and elsewhere. Ammunition was also made available from supply caches



This is the Navy's Mark 4 version of the M16A1 rifle. The dark appearance of the metal parts is due to the special anticorrosion coating that is part of the Mk 4 conversion. A side-mounting sling swivel can be seen projecting just under the front sight assembly.
PHOTO CREDIT: KEVIN DOCKERY

"One of the last specialized weapons received by the UDTs and SEALs while they were still involved in Vietnam was a modified M16A1."

TECHNICAL DATA—Mark 4 Mod 0 w/Mk 2 Mod 0 Blast suppressor
NSN 1005-00-102-8649
CARTRIDGE—.223 Remington (5.56x45mm)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 45 to 65 rpm, A 150 to 200 rpm, Cyclic 700 to 800 rpm
MUZZLE VELOCITY—3250 fps (991 m/s)
MUZZLE ENERGY—1313 ft/lbs (1780 J)
SIGHTS—Open, Flip-type aperture/post, Adjustable, battle aperture 0 to 300 meters, long range aperture 300 to 500 meters
FEED—20 or 30 round removable box magazines
WEIGHTS
WEAPON (EMPTY)—6.37 lbs (2.89 kg) w/o suppressor or flashhider
8.62 lbs (3.91 kg) w/suppressor
Mk 4 Mod 0 Blast suppressor 2.25 lbs (1.02 kg)
WEAPON (LOADED)—7.39 lbs (3.35 kg) w/30 rd mag, w/o suppressor or flashhider
9.64 lbs (4.37 kg) w/suppressor & 30 rd mag
MAGAZINE (EMPTY)—20 round aluminium 0.19 lb (0.08 kg)
30 round aluminium 0.24 lbs (0.11 kg)
MAGAZINE (LOADED)—20 round 0.71 lb (0.32 kg)
30 round 1.02 lbs (0.46 kg)
SERVICE CARTRIDGE—M193 Ball 182 gr (11.8 g)
PROJECTILE—56 gr (3.6 g)
LENGTHS
WEAPON OVERALL—39 in (99.1 cm) w/o suppressor
45.38 in (115.3 cm) w/suppressor
BARREL—20 in
SUPPRESSOR LENGTH—8 in (20.3 cm)
SUPPRESSOR DIAMETER—1.75 (4.4 cm)
SIGHT RADIUS—19.75 in. (50.2 cm)
Suppressor reduction on the normal sound signature of the weapon, was -32 db. The suppressor is designed to be fully self-draining within eight seconds of removal from immersion.
The Mk 4 Mod 0 rifle is a modified M16A1. The changes are to allow the weapon to be carried at a depth of 200 feet without damage. Provisions are made for the rapid drainage of water from the system and additional protection from the corrosive effects of sea water. Modifications include:
Anticorrosion treatment by applying Kalgard coating to many of the functioning components
Drilling a 1/4 inch hole in the lower receiver extension tube and stock
Installing an O-ring on the end of the buffer assembly
Attachment of the Mk 2 Mod 0 Blast suppressor which is considered an integral part of the Mk 4 rifle.
Basic issue with the weapon includes a sling, complete cleaning kit, and six - 30 round magazines.

This combat swimmer has just left the water with his Mark 4 variation of the M16A1 rifle. Besides the normal protection from the water that is part of the Mark 4 conversion, this weapon also has a plastic muzzle cap over the flash hider to help keep water out of the barrel. The muzzle cap is plastic and can be easily fired through without any damage to the weapon.
PHOTO CREDIT: US NAVY

captured in the field by SEALs. As the war progressed, the US military had sterile (unmarked) 7.62x39mm rounds manufactured at US ammunition facilities. Though the cartridges themselves were unmarked, that was not the case with the cardboard boxes the rounds came packaged in. In plain black letters is printed *20 CARTRIDGES - AK 47 RIFLE AMMO - 7.62 X 39 MM - LOT xxx-xxx-xx*

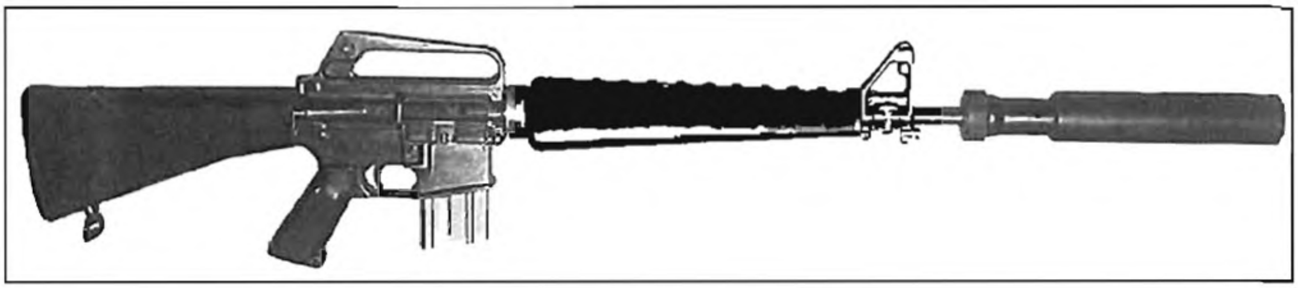
But for the Teams, the most common source of supply for 7.62x39mm ammunition was from the original people who made it, captured in Vietnam as shown in the following portion of a BARNDANCE card (Barndance cards were short reports filled out on each SEAL field operation conducted by a SEAL platoon while deployed to Vietnam):

BARNDANCE # 6-19 SEAL TEAM TWO; DET ALPHA; 6 PLT
DATE(S): 10 Jan 68
Located four enemy ammunition caches in vicinity of XT 270330. REMARKS (SIGNIFICANT EVENTS, OPEVAL RESULTS, ETC.): Captured the following: 67 - 75mm rockets, 29 - 57mm recoilless rockets, 197 - B40 rockets, 30 - 81mm mortars, 28,120 rounds of AK 47, 24 hand grenades, 1615 1⁄2 lb blocks of C-3, 6 ponchos, 1 gas mask. All ammunition except 7400 AK47 turned over to Army. 7400 rounds of AK47 retained for SEAL Team 2.

The AK47 and its variations have remained part of the SEALs training. Both the SKS and AK47 were listed as weapons a SEAL should be familiar with in the 1974 edition of the SEAL Training Handbook. It is interesting to note that one of the first weapons the SEALs faced in Vietnam, the AK47, was also one of the last weapons they carried on combat missions in Southeast Asia.

Mark 4 Mod 0 (M16)

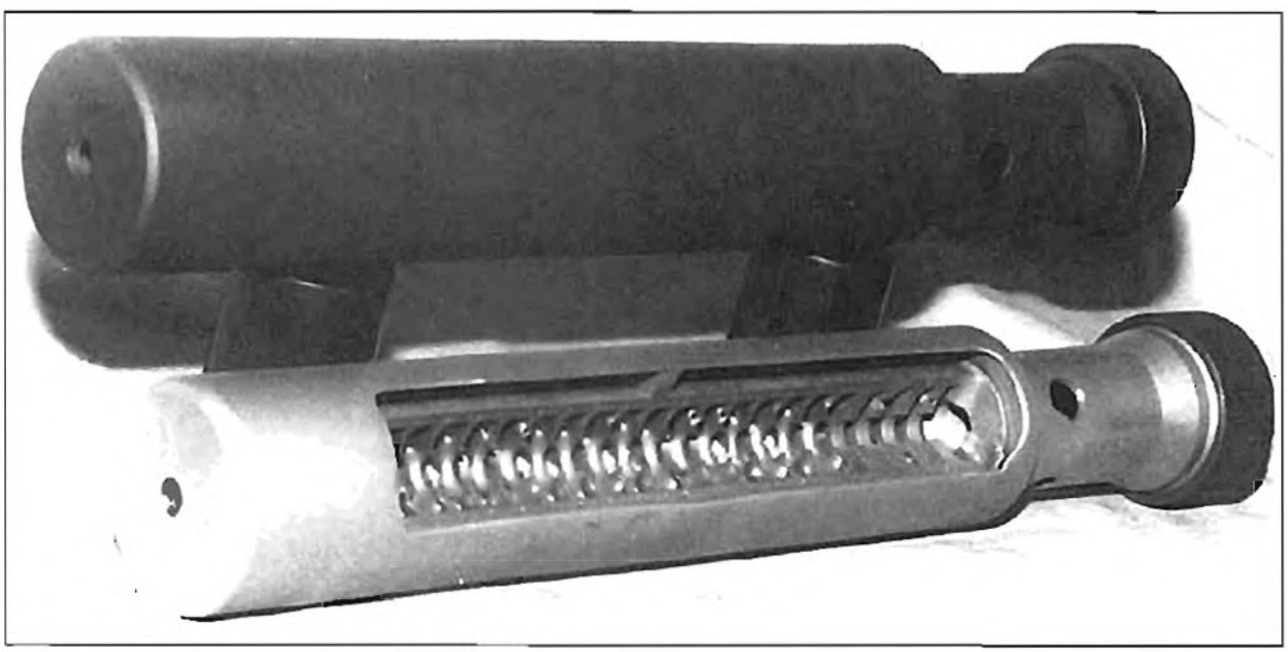
One of the last specialized weapons received by the UDTs and SEALs while they were still involved in Vietnam was a modified M16A1. The modifications done to the M16A1 were to waterproof the weapon and generally make it easier to transport underwater and prepare for immediate use by combat swimmers. Officially identified as the Rifle, 5.56mm Mark 4 Mod 0 at the time of its adoption in April 1970, modifications to the M16A1 included: an anticorrosion treatment consisting of coating many of the working parts of the weapon with Kal Gard gun coating; drilling a 1⁄2 inch hole in the lower receiver extension tube and stock; installing an O-ring on the end of the buffer assembly; and, attachment of the Mk 2 Mod 0 Blast suppressor



"The KAC suppressor is a stainless steel, baffle type design with a central perforated baffle tube surrounded by an annular expansion space. The suppressor, now identified as the Mk 2 Blast Suppressor, is able to be fully immersed in water and completely self-draining within 8 seconds."

A right-side view of a complete Navy Mark 4 version of the M16A1 rifle with a Mark 2 blast suppressor in place on the muzzle. The Mark 4 package is issued complete with the Mark 2 blast suppressor and five magazines.
PHOTO CREDIT: KEVIN DOCKERY

The Knight Armaments-produced Mark 2 blast suppressor. The top specimen is a standard-production model with the stainless steel body covered with a dark anticorrosion coating. The lower cutaway specimen shows the complex baffle arrangement inside the blast suppressor that slows down the escaping gas of a fired round. The multiple large holes in the reduced-diameter section of the Mark 2 allow a fired cartridge casing to be used to hold the Mark 2 while the collet is tightened or loosened. The collet used to secure the Mark 2 to the barrel of an M16 is adjusted by turning the serrated ring at the breech end of the suppressor.
PHOTO CREDIT: KEVIN DOCKERY/KNIGHT ARMAMENT COMPANY



Two SEALs during a beach insertion demonstration. Both men are holding Colt Model 653 carbines. The weapons are loaded with 30 round magazines and each is fitted with a China Lake blank adaptor on the muzzle. The flat, six-sided cross-section of the blank adaptor can be seen on the weapon at the right. One SEAL is wearing a floppy "boonie" hat while the other is wearing an olive-drab triangular bandage - commonly called a patrol rag - as a bandanna.
PHOTO CREDIT: UDT-SEAL MUSEUM

which is considered an integral part of the Mk 4 rifle.

The changes to the basic M16A1 are to allow the weapon to be carried at a depth of 200 feet without damage. Provisions are made for the rapid drainage of water from the system and additional protection from the corrosive effects of sea water. The basic issue of materials with the weapon includes a sling, complete cleaning kit, and six 30 round magazines.

The original suppressor issued with the Mk 4 was the first model Mk 2 Mod 0 blast suppressor based on the earlier HEL M4. By the late 1970's, the first model blast suppressor was no longer considered adequate for the Mk 4 rifle. Advances in suppressor technology had rendered the earlier design obsolete as a number of new suppressors were on the market with greater sound suppression and durability. After testing a number of available designs, the Navy chose the Knight's Armament Company's (KAC) model

The KAC suppressor is a stainless steel, baffle type design with a central perforated baffle tube surrounded by an annular expansion space. The suppressor, now identified as the Mk 2 Blast Suppressor, is able to be fully immersed in water and completely self-draining within 8 seconds. The advantages of this aspect of the design for the SEALs and UDTs are obvious. The KAC suppressor

Two combat swimmers come ashore in a more obvious manner than is usually done by the SEALs. The swimmers are both armed with Mark 4 versions of the M16A1 rifle. On their chests are Draeger LAR-V rebreathers and they still hold the breathing tubes in their mouths. The green-painted oxygen cylinder underneath the housing of the Draeger is visible on the front SEAL. PHOTO CREDIT: US NAVY

A right-side view of the Colt Model 653 carbine. The buttstock is in the maximum extended position and the weapon is loaded with a production 30 round magazine. The forward bolt assist can be seen on the upper receiver just above the pistol grip. The spring-loaded ejection port is closed in this picture. The weapon is supported by an M3 bipod clamped below the front sight and the muzzle is mounted with the third model "birdcage" flash suppressor.
PHOTO CREDIT: KEVIN DOCKERY

"Since the carbine did not require the longer flash/sound suppressor but had the shorter standard flash hider, the overall length of the model 653 carbine was only slightly longer than the XM177E2. A favorite weapon of the SEALs is produced when the short, handy carbine is mated with the M203 40mm grenade launcher. The powerful combination of automatic rifle and high explosive grenade launcher became a common sight in SEAL hands."

TECHNICAL DATA—Colt Model 653 Carbine
NSN 6D1005-01-029-3866
CARTRIDGE—.223 Remington (5.56x45mm)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 45 to 65 rpm, A 150 to 200 rpm, Cyclic 700 to 800 rpm
MUZZLE VELOCITY—3020 fps (920 m/s)
MUZZLE ENERGY—1134 ft/lbs (1538 J)
SIGHTS—Open, Flip-type aperture/post, Adjustable, battle aperture 0 to 300 meters, long range aperture 300 to 500 meters
FEED—20 or 30 round removable box magazines
WEIGHTS
WEAPON (EMPTY)—5.6 lbs (2.54 kg)
WEAPON (LOADED)—7.02 lbs (3.18 kg) w/sling & 30 rd mag
Sling 0.4 lbs (0.18 kg)
MAGAZINE (EMPTY)—20 round aluminium 0.19 lb (0.08 kg)
30 round aluminium 0.24 lbs (0.11 kg)
MAGAZINE (LOADED)—20 round 0.71 lb (0.32 kg)
30 round 1.02 lbs (0.46 kg)
SERVICE CARTRIDGE—M193 Ball 182 gr (11.8 g)
PROJECTILE—56 gr (3.6 g)
LENGTHS
WEAPON OVERALL—29.8/33 in. (75.7/83.8 cm)
BARREL—14.5 in (36.8 cm)
SIGHT RADIUS—14.72 in. (37.4 cm)

This SEAL takes aim with his Colt Model 653 Carbine while undergoing desert training. His radio is an AN/PRC-77 with the handpiece pulled under his left arm while he is seated. His loadbearing equipment is the nylon All Purpose Lightweight Individual Carrying Equipment (ALICE) gear adopted by the Army in 1974. He is also wearing 1st pattern desert camouflage BDUs (Battle Dress Uniform) made familiar to the public in the pictures from Desert Storm.
PHOTO CREDIT: SPECIAL OPERATIONS COMMAND PAO

acts as a muzzle blast device and has a very strong barrel attachment system that is still easily removable. In addition to its being made of noncorroding materials and self-draining design, the KAC Mk 4 suppressor is able to withstand full automatic fire from the M16 at the maximum rate possible without being damaged from the heat or blast.

By the end of their involvement in the Vietnam War, the SEALs and UDTs were already experiencing cutbacks in their numbers and financing. New weapons were relatively few in number and parts difficulties were making repair of some of the Vietnam era weapons difficult.

With the ending of the CAR-15 project by Colt in 1970, spare parts unique to the XM177/E1/E2 family were available in very limited numbers. The short barrels that helped make the CAR-15 weapons so popular were particularly rare. Most units, including the Teams, husbanded their remaining CAR-15s carefully and repaired some weapons by cannibalizing other more worn pieces for parts.

The short barrel of the CAR-15 weapons was never noted for its accuracy and when the barrels became worn, accuracy dropped quickly to unacceptable levels. When finally no more worthwhile 11.5 inch CAR-15 barrels were available, Colt offered their 14.5 inch carbine barrel. The M16A1 carbine was a new weapon from Colt that shared many features with the CAR-15 weapons. Some XM177E1 and E2 receivers were rebarreled for use with the carbine barrel and became hybrid weapons, appearing to be carbines but marked as XM177E1/E2s.

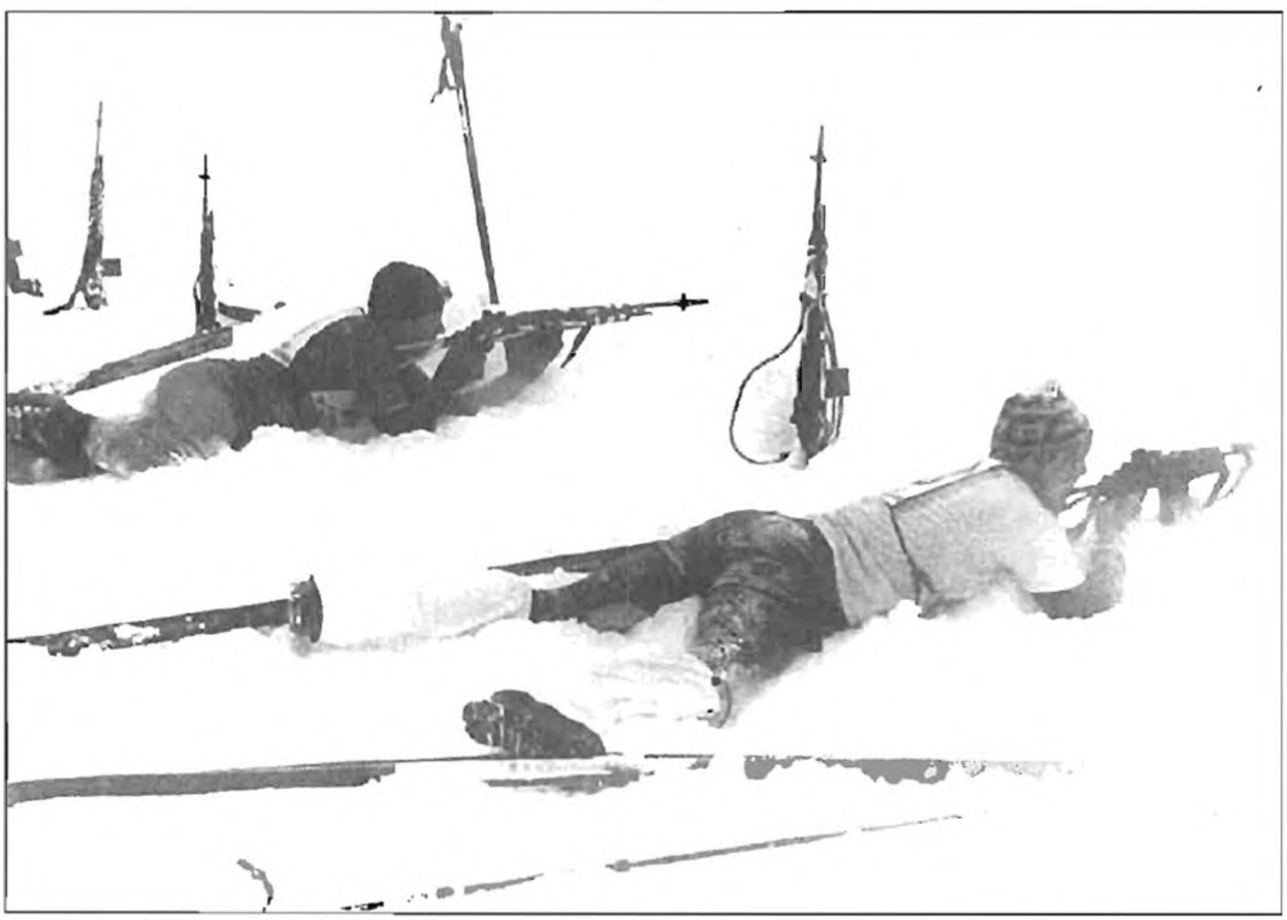
With the declaration by the ATF (Alcohol, Tobacco, and Firearms) department of the Treasury that the CAR-15 flash/sound suppressor qualified as a silencer under the law, and the State Department's outlawing export silencer sales under the Carter administration, Colt changed the design specifications of the CAR-15 to meet market requirements. Since the flash/sound suppressor of the XM177 weapons was a major sticking point, Colt simply extended the barrel of the new carbine weapon to the point where flash and sound could be held to reasonable levels. In addition, the slightly longer barrel of the carbine made it more accurate than the earlier CAR-15 weapons as the bullets had more time to stabilize for flight.

Colt Carbine Model 653

The Colt Model 653 M16A1 carbine was eventually adopted by the SEALs and UDTs in some small numbers.

At a demonstration, the SEAL in the center is wearing a full set of winter equipment including a white camouflage cover for his uniform and pack as well as aluminum-frame snowshoes. His weapon is a folding-stock M14A1 only found used by the SEALs. The stock on this specimen is folded forward and the magazine removed; that is in the SEAL's left hand. The buttplate of the folding stock is covered by a pad and is still in the extended (vertical) position. The SEAL to the right in this photo is equipped for Close Quarters Battle. A 3-cell pouch for 30 round MP5 magazine can be seen at his waist. Below the magazine pouch is a special 3-cell pouch for holding Flash-Crash (stun) grenades.
PHOTO CREDIT: KEVIN DOCKERY

Members of SEAL Team Two take part in a military biathlon competition while undergoing cold weather training in Norway. The men are target shooting with their folding-stock M14 rifles after having completed a portion of the cross-country skiing part of the competition. Additional weapons have been thrust into the snow butt-first to indicate additional firing positions on the line. Note the folding stocks on the weapons being fired.
PHOTO CREDIT: RYAN McCOMBIE COLLECTION



The model 653 shared the same sliding buttstock and short cylindrical handguards as the XM177E2. The most visible difference between the two weapons is the longer barrel of the carbine protruding well beyond the front sight.

The longer carbine barrel is fitted with the Type 3 flash suppressor as found on the standard M16A1s of the era. Since the carbine did not require the longer flash/sound suppressor but had the shorter standard flash hider, the overall length of the model 653 carbine was only slightly longer than the XM177E2. A favorite weapon of the SEALs is produced when the short, handy carbine is mated with the M203 40mm grenade launcher. The powerful combination of automatic rifle and high explosive grenade launcher became a common sight in SEAL hands.

More compact and powerful weapons have long been a priority with the Teams and especially the SEALs. Room is limited at best on many transports and it is at an absolute premium aboard submarines and Swimmer/SEAL delivery vehicles.

M14 WITH FOLDING STOCK

Facing much the same problem of space limitations in their armored vehicles, the Army examined fitting the, then standard, M14 rifle with a folding stock during the early 1960's. Four different models of folding stock were developed by the engineers at Springfield Armory. With the winding down of M14 production, the project was abandoned by the Army.

Few of the Army folding M14 stocks were ever made and even fewer still were available for later use by the Teams. A near-duplicate of the M14/M1 Garand was produced by Italy as their BM 59 series of weapons. The Parachutists and Alpine versions of the BM 59 are fitted with folding stocks that proved to be easily adapted to fit the M14 rifle.

The modified M14 stocks with the BM 59 folding buttstock design were obtained by the Teams by the late 1970's. With the stock folded, the M14 is a more compact package, not a great deal larger than an M16A1. The added power and range of the 7.62mm NATO round and the M14 rifle, combined with the compact folding stock gives the Teams the option of fielding the weapon as the tactical situation dictates.

Through the latter half of the 1970's trials were being conducted by the NATO countries to locate a candidate cartridge and possible weapon for NATO standardization. Though the trials did not locate a weapon design that was acceptable to all NATO members, they did focus on a superior cartridge.

What developed out of the NATO trials was not a new cartridge but a better loading for an existing round. The loading chosen was the Belgium SS109 heavy bulleted 5.56mm round. This loading was duplicated in the US counterpart, the XM855 round. The new loading called for a steel-cored, partial armor piercing 61.7 grain (4 g) bullet to be fired from a barrel with a 1 in 7 inch (1 in 30.5 cm) twist. The new projectile held excellent accuracy and terminal effects out to ranges near that of the 7.62mm NATO round.

M16A2

By late 1979, the US Marine Corps was already discussing the possibility of a new issue rifle. The improved range of the XM855 round caught the Marine's attention as a possible answer to their desire for more of a "rifleman's" weapon to arm the Corps. Requirements later formalized for the Marines desired new weapon, a modified M16A1, were as follows: an adjustable sight good to 800 meters; a projectile with good accuracy to 800 meters and able to penetrate all known helmets and military body armor at that range; stronger plastic and metal parts on the weapon to stand up better to the heavier demands placed on it by Marine training doctrine; and, elimination of the full automatic position and its replacement with a controlled 3-round burst setting.

Additional tests conducted by the Navy added more parameters and suggestions to the physical changes in a possible new Marine rifle. Test weapons were ordered from Colt and examined to see if a modified M16A1 would fit the Marines desires. This led to the development of the third-generation M16, the M16A2.

The Joint Services Small Arms Program (JSSAP) approved a joint-services approach to a new and improved M16A1 by ordering 50 Product Improvement Program (PIP) M16A1s from Colt to be delivered in November 1981. Designated the M16A1E1, the new rifles were extensively tested by the Marines during the last weeks of 1981. The results of the testing gave very favorable reports on the accuracy, range, effectiveness, and handling qualities of the M16A1E1. By September 1982, the M16A1E1 was type-classified as the M16A2.

The Marines ordered 76,000 M16A2's as quickly as they were able. The Army did not have as strong a desire for the new rifle to be immediately available, stocks of M16A1s being considered sufficient to cover several years needs. By 1986, the Army contracted for the purchase of 100,176 M16A2 weapons from Colt.

The M16A2 as issued to the US military is identified by Colt as their model 705. The major differences between the M16A1 and the A2 model include:

Modification of the flash hider to a fourth type without bottom slots. The lack of bottom slots on the M16A2 flash hider prevents dust and dirt from flying up when the weapon is fired in the prone position. The flash hider also acts as a muzzle compensator, helping to hold the muzzle down when firing bursts.

A barrel with a heavier contour from the front sight forward. In addition, the new barrel is rifled with a one in 7 inch twist for use with the M855 round.

Different front and rear sights with the rear sight adjustable to 800 meters range with an easily moved elevation drum.

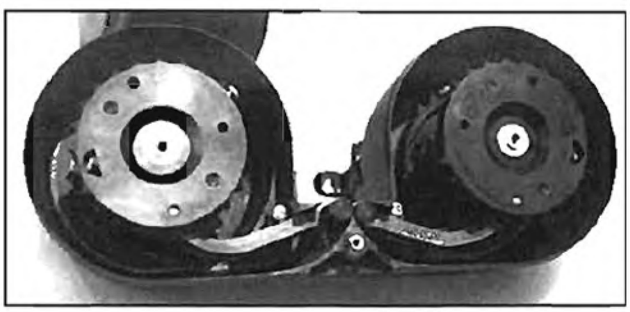
New cylindrical, ribbed handguards. Stronger and more efficient at cooling than the earlier triangular M16A1 handguards, the new handguards are also ambidextrous. Either one will fit on the right or left side of the barrel.

An angled slip ring making it easier to remove the handguards for routine maintenance.

A strengthening of the upper receiver.

TECHNICAL DATA—Colt Model 723
NSN OA1005-LL-L99-5287
CARTRIDGE—.223 Remington NATO (5.56x45mm NATO)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 45 to 65 rpm, A 150 to 200 rpm, Cyclic 700 to 950 rpm
MUZZLE VELOCITY—2900 fps (884 m/s)
MUZZLE ENERGY—1158 ft/lbs (1570 J)
SIGHTS—Open, Flip-type aperture/post, Adjustable, battle aperture 0 to 300 meters, long range aperture 300 to 500 meters
FEED—20 or 30 round removable box magazines

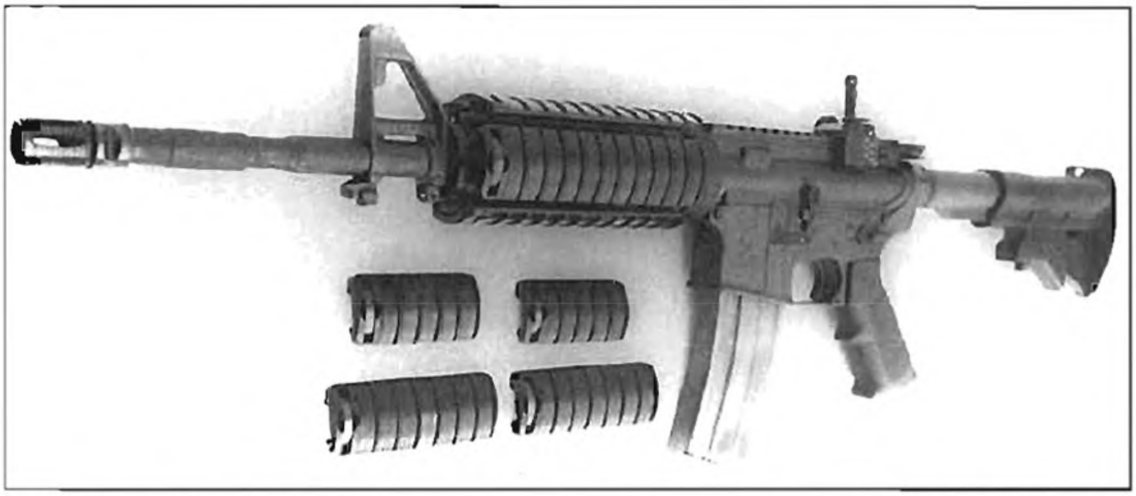
WEIGHTS
WEAPON (EMPTY)—5.9 lbs (2.68 kg)
WEAPON (LOADED)—7.35 lbs (3.33 kg) w/sling & 30 rd mag
Sling 0.4 lbs (0.18 kg)
MAGAZINE (EMPTY)—20 round aluminium 0.19 lb (0.08 kg)
30 round aluminium 0.24 lbs (0.11 kg)
MAGAZINE (LOADED)—20 round 0.73 lb (0.33 kg)
30 round 1.05 lbs (0.48 kg)
SERVICE CARTRIDGE—M855 Ball 190 gr (12.3 g)
PROJECTILE—62 gr (4 g)
LENGTHS
WEAPON OVERALL—29.8/33 in. (75.7/83.8 cm)
BARREL—14.5 in (36.8 cm)
SIGHT RADIUS—14.72 in. (37.4 cm)



A Colt Model 723 Carbine with its sliding stock in the fully-extended position. The weapon is loaded with a C-MAG 100 round double-drum magazine. The C-MAG magazine holds 50 rounds on either side of the magazine well of the weapon and feeds rounds alternately from each drum as the weapon is fired. The low-silhouette of the C-MAG design is illustrated in this photograph. The notch around the barrel of the Model 723 carbine is for the mounting of an M203 40mm grenade launcher without further modification to the carbine or launcher.
PHOTO CREDIT: KEVIN DOCKERY

A rear-view of the Beta Company 100 round C-Mag without the central magazine or rear cover. The two drums hold over forty round of ammunition in a double column around their circumference when fully loaded. The two pusher bars, braced at the center of the magazine for this photograph, drive the ammunition around the edges of the drum and up through the central magazine assisted by the sprockets at the center of each drum. As the magazine is emptied, the drums feed rounds alternately into the central magazine, maintaining a balance in the system.
PHOTO CREDIT: KEVIN DOCKERY

"A short carbine version of the M16A2 has been available to the Teams and is much preferred over the M16A2 rifle."



A left-side view of the SOCOM M4A1 carbine with the 800 meter rear sight raised and the forend mounting surfaces covered by grip plates. The different length grip plates below the weapon can be used to cover the forend mounting surfaces when only a portion of the mount is used by a sight or other accessory. On the muzzle of the weapon is the Knight Armament QD muzzle compensator.
PHOTO CREDIT: KNIGHT ARMAMENT COMPANY

A longer buttstock.
A pistol grip that is slightly larger and has a single finger rest.
All plastic parts are now made of a supertough nylon plastic, ten to 12 times stronger than the original M16A1 parts.
A bulge in the upper receiver acts as a brass deflector allowing easier left-handed firing of the weapon.
Replacement of the full auto position with a controlled 3-round burst.

The replacement of the full automatic fire capability in the M16A2 is one of the most discussed arguments against the new weapon. Though having other good characteristics, the lack of full automatic fire limits the appeal of the M16A2 to the Teams. In addition, flaws were quickly noticed by operators who used the 3-round burst position on the M16A2.

If a 3-round burst is attempted to be fired from the M16A2, and the weapon stops or runs out of ammunition, the mechanism does not reset when the trigger is released. If the weapon runs out of ammunition on the second round of a 3-round burst, when the operator reloads and again pulls the trigger, only a single shot will be fired. If the operator releases the trigger when only a single shot of a 3-round burst has been fired, when he pulls the trigger again, 2 rounds will be fired. This fault is part of the design of the M16A2 controlled burst mechanism and cannot be changed.

Colt Model 723

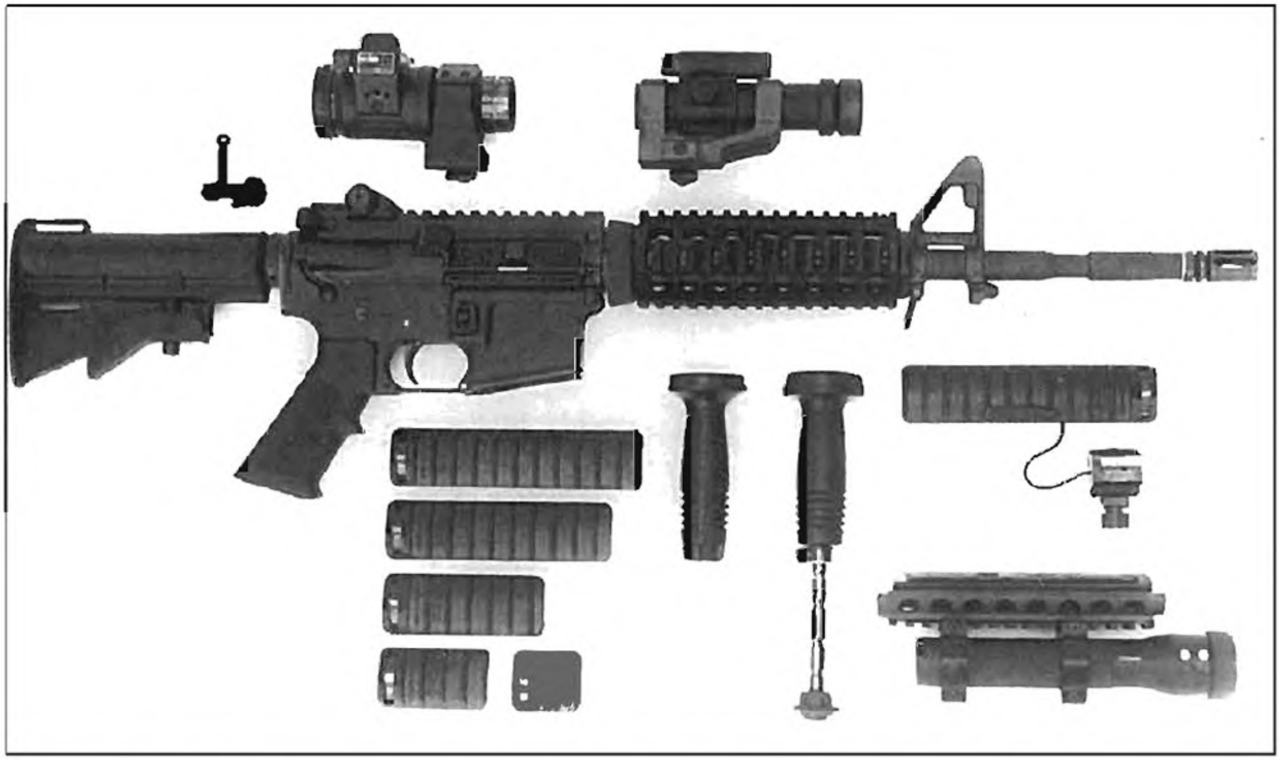
As the new standard issue shoulder arm in the US military, the M16A2 is issued to the SEALs as well as all the other branches of the service. A short carbine version of the M16A2 has been available to the Teams and is much preferred over the M16A2 rifle. The M16A2 carbine is identified by Colt as their model 723 weapon. Virtually identical to the earlier model 653 M16A1 carbine, the model 723 weapon has the larger pistol grip of the M16A2, the fourth model flash hider, and the 1 in 7 inch rifling twist. The full automatic capability, sights, and other characteristics of the model 653 carbine, including the thinner contour barrel, remain the same on the new model 723 carbine.

M4 Carbine (Colt Model 720, model 727)

Another version of the M16A2 system is seeing duty with the SEAL teams and is being much more enthusiastically received than the M16A2 rifle. The M4 carbine is a another shortened version of the M16A2 but retains many of the new features found on the full-sized rifle.

The sights on the M4 are the same long range adjustable model as found on the M16A2. The M4 also has the heavier barrel, fourth model flash hider, and brass deflector as on the M16A2. The heavy barrel of the M4 carbine has a slight step in the barrel diameter roughly midway between the muzzle and the front sight. The step is so that the M203 40mm grenade launcher can be mounted on the M4 with no modifications needed on either weapon.

The M4/M203 combination is a very popular one with the Teams. Given the proper circumstances, entire platoons have been armed with the M4/M203 such as during operation JUST CAUSE in Panama. Two different models of the M4 are issued in the military. The Colt model 720 is an M4 carbine with the 3-round controlled burst setting and no other capability for full automatic fire. The Colt model 727 M4 carbine has the capability of full automatic fire and is the preferred model for use by the SEALs.



The complete Knight Armaments Company (KAC) Modular Weapon System recently adopted by the Special Operations Command (SOCOM) for issue to their forces including the Navy SEALs as the M4A1 carbine. The basic weapon is the Colt Model R0927 carbine version of the M16A2 rifle with the KAC Rail Interface System (RIS) in place of the standard front handguard. The RIS has four MIL-STD-1913 mounting rails that will accept a wide range of accessories for both aiming or controlling the weapon. Accessories in this photo include (above the weapon from left to right) the KAC low-profile folding 300 meter rear sight, the ITT "pocketscope" night vision device on a KAC mount, and the Aimpoint 5000 also on a KAC mount. Below the weapon from left to right are; the five different lengths of handguard sections that can fit on the RIS forend different lengths filling in for the space remaining from various devices, the KAC basic vertical foregrip, the KAC monopod vertical foregrip assembly with the monopod extended. Directly below the barrel is the Leupold visible laser aiming device with its companion panel switch module. Below the Leupold assembly is the tactical Streamlight poly flashlight package held to the mounting plate with KAC rings. In addition to these devices, a folding bipod assembly is also available to go on the RIS-equipped M4A1 carbine
PHOTO CREDIT: KNIGHT ARMAMENT COMPANY

TECHNICAL DATA—M4 Carbine (Colt Model 720)
CARTRIDGE—.223 Remington NATO (5.56x45mm NATO)
OPERATION—Gas
TYPE OF FIRE—Selective - semiautomatic/full automatic
RATE OF FIRE—Practical SS 45 to 65 rpm, A 150 to 200 rpm, Cyclic 700 to 800 rpm
MUZZLE VELOCITY—2900 fps (884 m/s)
MUZZLE ENERGY—1158 ft/lbs (1570 J)
SIGHTS—Open, Flip-type aperture/post, Adjustable, battle aperture 0 to 200 meters, adjustable long range small aperture 300 to 800 meters in 100 meter graduations
FEED—20 or 30 round removable box magazines

WEIGHTS
WEAPON (EMPTY)—5.65 lbs (2.56 kg)
WEAPON (LOADED)—7.1 lbs (3.22 kg) w/sling & 30 rd mag
Sling 0.4 lbs (0.18 kg)
MAGAZINE (EMPTY)—20 round aluminium 0.19 lb (0.08 kg)
30 round aluminium 0.24 lbs (0.11 kg)
MAGAZINE (LOADED)—20 round 0.73 lb (0.33 kg)
30 round 1.05 lbs (0.48 kg)
SERVICE CARTRIDGE—M855 Ball 190 gr (12.3 g)
PROJECTILE—62 gr (4 g)
LENGTHS
WEAPON OVERALL—29.8/33 in. (75.7/83.8 cm)
BARREL—14.5 in (36.8 cm)
SIGHT RADIUS—14.72 in. (37.4 cm)

The M4A1 carbine with the Knight RIS system. Mounted on the top rail of the RIS forend is an infrared aiming light. On either side of the forend are "11 rib" full length handguard sections. On the bottom of the RIS, held in a firing position by the operator, is the KAC "Masterkey" shotgun, a modified 12 gage Remington 870 pump shotgun used primarily for opening doors by blasting off the hinges/lock.
PHOTO CREDIT: KNIGHT ARMAMENT COMPANY

As of February, 1994, Special Operations Command (SOCOM) awarded a contract to Colt for production of 5,000 to 6,000 M4A1 carbines. The new M4A1, Colt model 927, is intended specifically for Special Operations forces including the SEALs. Firing settings for the M4A1 will be full and semi automatic, with the sights, barrel, and other aspects retained from the standard M4 carbine. The major change will be in the rear sight system.

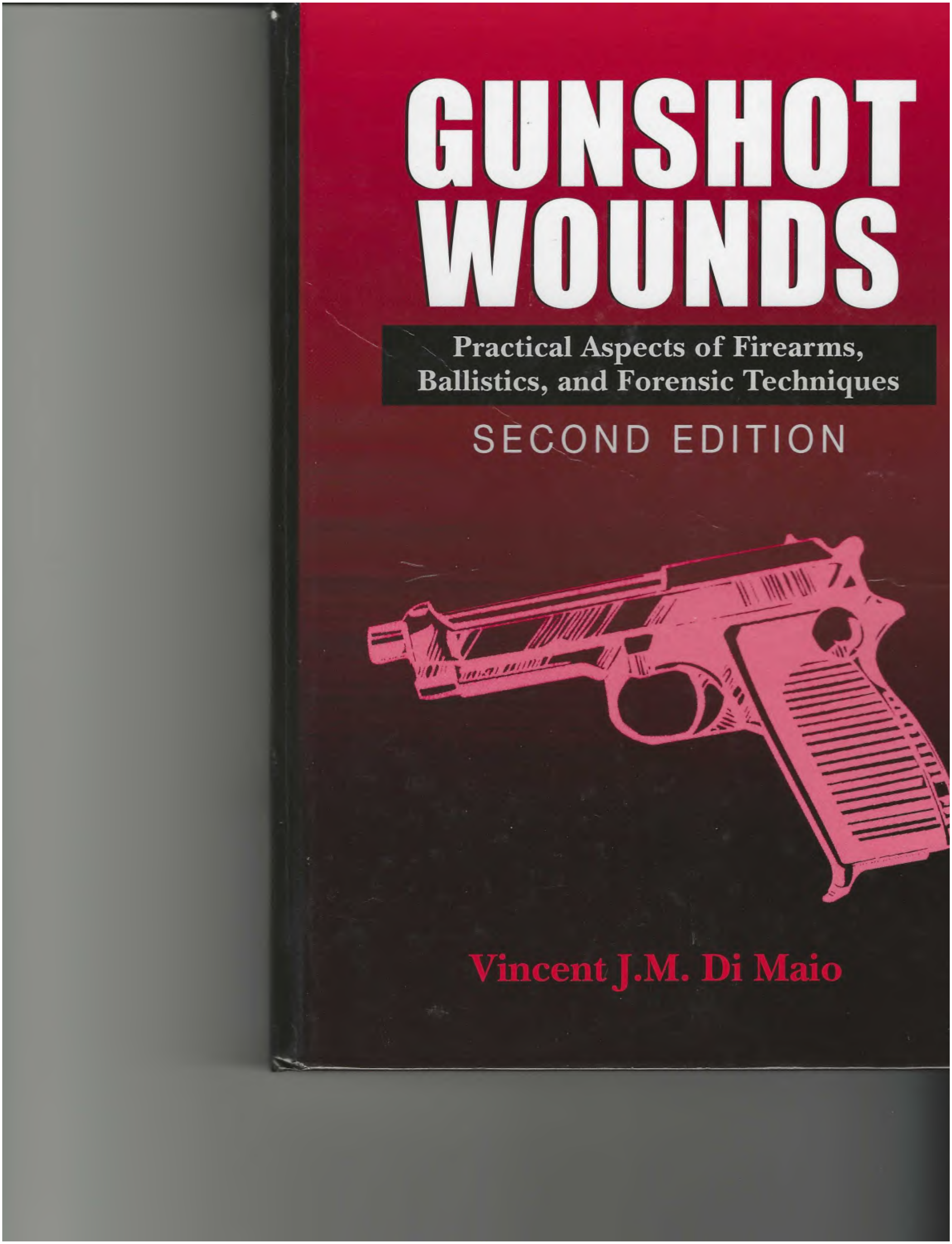
The M4A1 will be equipped with the "Picatinny Rail" mounting located under the removable carrying handle. The carrying handle will retain the standard M16A2 rear sight but can be removed to allow different sighting devices to be mounted. Mounting on the Picatinny Rail makes for a much lower weapon outline as well as giving a more solid and accurate mounting interface than the handle of the weapon. Other modifications on some M4A1s will allow a laser sight or 12 gauge shotgun to be mounted underneath the barrel for close-quarters combat. Production of the M4A1 was planned to begin in May 1994.

To increase their available volume of fire, the SEALs and Special Forces have obtained a number of special C-MAG 100 round drum magazine for the M16 family of weapons. The C-MAG drum is a large capacity, highly dependable feed device that will fit any magazine well that accepts an M16 magazine.

The C-MAG weighs 2.21 pounds (1.00 kg) empty and will accept and feed a full 100 rounds of ammunition. The use of dual drums feeding from either side of the magazine extension allows the C-MAG to have a very low profile when mounted on the M16 weapon. The drums are spring driven and feed their rounds along a spiral track on the outside diameter of the drum. The rounds feed up into the magazine extension alternating one from each drum.

As the ammunition empties onto the magazine extension, flexible feed chains move from the drums up into the magazine extension. The feed chains insure positive tension is kept on the ammunition until the last round is fed into the weapon. When the last round is fired, the C-MAG activates the bolt lock just as a standard magazine would. The design of the C-MAG is such that the weapon actually has a lower profile with the 100 round drum loaded than it does with a standard 30-round box magazine.

Exhibit I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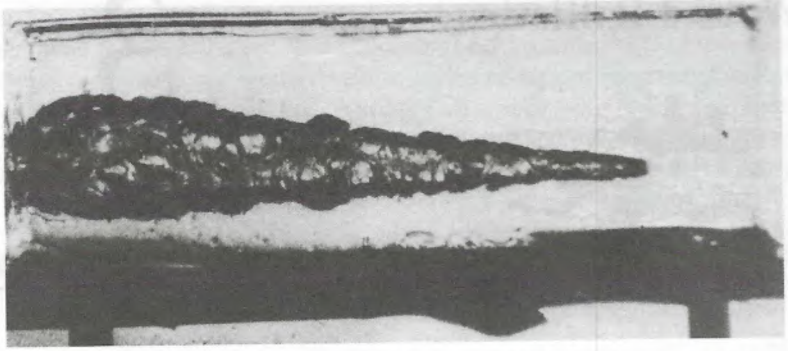

Figure 3.1 Temporary cavity produced in gelatin block by 110-gr. semi-jacketed hollow-point .38 Special bullet.

adjacent to the bullet path (shearing, compression, and stretching) that determines the final extent of a wound.

The location, size, and the shape of the temporary cavity in a body depend on the amount of kinetic energy lost by the bullet in its path through the tissue, how rapidly the energy is lost, and the elasticity and cohesiveness of the tissue. The maximum volume and diameter of this cavity are many times the volume and diameter of the bullet. Maximum expansion of the cavity does not occur until some time after the bullet has passed through the target. The temporary cavity phenomenon is significant because it has the potential of being one of the most important factors in determining the extent of wounding in an individual. For this potential to be realized, however, not only must a large temporary cavity be created but it must develop in strategically important tissue, e.g., a cavity in the liver is more significant than one located in the thigh.

In the case of handgun bullets, the bullet produces a direct path of destruction with very little lateral extension within the surrounding tissues, i.e., only a small temporary cavity is produced. As a general rule, the temporary cavity plays little or no role in the extent of wounding. To cause significant injuries to a structure, a handgun bullet must strike that structure directly. The amount of kinetic energy lost in the tissue by the bullet is insufficient to cause the remote injuries produced by a high-velocity rifle bullet.

The picture is radically different in the case of a high-velocity rifle bullet. As the bullet enters the body, there is a "tail splash," or backward hurling of injured tissue. This material may be ejected from the entrance. The bullet passes through the target, creating a large temporary cavity whose maximum diameter is up to 11 to 12.5 times the diameter of the projectile.[3] The maximum diameter of the cavity occurs at the point at which the maximum rate

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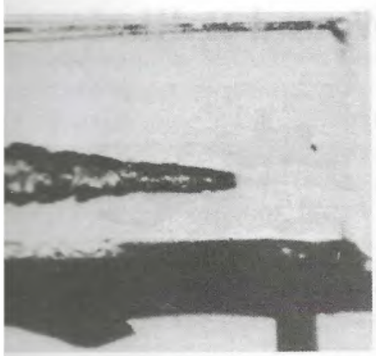
To illustrate this point, consider the
cartridges. The 5.56 × 45-mm cartrid



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of loss of kinetic energy occurs. This occurs at the point where the bullet is at maximum yaw, i.e., turned sideways (at a 90° angle to the path) and/or when it fragments. If fragmentation does not occur and the path is long enough, the yawing continues until the bullet rotates 180° and ends up in a base-forward position. The bullet will continue traveling base first with little or no yaw as this position puts the center of mass forward.

The temporary cavity will undulate for 5 to 10 msec before coming to rest as a permanent track. Positive and negative pressures alternate in the wound track, with resultant sucking of foreign material and bacteria into the track from both entrance and exit. In high-velocity centerfire rifle wounds,, the expanding walls of the temporary cavity are capable of doing severe damage. There is compression, stretching and shearing of the displaced tissue. Injuries to blood vessels, nerves, or organs not struck by the bullet, and a distance from the path, can occur as can fractures of bones, though, in the case of fractures, this is relatively rare.[3] In the author's experience, fractures usually occur when the bullet perforates an intercostal space fracturing ribs above and below the bullet path.

The size of both the temporary and the permanent cavities is determined not only by the amount of kinetic energy deposited in the tissue but also by the density and elastic cohesiveness of the tissue. Because liver and muscle have similar densities (1.01 to 1.02 and 1.02 to 1.04), both tissues absorb the same amount of kinetic energy per centimeter of tissue traversed by a bullet.[4] Muscle, however, has an elastic, cohesive structure; the liver, a weak, less cohesive structure. Thus, both the temporary and the permanent cavities produced in the liver are larger than those in the muscle. In muscle, except for the bullet path, the tissue displaced by the temporary cavity returns to its original position. Only a small rim of cellular destruction surrounds the permanent track. In liver struck by high-velocity bullets, however, the undulation of the temporary cavity loosens the hepatocytes from the cellular supporting tissue and produces a permanent cavity approximately the size of the temporary cavity. Lung, with a very low density (specific gravity of 0.4 to 0.5) and high degree of elasticity, is relatively resistant to the effects of temporary cavity formation, and has only a very small temporary cavity formed with very little tissue destruction.[4]

It is not the high velocity of the rifle bullet per se that is responsible for the aforementioned picture, but rather the amount of kinetic energy possessed by the bullet by virtue of the high velocity and which is deposited in the tissue. With most modern rifles, the kinetic energy possessed by the bullet is acquired by virtue of high velocity. A high level of kinetic energy can also be acquired by increasing the mass of the bullet, though this is not as efficient. To illustrate this point, consider the .223 (5.56 × 45-mm) and the .45–70 cartridges. The 5.56 × 45-mm cartridge, fired in the M-16 rifle series, is the most famous of the new high-velocity military cartridges. It fires a 55-gr. bullet at 3250 ft/sec with a muzzle kinetic energy of 1320 ft-lbs (1790 J). The .45–70 U.S. government black powder cartridge, adopted by the U.S. Army in 1873, fired an all-lead bullet of 405 gr. at a velocity of 1285 ft/s and with a muzzle kinetic energy of 1490 ft-lbs (2020 J), 170 ft-lbs (230.5 J) more than that of the .223 bullet. These bullets, a light-weight, high-velocity one and a heavy, slow-moving one, possess relatively equivalent amounts of kinetic energy and, thus, are capable of producing identical-sized temporary cavities. What will determine their effectiveness is where in the body they will produce their respective cavities.

Energy loss along a wound track is not uniform. Variations may be due either to behavior of the bullet or changes in the density of the tissue as the bullet goes from one organ to another. An increase in kinetic energy loss is reflected by an increase in the diameter of the temporary cavity. A full metal-jacketed rifle bullet will produce a cylindrical cavity until it begins to yaw. At this time, the bullet's cross-sectional area will become larger, and the drag force will be increased. The result is an increase in kinetic energy loss and thus an increase in the diameter of the temporary cavity (Figure 3.2A). In addition to the increase in size of the temporary cavity, there will also be an increase in the amount of tissue crushed as the bullet is presenting a larger impacting surface area. For the 7.62-mm NATO M 80 bullet, gelatin studies reveal that yawing begins after 15 cm of penetration, with maximum tissue disruption at approximately 28 cm where the yaw is 90 degrees.[3]

Projectile fragmentation can amplify the effects of the temporary cavity increasing the severity of a wound (Figure 3.3). This is the reason for the effectiveness of the 5.56 × 45-mm cartridge and the M-16 rifle. For the M-193 55-gr. bullet, on the average, the yaw becomes significant at 12 cm with marked tissue disruption occurring most commonly at 15 to 25 cm due principally to bullet fragmentation.[3,5]

In contrast to full metal-jacketed military bullets, with hunting ammunition, the bullet begins to expand (mushroom) shortly after entering the body, with a resultant rapid loss of kinetic energy. Thus, a large temporary cavity is formed almost immediately on entering the body (Figure 3.2B). This is augmented by shredding of the lead core.

A lead shotgun pellet produces a cone-shaped temporary cavity with the base of the cone at the entrance (Figure 3.2C). The diameter of the cavity gradually lessens as the velocity of the pellet decreases. The loss of velocity is much more rapid for shotgun pellets because of their unfavorable ballistic properties (large cross-sectional area in relation to mass).

It has been found that above a certain critical velocity 800 to 900 m/sec (2625 to 2953 ft/sec), the character of a wound changes radically with tissue destruction becoming much more severe.[2] Trans- or supersonic flow within

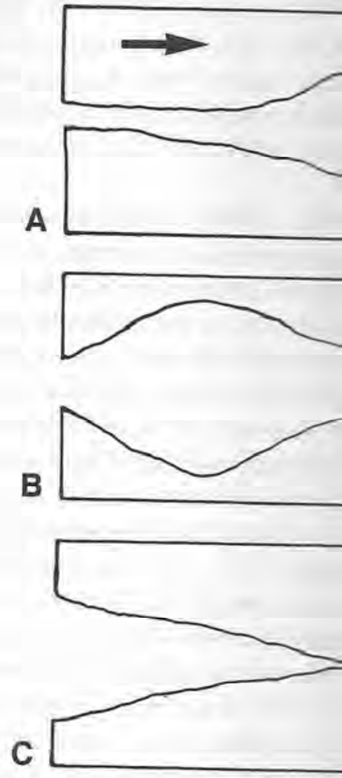


Figure 3.2 Appearance of temporary
metal-jacketed rifle bullet, (B) hunting

the tissue causing strong shockwaves
this effect. In experiments by Rybeck
0.86 g were fired at the hind legs of
510 m/sec, the volume of macroscop
larger than the diameter of the bullet.
devitalized muscle was seen to be 20 to
cavity.

It is the author's belief that rath
above which the severity of wounds in
critical level (amount) of kinetic ener
becomes radically more severe. This le
When a bullet or missile exceeds this
temporary cavity that the organ or tiss
exceeds the elastic limit of the organ.
organ "bursts." For full metal-jackete
this critical level of kinetic energy lo

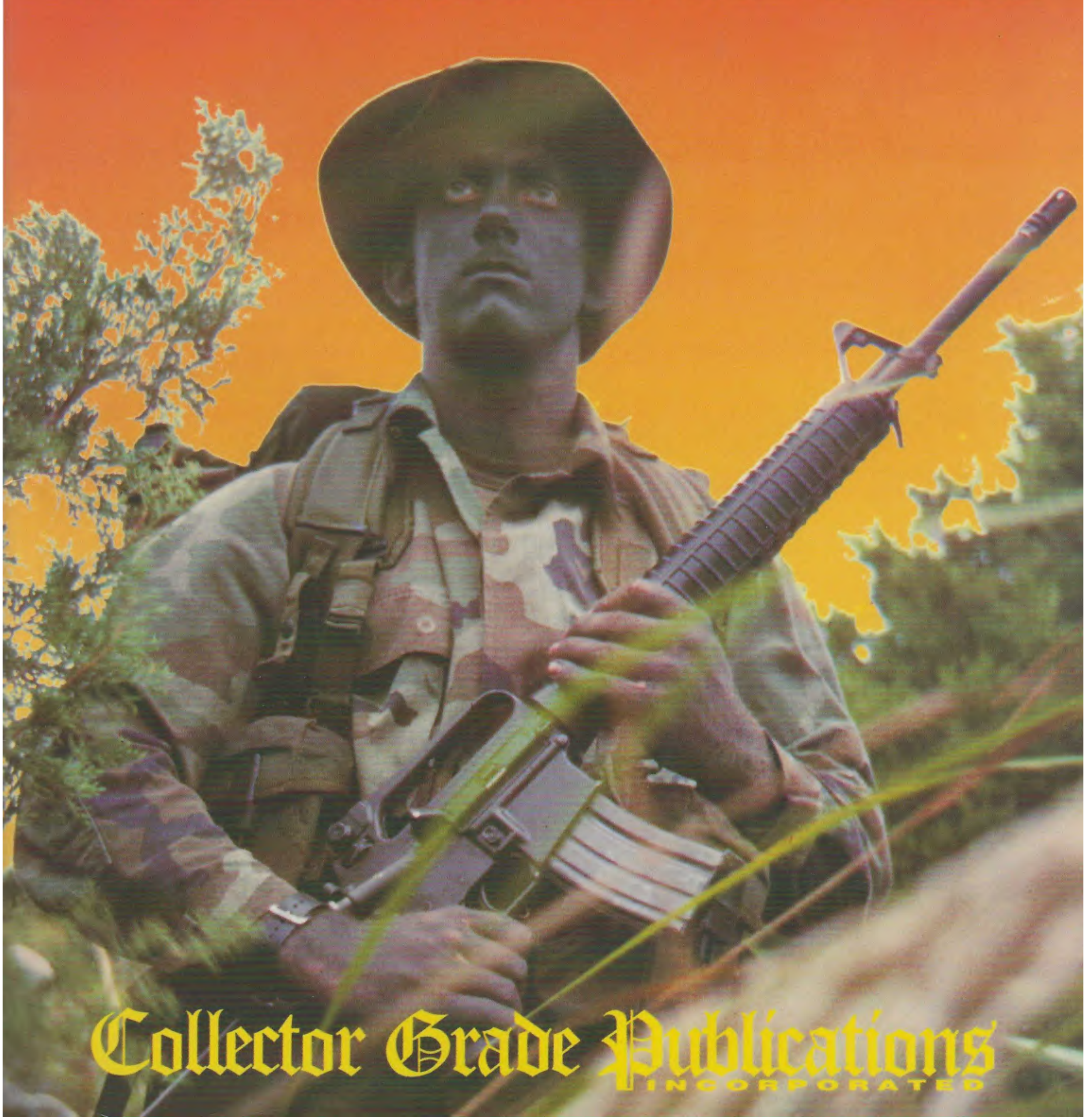
Exhibit J

MODERN US MILITARY SMALL ARMS SERIES – VOLUME THREE

THE BLACK RIFLE

M16 RETROSPECTIVE

R. BLAKE STEVENS • EDWARD C. EZELL



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115. Closeup of receiver markings of Colt AR-15 serial no. 000614, used in the Aberdeen "Test of Rifle, Caliber .223, AR-15" September, 1960.
Photo credit: Eric Long, Smithsonian Institution

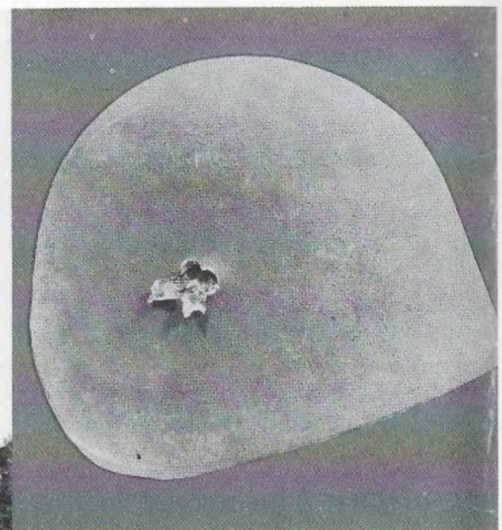
Abstract

Three rifles were subjected to the light automatic rifle test and two rifles were subjected to additional accuracy tests. A total of 24,443 rounds were fired. The AR-15 rifle, which has a weight of 6.92 pounds when fully loaded and an overall length of 38.8 inches, fires Cartridge, caliber .223. The average velocity of the 55-grain bullet at 78 feet was 3,104 fps. In the 100-yard bench-rest accuracy test the average mean radius for 10-round targets was 1.5 inches. The average number of rounds fired semi-automatically in one minute in the rate-of-aimed-fire test was 84.2 and the average number of hits obtained on the "E" target at a range of 100 yards was 77.8. During automatic firing in this test, the average number of rounds fired was 128.7, and the average number of hits was 41.3. The average malfunction rate with the rifle held normally was 0.25 per hundred rounds. Only ten parts were broken in firing 18,000 rounds in the endurance test. One of these parts, an extractor spring, was broken during disassembly of the extractor. The AR-15 rifle gave near-normal performance in the unlubricated, dust, extreme-cold and rain tests, and it completed the mud test. [A modified rain test was also conducted, wherein the bolt was retracted slightly with the muzzle held down to facilitate drainage, before firing]. A cook-off occurred after firing 140 rounds in 54 seconds, but no cook-off occurred in firing 120 rounds in 39 seconds. When fired with a telescopic sight from a bench rest at 100 yards two rifles gave an average mean radius of 1.1 inches for four 10-shot groups from each rifle with each of two lots of ammunition.

Even in the absence of conclusions and recommendations it appears from the above that the performance of the 1960 Colt AR-15s, especially in the scoped-accuracy and adverse condition tests, was little short of phenomenal. Indeed, a perusal of other standard light rifle tests, such as are to be found in previous Collector Grade books, will show the above results superior to most if not all the developmental weapons of the period, including the M1 and T44E4 "control" rifles. However, even though Dr. Carten's report to the Chief of R&D grudgingly summed up the AR-15 as only "reasonably satisfactory", the AR-15 was approved for Air Force trial as requested.

ACCURATE, POWERFUL AT LONG RANGE

Unsurpassed as a Sniper Rifle both accurate and lethal, at 500 yards the AR-15 makes a complete penetration of 10 gauge steel, or both sides of a steel combat helmet. On impact the tumbling action of the .223 caliber ammunition increases effectiveness.



GRENADE LAUNCHER

Converts instantly without the use of supplementary attachments or adjustments with complete interchangeability of grenade launching or combat ammunition.

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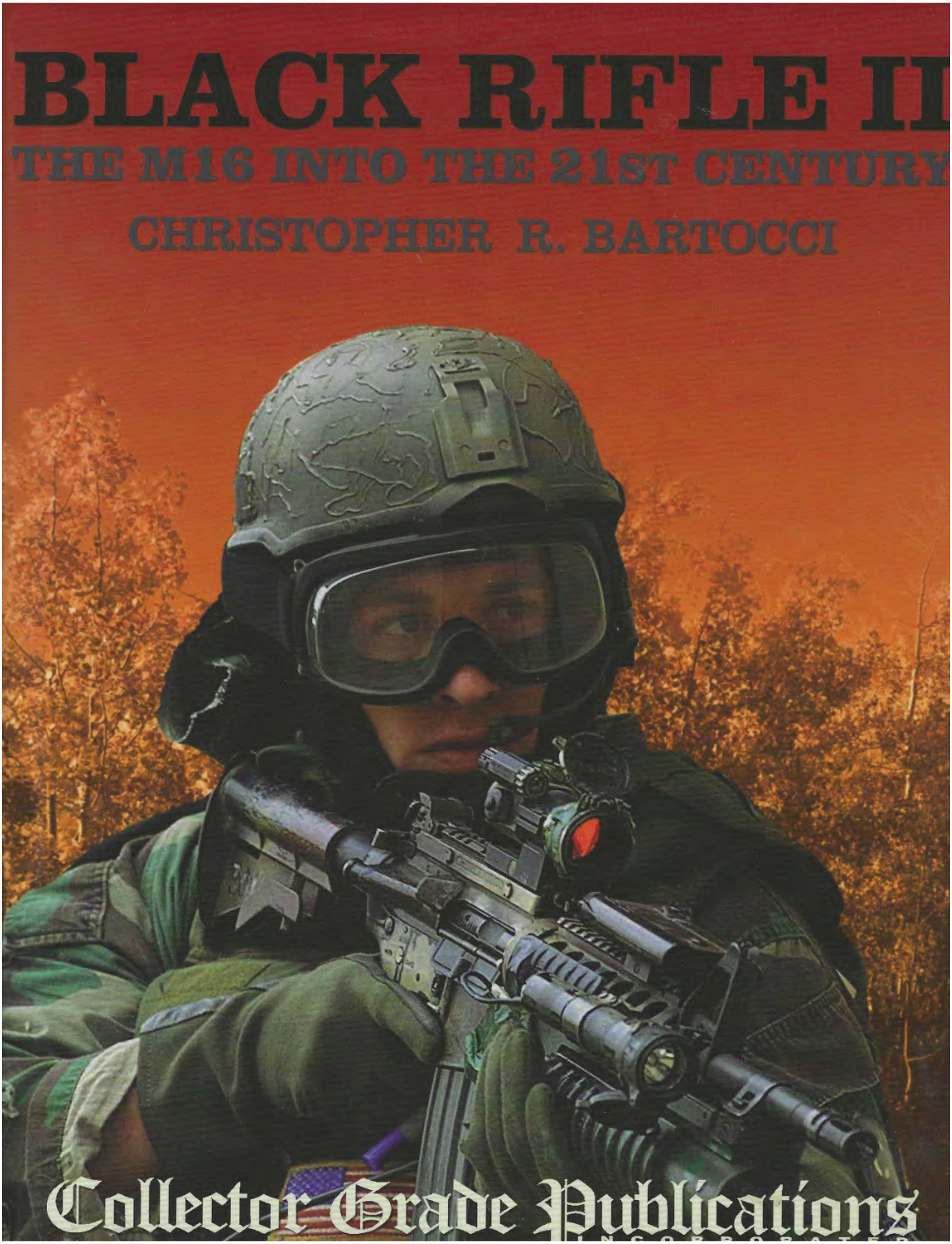
CABLE "COLT" HARTFORD, U S A

117. From the first Colt AR-15 brochure, produced in a desperate attempt to interest somebody - anybody - in the merits of the AR-15's "unmatched superiority".

Exhibit K


BLACK RIFLE II
THE M16 INTO THE 21ST CENTURY
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350. Right side closeup of the original semi-automatic-only pilot model, serial no GX 4968. The faint two-line hand-stamped marking on the magazine well reads "Colt Gun Room".

1. Removal of the automatic sear.
2. Elimination of the automatic sear hole in the lower receiver.
3. Elimination of the automatic sear well in the lower receiver.
4. Removal of the automatic sear hook on the hammer.
5. Removal of the automatic sear trip notch from the bottom rear portion of the bolt carrier.
6. Modification of the selector to eliminate the automatic setting.
7. Elimination of the "AUTO" position identification marking on the lower receiver.
8. Mechanical restriction of selector lever movement to two positions only: SAFE and FIRE.
9. Enlargement of the front pivot pin holes in both upper and lower receivers, and use of a larger-diameter front pivot pin.

On October 25,1963, the Treasury Department advised Colt that in addition to these nine changes, they wanted the upper and lower receiver pin lugs relocated, in order to further prevent the interchangeability between semi-auto-only and selective-fire receivers. This was done by moving the enlarged pivot pin holes in the upper and lower receivers down and rearward.

Permission was granted on December 10, 1963 for Colt to commence production of the semi-automatic only AR-15, embodying the above ten changes. On January 2, 1964, the initial "Original First Issue" Colt AR-15 Sporter rifles were released for commercial sale.

Exhibit L

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What the medics have learned about his— and yours

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—a complete spec chart

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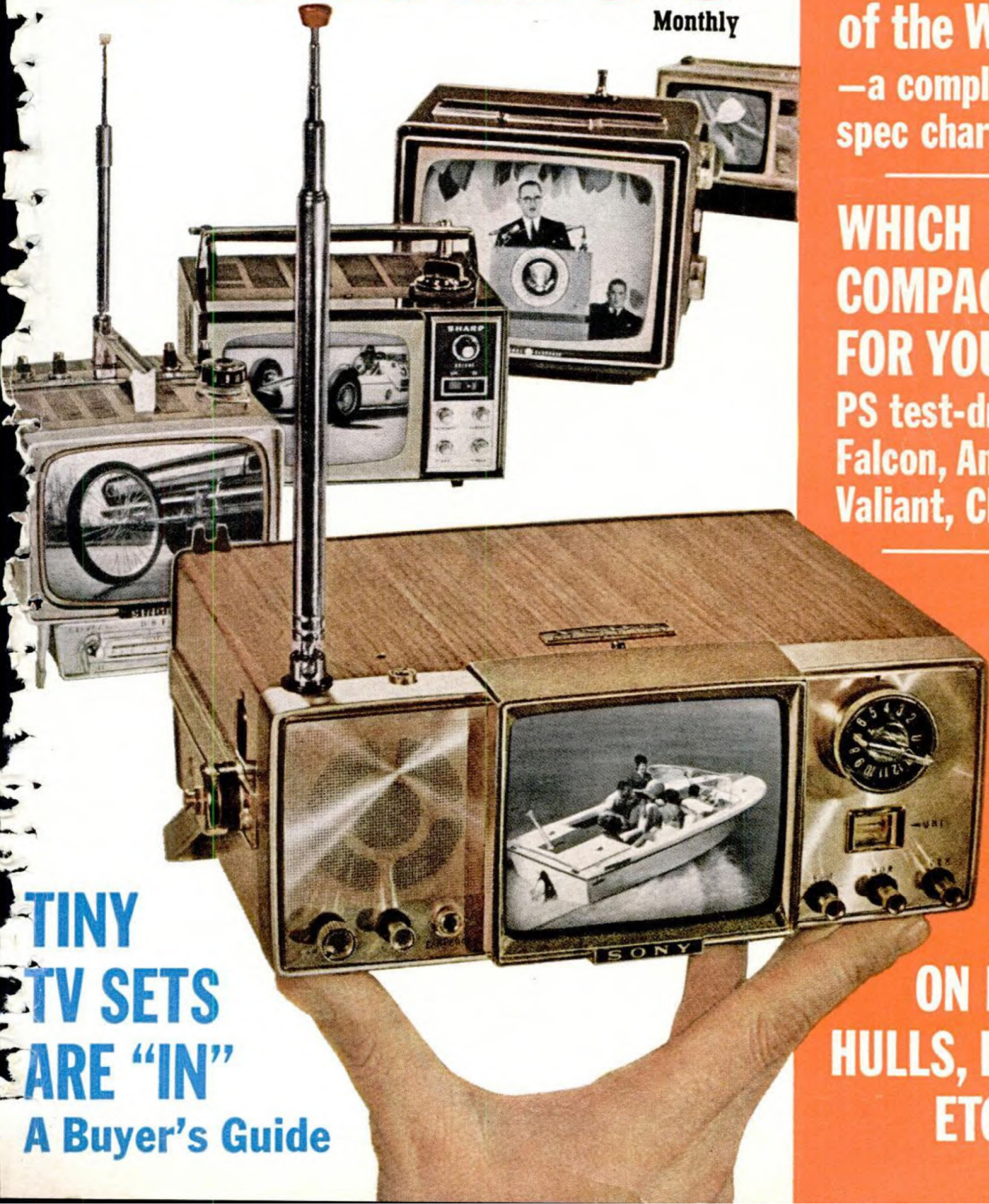
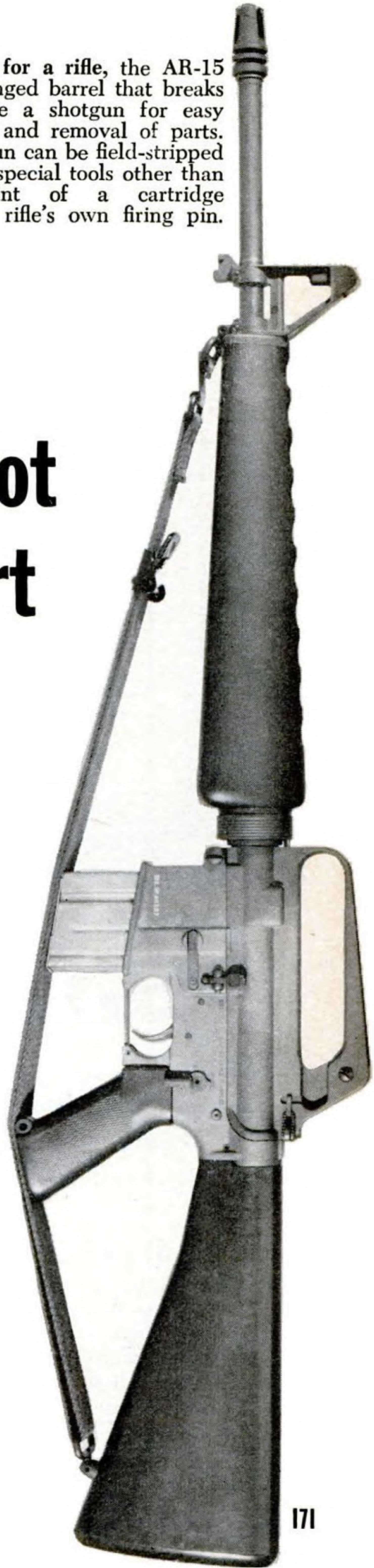


24 PAGES ON BOATS, HULLS, DOCKS, ETC., ETC.

TINY TV SETS ARE "IN"
A Buyer's Guide

Unusual for a rifle, the AR-15 has a hinged barrel that breaks open like a shotgun for easy cleaning and removal of parts. Entire gun can be field-stripped with no special tools other than the point of a cartridge and the rifle's own firing pin.



Now You Can Buy a Hot Combat Rifle for Sport

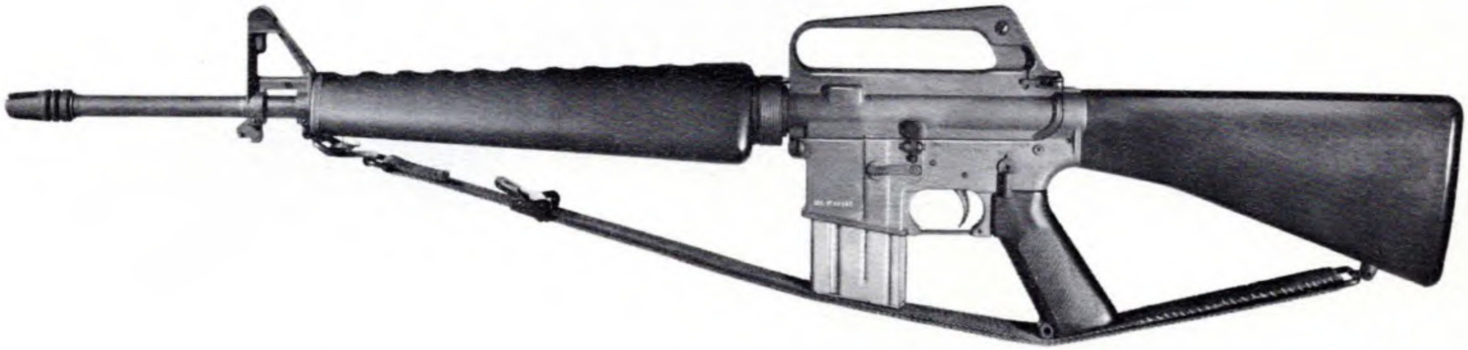
OUT of the jungles of Vietnam comes a powerful, battle-proven rifle ready for sale to civilians for hunting and target use. It's the Army's rakish AR-15, famed for its success in guerrilla fighting. The sport version is an exact duplicate of the military weapon except for one alteration. Because machine guns are illegal for civilian use, the action is semiautomatic rather than fully automatic. It fires as fast as you can pull the trigger, but won't keep firing if you hold the trigger back.

Originally developed by ArmaLite and now sold by Colt, the jaunty AR-15 looks like a cross between a G-man's submachine gun and something out of Buck Rogers' 25th Century. It has both a pistol grip and conventional butt stock, can be fired from either the waist or shoulder. There's a handy carrying handle on top that doubles as a precision rear peep sight. A flash suppressor on the muzzle is a hangover from military needs.

Highly accurate, the AR-15 sporter fires the hot new .223 Remington cartridge, a soft-point civilian version of the famous full-jacketed 5.56mm military round. The combination of small caliber and high muzzle velocity—3,300 feet per second—gives the .223 Remington the same deadly precision found in high-velocity varmint cartridges. In tests, the gun consistently shoots three-inch or better groups at 100 yards—and that's good shooting.

Weighing only 6¼ pounds, the rifle is light, compact, and easy to handle. It has a 20-inch barrel, is 39 inches overall. Most similar rifles heft over seven pounds and are several inches longer. The magazine holds 20 rounds, but can be reduced to five with a spacer for certain hunting requirements. Price: $189.50. Colt's Firearms, Hartford, Conn.—*Paul Wahl.*

Exhibit M



COLT AR-15 SPORTER SEMI-AUTOMATIC RIFLE

.223 CALIBER

Colt's answer to the demand for a semi-automatic version of the AR-15 automatic rifle purchased by The United States Armed Forces. Painstaking engineering redesign efforts have resulted in a Government-approved conversion of the Colt AR-15 automatic rifle without sacrificing any performance or weight characteristics. The semi-automatic AR-15 Sporter weighs only 6.3 pounds. Its recoil is light and barrel rise minimal.

Lightweight • Extremely accurate • Easy to handle • Straight line construction — barrel, bolt, recoil buffer unit and stock assembled in a straight line • Rapid semi-automatic fire is more controllable than with rifles of commercial design • Simple to maintain.

	RETAIL PRICE*
MODEL R-6000	**$189.50**

CALIBER	BARREL LENGTH	OVERALL LENGTH	CAPACITY	SIGHTS	SAFETY	WEIGHT
.223	21″	39″	5 rounds	Double tang rear peep sight adjustable for windage. Post type front sight adjustable for elevation.	Rotary safety—selector lever	Approx. 6¾ lbs.

*The suggested retail price of the Sporter is $189.50 and includes two magazines (each blocked for five rounds), sling, flash suppressor, rubber recoil pad, cleaning rod assembly, cleaning brush, and the Colt AR-15 Sporter Operation and Maintenance manual.

Exhibit N

Arm your men with confidence

Colt's AR-15 Semi-Automatic Rifle

MODEL R-6000

- Lightweight
- Weighs only 6.3 pounds
- Easy to handle
- Extremely accurate
- Straight line construction
- Simple to maintain

Colt's answer to the law enforcement agencies' demands for a semi-automatic version of the M16 automatic rifle purchased by the United States Armed Forces. Painstaking engineering redesign efforts have resulted in government-approved conversion of the automatic military rifle to a semi-automatic police weapon without sacrificing any performance or weight characteristics.

Colt Industries

Colt's Small Arms Division
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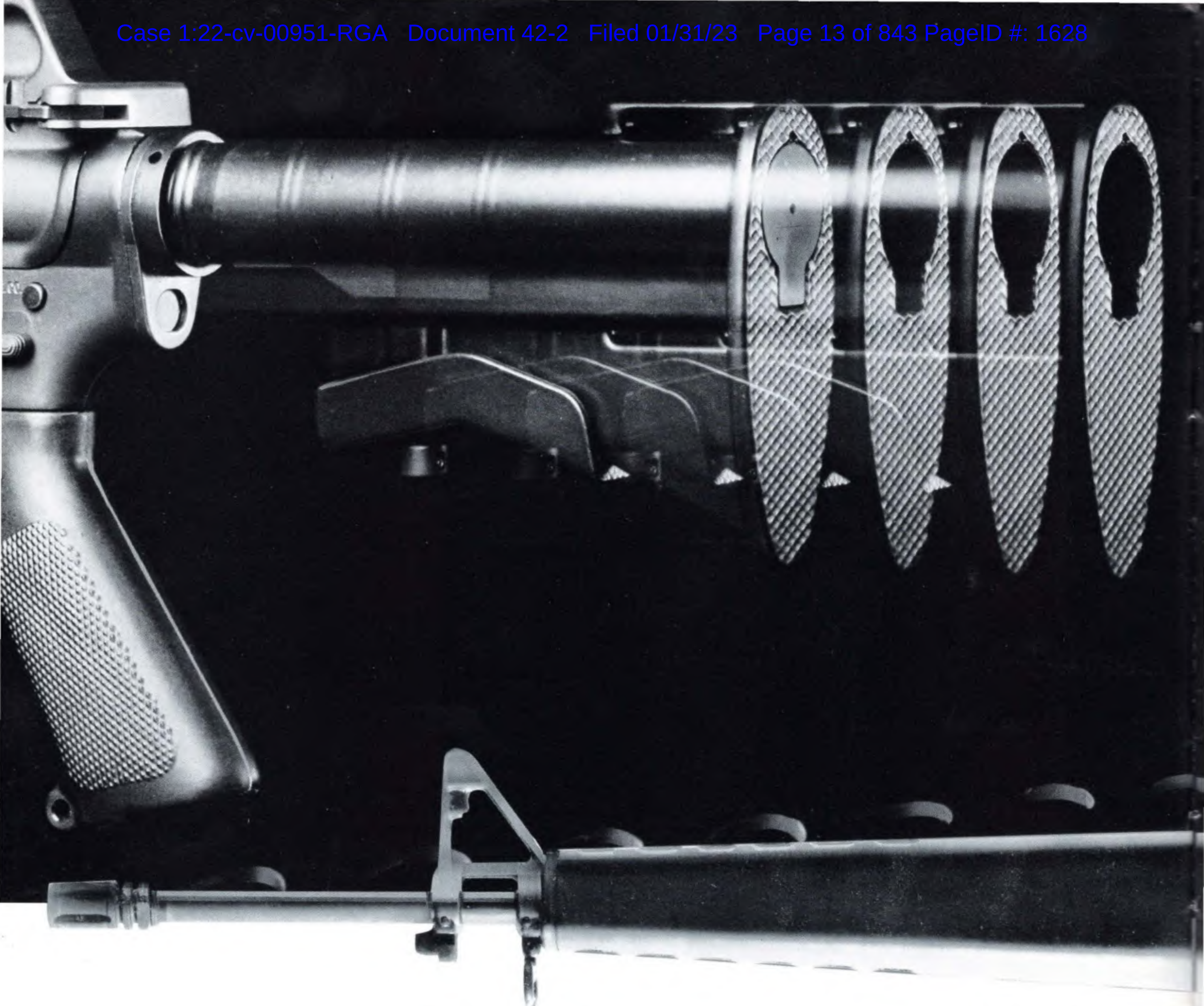


AR-15 Sporter

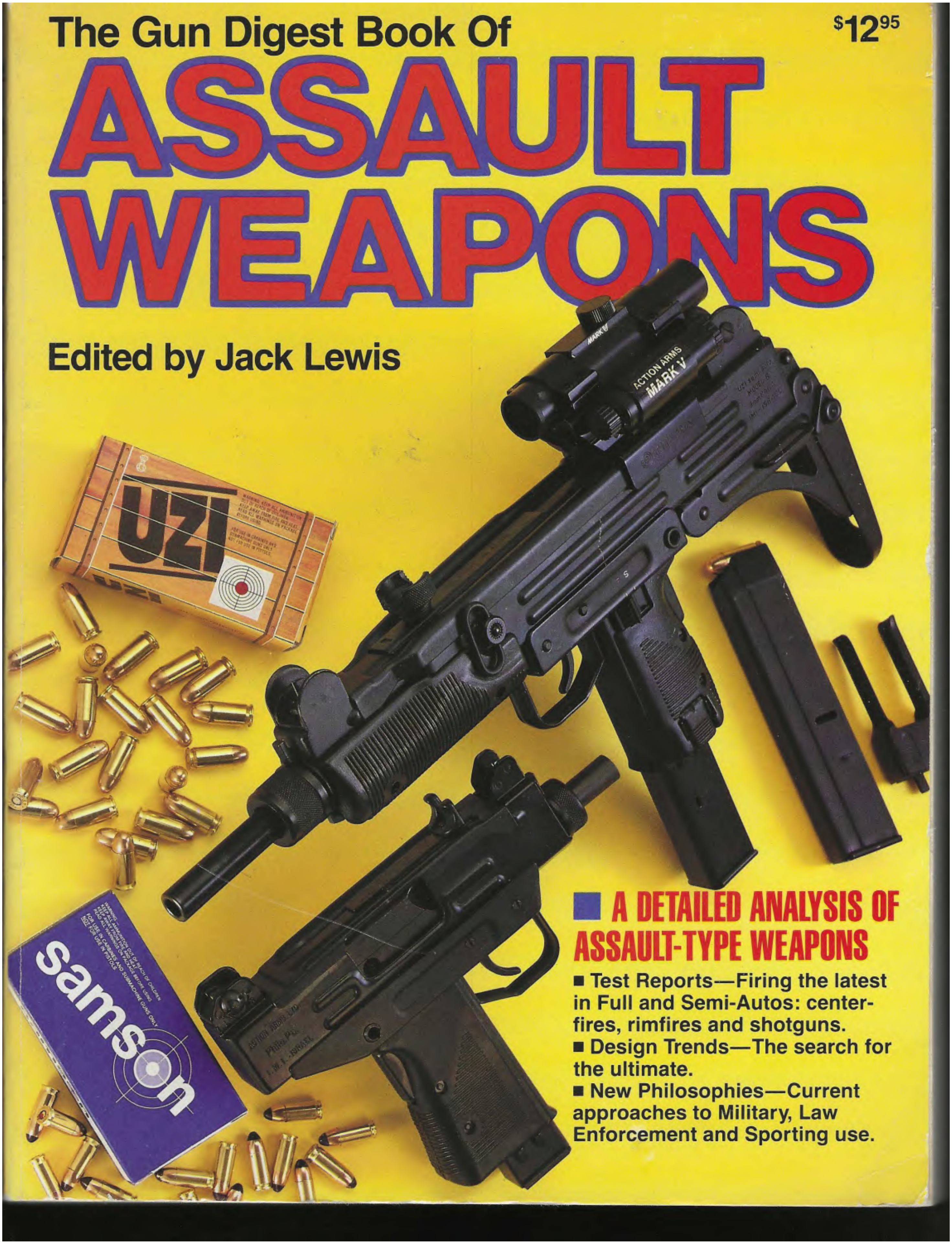
The semi-automatic version of the U.S. Military M16A1 which meets the highest standards of function and dependability. Lightweight and rugged. Clip fed with two 5-round magazines. 3 power scope is available as an accessory item. Extremely effective for varmint control and hunting small game. Excellent for the ranch or farm.

AR-15 Sporter with Collapsable Butt Stock

The collapsable butt stock and redesigned forearm offer a more compact version of the AR-15.

	Barrel length	Overall length	Stock	Finish	Weight (empty)	Length of pull	Magazine capacity	Sights	Fittings
AR-15 Sporter 223 (5.56mm)	20″	39″	Reinforced polycarbonate with butt-stock storage compartment	Black anodized receiver, black oxide barrel	7-1/2 lbs. with 5-rd. magazine	13″ 19-3/4″ sight radius	5 rds. with detachable magazine	Windage adjustment quick-flip rear Elevation adjustment front post	Optional 3x scope

Exhibit P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ABOUT OUR COVERS

It all started in the early 1950s. There it was, alone, awash in a sea of competing submachine guns. During the next three decades, the UZI 9mm submachine gun became, quite simply, that by which all others were measured. Then something new happened.

The UZI carbine — in long-barrel semi-auto persuasion — hit the scene in the late 1970s. It was, and is, a solid success. Action Arms, the UZI's importer, recently announced the introduction of their UZI Carbine in .45 ACP. That new offering, and the equally new UZI 9mm Pistol appear on our front cover. The good news for UZI Pistol fanciers is the fact that it too will soon be available chambered for the big .45 ACP. Next to the UZI Carbine is Action Arms' new line of UZI Pistol (9mm or .45 ACP) ammo. Below the UZI ammo is a box of the popular Samson ammo which is available in .380 ACP, .38 Special, .357 magnum, .44 magnum, .223, .308 and .30/06.

Also seen on the front cover is Action Arms' new MARK V optical sight mounted on the UZI Carbine. The MARK V is adjustable for brightness as well as windage and elevation. It's available with an optical polarizing filter.

On the back cover is another Action Arms offering — the Galil semiauto assault rifle. The Galil is available in either .308 or .223, comes complete with folding stock. The Galil, in full auto dress, is the main battle rifle of the Israeli army.

It could be easily said that both the Galil and UZI are two of the most popular and recognizable firearms ever produced. We are indeed proud to have them on our covers.

Photos by John Hanusin

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CHAPTER 11

This Reproduction Of The FAL 7.62mm NATO Assault Rifle Follows Tradition

Springfield's SAR-48

IN VIEW of his strict Mormon upbringing, there is no doubt that John Moses Browning thought of himself as a man of God and a man of peace. Nonetheless, the military armament he designed over his lifetime has done much to change the world. Many of his designs still serve as the basis for arms in use around the world today.

This paradox is reminiscent of the fact that Darwin, who suggested mankind descended from apes rather than Adam and Eve, was a constant churchgoer despite his seemingly contradictory scientific theory.

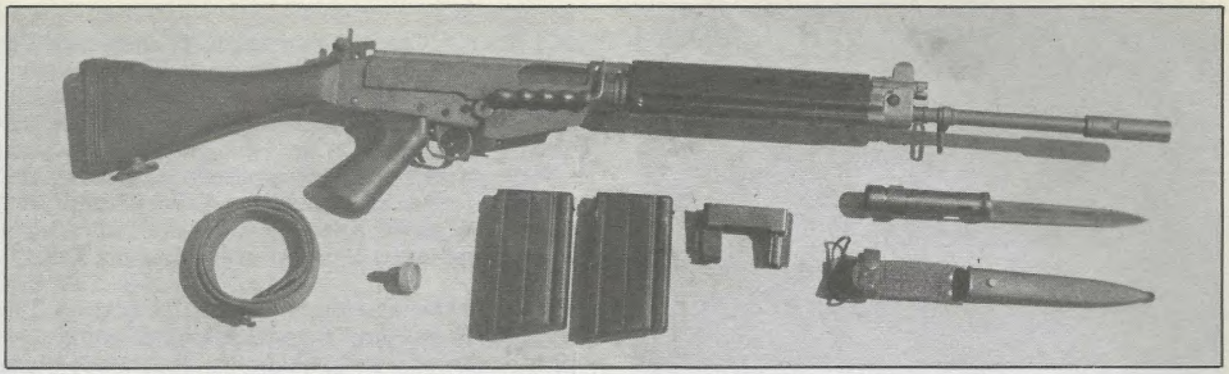
The Browning Automatic Rifle, so dear to U.S. troops through three wars, has been phased out of our Armed Forces inventory. A direct descendent of that design continues to be used around the globe by a host of nations. This is the FAL, manufactured originally by Fabrique Nationale de'Armes of Belgium. Into the Seventies, the FAL, officially known as the Fusil Automatique Leger — or the 7.62 FN Light Automatic Rifle — was used by as many as seventy countries as a primary infantry weapon. Others were produced under license with one variation produced in England and another in Canada.

These models varied from country to country, with the differences in external details: barrels, flash suppressors, bayonets, extractors, butt stocks, handguards, butt plates, bipods and loading devices. The basic action remained the same.

In some armies, the FAL has given way to more sophisticated weaponry, but a number of nations still use this model as a staple of their defense.

Now a version is being produced in the United States by Springfield Armory of Geneseo, Illinois. Designated as the SAR-48, this reproduction is based upon the FAL design used by the Rhodesian Army — when there still was a Rhodesia. The country now appears on modern maps as Zimbabwe. While hunting there years ago, I noted that the FAL 7.62mm automatic rifle still is kept close at hand in farming communities as a deterrent against the bandits and outlaws that have pervaded the country in the wake of the revolution.

Headquarters for Springfield Armory and its sister company, Rock Island Armory, occupy this structure in Geneseo. The firm was originated on a local grain farm.



The Illinois-produced SAR-48 is marketed with accessories that include extra twenty-round magazine and a bayonet.

The SAR-48 is based upon the design of the 1962 FAL model, but takes advantage of latter-day technology to incorporate high-impact plastic for the stock, pistol grip and handguard.

All of this, of course, may lead one to question why such a weapon of war is being produced in an Illinois farming community. To learn the answer to that, one must know something about the Reese family, who own and operate Springfield Armory and a sister corporation, Rock Island Armory.

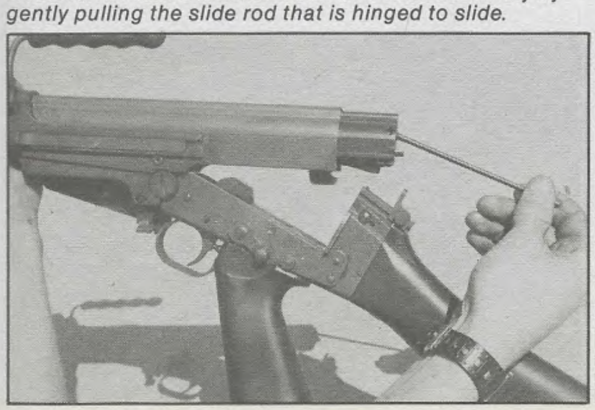
Bob Reese, the patriarch of the clan, farmed for decades in the community bordering the Mississippi River. Throughout, he had a continuing interest in firearms. Sometime after World War II, he bought some war surplus items and began to dabble in wholesale military parts. When the demand for the old military M1 rifle could not be answered among shooters and collectors, he began to weld together parts of receivers that had been cut in two, providing the basis for reassembling rifles. It wasn't long before he decided that it was simpler to machine a new receiver than attempt to weld together sections.

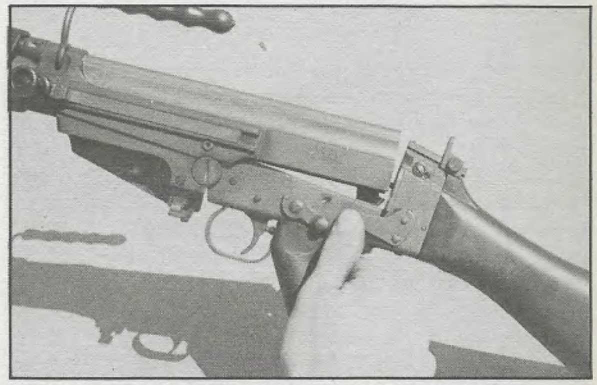
Today, most of the 640-acre Reese farm is leased out to other farmers, but the barns and outbuildings serve as storage areas for surplus gun parts from a host of countries. One entire barn I visited was filled with cases of mint-condition stocks for M-1 carbines.

Out of all this came the Springfield Armory and its sister corporation, the Rock Island Armory. The latter firm bears absolutely no connection to the government's Rock Island Arsenal located a few miles up the river. The Rock Island Armory, however, is devoted largely to supplying overseas military customers, while the Springfield Armory aims its efforts at the civilian and law enforcement markets.

Bob Reese serves as chairman of the board, while son Dennis is president of Springfield Armory and another son, Tom, is vice president. A third Reese son, David, is president of Rock Island Armory. The sons keep the day-to-day business running, while the senior Reese and his

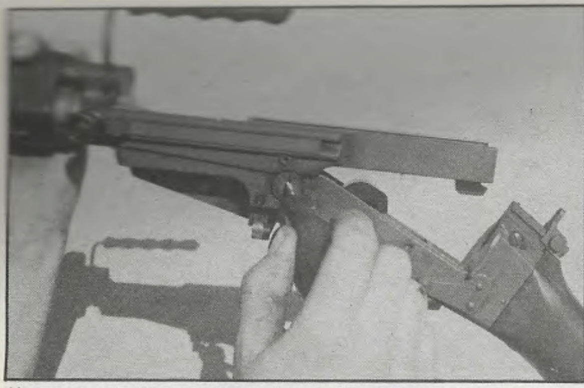
Remove the entire breech block and slide assembly by gently pulling the slide rod that is hinged to slide.





No tools are required to field strip the SAR-48. One presses locking lever straight up with the thumb, then pulls butt and trigger group down; it then swings open.

After cover has been removed from body by sliding it to the rear, one can separate slide from breech block. Following instructions, block can be separated easily.



If one wants the separate barrel from the stock, small screwdriver or even cartridge rim can be used to turn the slotted screw head, thus allowing the disassembly.

wife, Carol, reside in the old family farmhouse, where their sons were raised. Frequently they travel to Latin America to work out arms contracts with countries friendly to the United States.

Originally, all of the arms work was done in the farm's barns, but a modern factory now is located in downtown Geneseo, employing some forty people who machine and build the various firearms for which the firm is becoming noted. One section of the farm, however, is not under lease. This is a deep canyon that makes an excellent rifle range. Here, full-automatic weapons can be tested with safety, the canyon walls partially muffling the sounds of fire from the neighbors who are starting to encroach upon the property.

The Rhodesian Army training manual, published in 1972, describes the FAL as "a thoroughly reliable, magazine-fed weapon which is capable of:

(a) Single shots and automatic fire.

(b) Quick and accurate fire at short-range opportunity targets.

(c) A high rate of accurate rapid-fire at ranges up to three hundred meters.

(d) Effective section fire at ranges up to six hundred meters."

The manual also points out that with a telescopic sight the rifle is an accurate sniper rifle at ranges up to six hundred meters and more, "according to the sniper's skill."

Not surprisingly, the officially issued Rhodesian manual for the FAL is being adapted as the buyer's manual for the SAR-48, since the same facts are true of the Springfield Armory offering.

Weight of the SAR-48 is nine pounds six ounces with an empty magazine. The standard magazine, incidentally, holds twenty rounds. Overall length is 41.5 inches, while the barrel measures 21 inches with a four-groove right-hand twist.

Most of the parts are forged, including the receivers. The barrels are chrome-lined. Each rifle comes with two twenty-round magazines, a sling, a bayonet and scabbard, cleaning kit, blank firing attachment and a magazine loader. At this point, the retail price is $899.

While we didn't have a chronograph on hand to check it out, Dave Reese assured me that, when firing the standard 150-grain NATO round, muzzle velocity for the SAR-48 is in the vicinity of 2800 feet per second.

The SAR-48 is being made in two configurations: semi-automatic and selective fire. The former is marketed to civilian marksmen by Springfield Armory, while Rock Island Armory handles sales of both versions to friendly nations, police and law enforcement agencies.

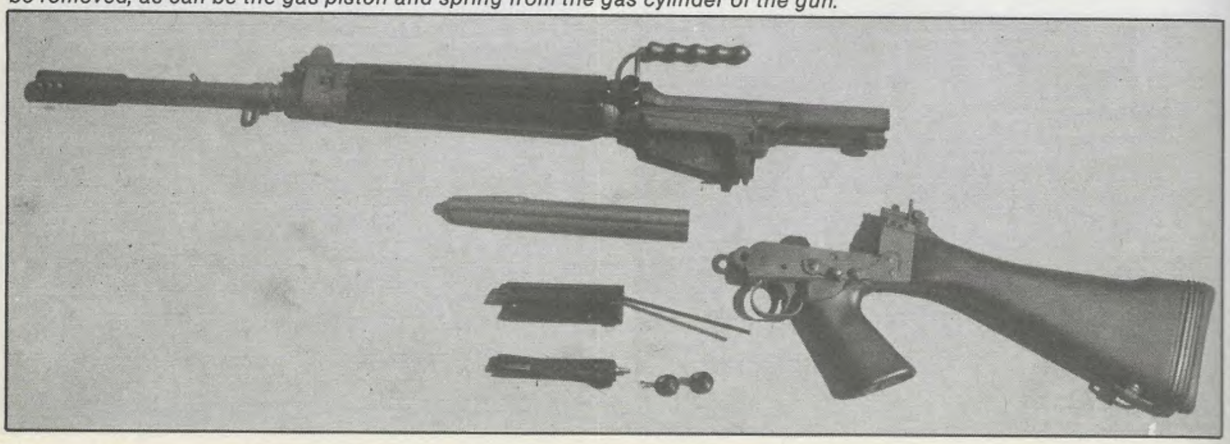
The Rhodesian manual makes an interesting point, stating, "When, for any reason, rifles are left without the breech block for periods of twenty-four hours or more, action must be taken to prevent weakening the hammer spring." It was the practice during the revolution in that country to remove breech blocks for security purposes should the weapon be stolen by the rebels.

"Under ordinary use, the SAR-48 should require little more than basic cleaning and preventive maintenance to keep it operating efficiently," David Reese contends.

Consistent with the SAR-48's simple design, stripping and reassembly for most normal maintenance procedures can be done without the use of special tools. Only the magazine, the gas plug and piston, and the breech block assembly need to be removed for most ordinary cleaning or field stripping. All other maintenance or repair work requiring more extensive stripping should be done by a qualified armorer.

Before starting to field strip the rifle, one should be sure

With the SAR-48 disassembled to this point, it can be cleaned. Firing pin also can be removed, as can be the gas piston and spring from the gas cylinder of the gun.



the SAR-48 is unloaded, that the safety is on *Safe* and that the magazine has been removed.

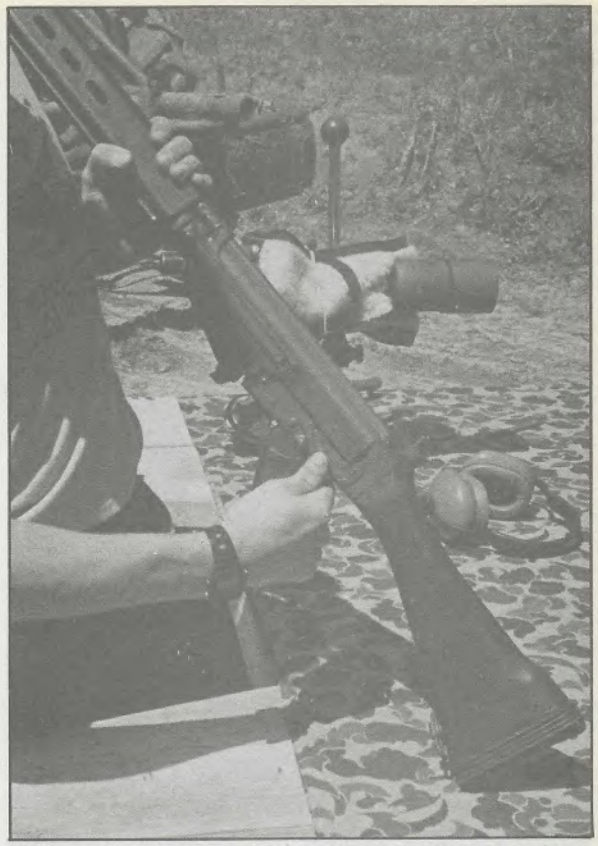
Check to make sure your SAR-48 is unloaded by first pulling back the cocking handle into the cocked position with your left hand and holding it in place while you look into the chamber from the rear to be certain it's empty. Then, with your hand still on the cocking handle, allow the breech block and slide to move forward slowly. Do not let the slide "slam" into place. Note: The SAR-48 must always be in the "cocked" position before being broken open for field stripping or cleaning.

(1) Stripping the mechanism is a simple procedure that requires no tools. First, using your right thumb, press the locking lever on the left side of the trigger frame straight up. At the same time, pull the butt and trigger group down with your right hand while holding the barrel group steady with your left hand. The rifle swings open on a pivot pin much like a shotgun.

(2) Remove the entire breech block and slide assembly by gently pulling on the slide rod that's hinged to the slide.

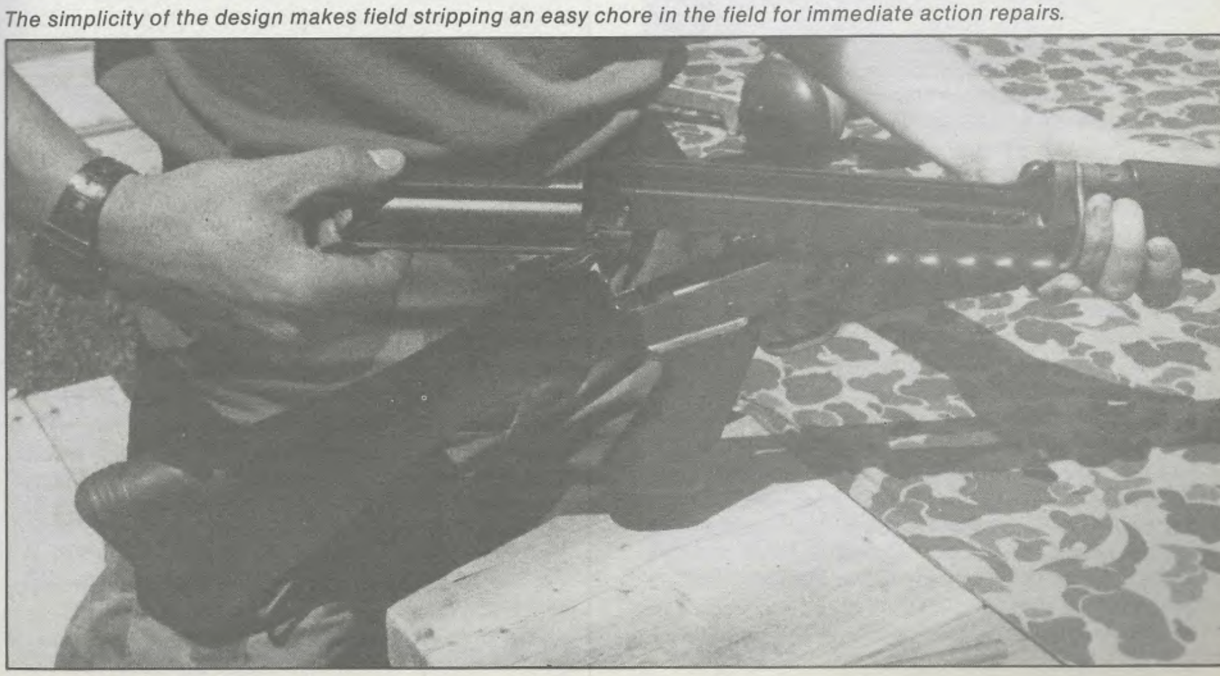
(3) Remove the cover from the body by sliding it to the rear.

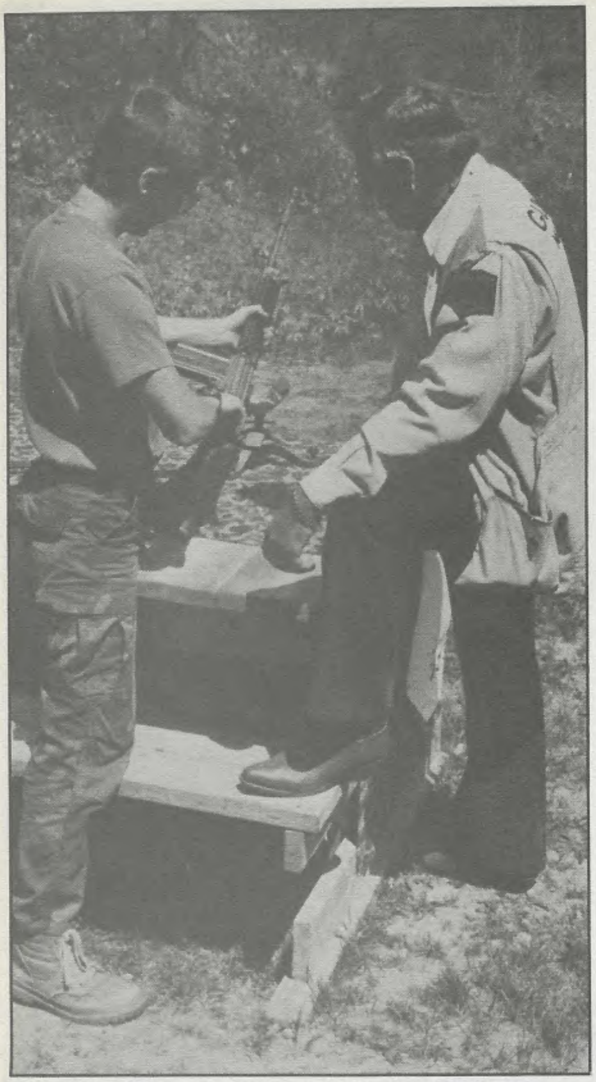
(4) Separate the slide from the breech block. First, allow the front part of the breech block to fall down and away from the slide. Then, complete the disassembly by levering the rear of the breech block away from the rear of the slide while applying pressure to the firing pin with your thumb — much like pushing a button or a spring-loaded pin. The breech block will separate from the slide quite easily.



Modern manufacturing techniques are used to produce the SAR-48. The classic military rifle features clean lines.

The simplicity of the design makes field stripping an easy chore in the field for immediate action repairs.





Tim Dillon (left) explains the setting of the sights of the rifle to the author during canyon shooting session.

(5) Removing the firing pin is a simple, three-step procedure:

Press on the rear of the firing pin with your thumb, as if you're pressing it farther into the rear end of the breech block. You'll feel the firing pin spring "give" as the firing pin moves inward.

While holding in the firing pin with your thumb, push out the small retaining pin on the side of the breech block. The nose of a cartridge can be used to push on the retaining pin until it falls out.

When the retaining pin has been removed, gradually release your thumb pressure from the rear of the firing pin. Without the firing pin to hold it, the firing pin spring will push the firing pin out of its housing so you can grasp it and remove it with your fingers.

(6) Remove the gas plug by pressing in on the plunger of the gas plug with the nose of a cartridge, then turning the gas plug a quarter of a turn clockwise. The gas plug will then be pushed from its housing by the piston spring. Remove the gas plug with your fingers.

(7) Next, remove the gas piston and spring from the gas cylinder and separate the piston spring from the piston ring. These are all extremely simple manual operations.

Under ordinary conditions, disassembling the rifle beyond this point will not be necessary and is not recommended for anyone other than a trained armorer. Always field strip the SAR-48 in the order described above. To simplify reassembly, lay out the parts on a clean, dry surface as they are removed from the rifle. Keep them in order, because they will be reassembled in the exact reverse order.

The Rhodesian manual then has a note that is offered herewith in the spirit in which it was intended. "You must not strip the rifle further than this. If you do, the chances are that you will assemble it incorrectly and the rifle will be inoperative."

The cleaning procedures recommended by Springfield Armory, after the rifle has been fired and it is field stripped, pretty much follow the steps suggested in the Rhodesian Army manual for their version of the FAL.

(1) Use the bore brush to clean all residue from the barrel, visually checking the barrel regularly. A lightly oiled cleaning patch or piece of clean flannel cloth might help remove all vestiges of dirt or grime. If an oiled cleaning patch is used, complete the cleaning process with a clean, dry patch or a dry rag.

Follow the above procedure to clean the chamber, using the chamber brush rather than the bore brush.

Using a clean, lightly oiled rag, thoroughly clean the slide, the rear part of the barrel and inside the receiver, the breech block, the top cover, the gas plug, the gas piston, the spring, the firing pin, the firing pin housing, and the firing pin spring. Dry them after they're cleaned.

Using a cleaning rod, run a clean, lightly oiled rag through the front end of the gas cylinder. Do not run a cleaning rod through the small hole in the rear end of the gas cylinder.

Finish the whole cleaning process by lightly oiling all moving parts with a good quality lubricating gun oil, like Springfield Armory LSA Lubricant.

(2) Complete barrel cleaning (the barrel requires special periodic attention).

Wash the bore with soapy water, using a solution of approximately 15% non-acid soap. A good-quality bore

Shooting from a bench, but sans sandbags, the author found that the Springfield Armory rifle performed well. Firing several hundred rounds, there was no malfunction.

solvent can also be used. Be sure to keep soapy water out of the mechanism. Dry thoroughly with a clean flannel rag. Dry the outside of the barrel with another dry rag.

If the rifle is to be stored for any length of time, barrel grease should be applied to the bore after cleaning.

Before firing your SAR-48, it should be cleaned again to remove excess oil from all parts. Most surfaces should be thoroughly dry, except for the breech block and the inside surface of the slide.

The SAR-48 is a gas operated rifle, controlled by an adjustable gas regulator which, in turn, is designed on the exhaust principle. The adjustable gas system allows the flexibility of controlling the amount of recoil or adapting the rifle to different ammunition loads. It further allows the rifle to operate efficiently on minimum gas intake to prevent excess wear and tear on the moving parts.

The gas regulator adjustment is located immediately behind the front sight. It moves in precise clicks from right to left (the farthest right position being fully open; the farthest left is fully closed). It should move easily with your fingers or with the nose of a cartridge. Begin finding the correct adjustment with the regulator set fully closed, or screwed flush against the rear part of the gas block. Turn the regulator one click at a time and fire one round after each adjustment, until the mechanism is engaged and short recoil ceases. Verify this adjustment by firing five rounds. If any shot results in a short recoil, repeat the process.

An incorrectly adjusted gas regulator or faulty ammunition are the most common causes of feeding or ejection failures. If cartridges repeatedly fail to feed or eject properly, always check those two potential problem areas before disassembling your rifle to look for more serious causes.

The original FAL has a reputation for having too light a barrel, which causes it to climb excessively, even when equipped with a light bipod. The SAR-48 has the same type of light barrel and we fired it without a bipod from a bench. At a range of something over two hundred yards, Tim Dillon, a member of the Springfield staff, placed a bowling pin against the dirt backstop formed by the wall of the gulch.

Somewhat gingerly, I took my place at the shooting bench to check out the Rock Island Armory full-auto version. I positioned the selector switch for semi-automatic fire. With the flip-type sight set for two hundred meters, I squeezed off a couple of rounds and discovered I was firing about six inches low.

The rear sight consists of a ramp with the ranges marked from two hundred to six hundred meters, much in the manner of the old Springfield rifle sights. The lowest setting, when the slide is down, is two hundred.

To set the sight, one presses the thumb catch on this rear sight with the right thumb and moves the slide forward or backward until the slide matches the appropriate number. For battle shooting, the Rhodesians suggested leaving the sight set at three hundred meters.

The front sight resembles that of the M1 rifle, complete to the protective ears on each side. I had sighted on the bowling pin with a sight picture as recommended by the Rhodesian manual, placing the top of the front sight on the bottom of the pin. Rather than make minute sighting adjustments, I simply raised the sight picture to center on the top of the pin, angled the selector switch to the full-automatic mode and squeezed off a three-shot burst. Dirt kicked up in the vicinity of the bowling pin and it began to roll down the embankment. I squeezed off another burst, following the pin through the sights.

"Well, if you didn't hit it," Tim Dillon opined, "you scared it to death." Later inspection revealed that the pin had been splintered by two of the 7.62mm rounds.

Dillon is a 22-year-old veteran, who served as a small-arms repairman with the Army. Since his discharge, he has been a technician with Springfield Armory, putting his service-learned knowledge to work in a job he loves.

"I get a chance to shoot a lot," is the way he explains his satisfaction with the job.

It was Dillon who demonstrated to me that the SAR-48 may be more controllable than some shooters are willing to admit. He fired it from the hip into a nearby stream, the bullets kicking up a spray of water in an arc that spread some six feet across his front. Still, the manner in which he held the gun at the thirty-yard range didn't allow the muzzle to climb perceptibly. The SAR can be controlled.

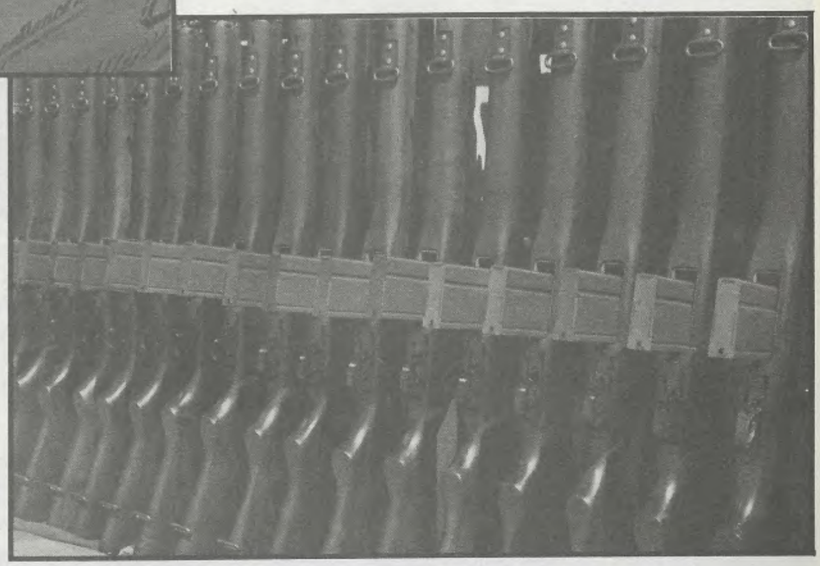
Young Dillon is one of forty employees who build the guns for the sister corporations, Springfield Armory and Rock Island Armory. While Bob Reese still maintains a machine shop on his farm and putters with some of the war surplus armament he has imported from around the world, the vast majority of the gun-making is accomplished in the modern plant in Geneseo. Duke Ballengee is in charge of manufacturing and oversees the building of an entire line of weaponry steeped in nostalgia. In addition to the SAR-48, the Illinois firm turns out M-60 machine guns; several variations of the M1 and M-24 rifles and a reproduction of the Beretta BM59. Plans are in the mill for further expansion and other firearms.

As for the designation of the rifle we tested there in the hidden canyon, I asked what SAR stood for. The logical answer was "Springfield Automatic Rifle." That figures — *Jack Lewis.*

acceptance came when the Marines began to use them in China and Nicaragua.

For a long time, the Thompson carried the bum rap of being a criminal's gun. So much so that a British War Office official is said to have rejected a request for Thompsons for the early Commandos with the cryptic remark that English gentlemen would not be armed with an American gangster's weapon.

The Thomposn was, and is, an efficient if somewhat heavy submachine gun. In view of the fact that they are so widely recognized as the epitome of lethal firepower, the present owners of the company which produced the gun considered producing a civilian-legal version.



The GI M1 was a 30/.06, but there's not much match grade ammo available these days. Springfield makes these M1s to shoot the more commonly seen 7.62mm round. Right: Racks of legal M1As awaiting shipment from the factory at Springfield Armory.

They were able to do so by doing two things. First, the gun would have to be converted to fire only semi-automatic. This was done by changing to a closed-bolt firing mode and by making some changes in the shape and function of internal parts. The resulting gun was a true semi-auto, classified as a rifle under the law. But because the law mandated a minimum barrel length of sixteen inches, they also were required to use barrels longer than those of the original Thompsons. The end result was an unusual weapon with a long barrel that had most of the original features of the old Tommy gun. They sell quite steadily to the present day.

This all has happened within the last dozen years or so and a small industry has grown up in response to the legal Thompson. You can now buy perfectly legal versions of the UZI, MAC10, M16, Sterling and countless other modern assault weapons. The vast majority of these weapons were built for and sold to the same sort of individual that wanted a souvenir M1 rifle or carbine. In other words, for reasons of nostalgia, curiosity or military display value.

Despite the use of the semi-autos for innocuous and even non-firing purposes, the fact remains that they are guns. And for some purposes, they are effective guns. Nothing is much more intimidating than a Thompson with a full drum. That's plainly a lethal-appearing combination. The illegal interloper in the distant ranch or forest home is not likely to pay a great deal of attention to the fact that the gun pointed at him has a barrel too long to be a real Thompson. If he does choose to pursue illegal actions to the point that legal defensive force is warranted, he might find out why so many Thompons have been sold.

Particularly in the case of rural areas, legal semi-autos in assault weapon configuration make excellent choices as defensive weapons. The reason for emphasizing their use in rural areas is simply because so many of them are chambered for long-range cartridges that would tend to over-penetrate in urban areas.

Just as the Thompson got the gangster gun rap so many years ago, many of these other guns also are falling into criminal hands. Some of them are being reconverted to a full-auto firing mode. When that is done, a host of criminal laws is violated. When the gun is criminally altered, it takes an act of human volition to do it, just as a human decision is required for the same gun to be used in the commission of a criminal act. In neither case can the gun itself be held responsible.

Modern assault weapons — the legal civilian versions — are high tech guns. They're on the far end of the scale from Saturday Night Specials (whatever they are). There is just as much justification for the one as there is for the other.

Whatever a shooter's reasons may be for wanting one, he'll be able to find one of these civilian-legal semi-auto assault weapons on dealer's shelves. A number of them are covered in detail on the following pages.

Exhibit Q

DEPARTMENT OF THE TREASURY
BUREAU OF ALCOHOL, TOBACCO AND FIREARMS
WASHINGTON, D.C. 20226

JUL 06 1989

MEMORANDUM T0: Director

FROM: Associate Director (Compliance Operations)

SUBJECT: Report and Recommendation on the Importability of Certain Semiautomatic Rifles

The working group has completed its evaluation of the semiautomatic rifles whose importation was suspended pending a determination as to whether these weapons are, as required by 18 U.S.C. § 925(d)(3), of a type "generally recognized as particularly suitable for or readily adaptable to sporting purposes".

Attached for your review and approval is the report and recommendation on the importability of these rifles.

Daniel R. Black
Daniel Black

Attachment

Approved: Stephen E. Higgins 7/6/89

Disapprove: ______________________

REPORT AND RECOMMENDATION OF THE ATF WORKING GROUP ON THE IMPORTABILITY OF CERTAIN SEMIAUTOMATIC RIFLES

SUSPENSION OF ASSAULT-TYPE RIFLE IMPORTATIONS

On March 14, 1989, ATF announced that it was suspending, effective immediately, the importation of several makes of assault-type rifles, pending a decision as to whether these weapons meet the statutory test that they are of a type generally recognized as particularly suitable for or readily adaptable to sporting purposes. The announcement stated that ATF would not approve, until further notice, the importation of AKS-type weapons, Uzi carbines, FN/FAL-type weapons, FN/FNC-type weapons and Steyr Aug semiautomatic weapons. On April 5, 1989, the suspension was expanded to include all similar assault-type rifles.

For purposes of this suspension, assault-type rifles were rifles which generally met the following criteria:

a. military appearance

b. large magazine capacity

c. semiautomatic version of a machinegun

Based on these criteria, ATF suspended action on pending applications and suspended outstanding permits covering certain firearms listed in Attachment 1. These included both centerfire and .22 rimfire caliber firearms. At that time, ATF indicated that the reexamination of these weapons would take approximately 90 days.

This ATF working group was established to conduct the reevaluation of the importability of these semiautomatic rifles. This report represents the findings and recommendations of the working group.

BACKGROUND

Section 925(d)(3) of Title 18, United States Code, as amended, provides in pertinent part that:

> The Secretary shall authorize a firearm. . .to be imported or brought into the United States . . if the firearm . .
>
> > (3) is of a type that does not fall within the definition of a firearm as defined in section 5845(a) of the Internal Revenue Code of 1954 and is generally recognized as particularly suitable for or readily

> adaptable to sporting purposes, excluding surplus
> military firearms. . .

This provision was originally enacted by Title IV of the Omnibus Crime Control and Safe Streets Act of 1968, and was also contained in Title I of the Gun Control Act of 1968, which amended Title IV later that year. According to the Senate Report on Title IV, this provision was intended to "curb the flow of surplus military weapons and other firearms being brought into the United States which are not particularly suitable for target shooting or hunting." S. Rep. No. 1097, 90th Cong. 2d Sess. 80, 1968 U.S. Code Cong. and Admin. News 2112, 2167.

Moreover, there is legislative history which indicates that Congress intended the standard to allow the importation of traditional sporting rifles, while excluding military-type rifles. The Senate Report on the Gun Control Act observed that the importation standards ". . . are designed and intended to provide for the importation of quality made, sporting firearms, including . . . rifles such as those manufactured and imported by Browning and other such manufacturers and importers of firearms." S. Rep. No. 1501, 90th Cong. 2d Sess. 38 (1968). Significantly, the rifles being imported by Browning at that time were semiautomatic and manually operated traditional sporting rifles of high quality.[1]

An explanation of the effect of this section by one of the sponsors of the bill specifically stated that military firearms would not meet the "sporting purposes" test for importation. The mere fact that a military firearm may be used in a sporting event does not make it importable as a sporting firearm[2].

There is a reference in the Senate Report on Title IV which notes that the importation prohibition ". . . would not interfere with the bringing in of currently produced firearms, such as rifles . . . of recognized quality which are used for hunting and for recreational purposes, or for personal protection." S. Rep. No. 1097, 90th Cong. 2d Sess. 80, 1968 U.S. Code Cong. and Admin. News 2112, 2167. However, this language is not inconsistent with the expressed purpose of restricting importation to firearms particularly suitable for target shooting or hunting since firearms particularly suitable for those purposes can obviously be used for other purposes such as recreational shooting and personal protection.

The determination of a weapon's suitability for sporting purposes "rest[s] directly with the Secretary of the Treasury." 114 Cong. Rec. 27465 (1968) (Statement of Sen. Murphy). While the legislative history suggests that the term "sporting purposes" refers to the traditional sports of target shooting, trap and skeet shooting, and hunting, the statute itself provides no criteria beyond the "generally recognized" language of section 925(d)(3). S. Rep. No. 1097, 90th Cong. 2d Sess. 80, 1968 U.S. Code Cong. and Admin. News 2167. The Senate Report on the Gun Control Act stated:

> The difficulty of defining weapons characteristics to meet this target [of eliminating importation of weapons used in crime] without discriminating against sporting quality firearms, was a major reason why the Secretary of the Treasury has been given fairly broad discretion in defining and administering the import prohibition.

S. Rep. No. 1501, 90th Cong. 2d Sess. 38 (1968).

Following enactment of the Gun Control Act in 1968, the Secretary established a Firearms Evaluation Panel to provide guidelines for implementation of the "sporting purposes" test of section 925(d)(3). This panel was composed of representatives from the military, law enforcement, and the firearms industry. The panel focused its attention on handguns and recommended the adoption of factoring criteria to evaluate the various types of handguns. These factoring criteria are based upon such considerations as overall length of the firearm, caliber, safety features, and frame construction. An evaluation sheet (ATF Form 4590) was developed thereafter by ATF and put into use for evaluating handguns pursuant to section 925(d)(3). Attachment 2.

The 1968 Firearms Evaluation Panel did not propose criteria for evaluating rifles and shotguns under section 925(d)(3). Other than surplus military firearms which Congress addressed separately, long guns being imported prior to 1968 were generally conventional rifles and shotguns specifically intended for sporting purposes. Thus, in 1968, there was no cause to develop criteria for evaluating the sporting purposes of rifles and shotguns. Until recently, all rifles and shotguns were approved for importation so long as they were not otherwise excluded by section 925(d)(3). Only rifles and shotguns covered by the National Firearms Act (NFA), 26 U.S.C. S 5845(a) (for example, machineguns and short-barreled rifles and short-barreled shotguns), and surplus military rifles and shotguns had been denied importation.

The Firearms Evaluation Panel did briefly comment on whether a model BM59 Beretta, 7.62mm NATO Caliber Sporter Version Rifle was suitable for sporting purposes. Minutes of the Firearms Advisory Panel, December 10, 1968. Attachment 3. It was the consensus of the Panel that this rifle did have a particular use in target shooting and hunting. Accordingly, it was recommended that importation of the Beretta BM59, together with the SIG-AMT 7.62mm NATO Caliber Sporting Rifle and the Cetme 7.62mm NATO Caliber Sporting Rifle, be authorized for importation. (The Beretta BM59 and the Cetme, the predecessor to the HK91, are two of the rifles whose importation has been suspended. The SIG-AMT is no longer being produced.) However, the Panel recommended that importation of these weapons should include the restriction that they not possess combination flash suppressors/grenade launchers.

The working group found the Panel's consideration of these rifles to be superficial and unpersuasive. The vast majority of the work of the 1968 Panel was devoted to handguns and the establishment of the factoring criteria for the importation of handguns. Indeed, we found compelling evidence that these rifles are not generally recognized as particularly suitable for sporting purposes.

The first time that ATF looked beyond the restrictions on NFA and surplus military rifles and shotguns and undertook a meaningful analysis under the "sporting purposes" test was in 1984. At that time, ATF was faced with a new breed of imported shotgun. It was clear that the historical assumption that all shotguns were sporting was no longer viable. Specifically, ATF was asked to determine whether the Striker-12 shotgun was suitable for sporting purposes. This shotgun is a military/law enforcement weapon initially designed and manufactured in South Africa for riot control. When the importer was asked to provide evidence of sporting purposes for the weapon, ATF was provided information that the weapon was suitable for police/combat style competitions. ATF determined that this type of competition did not constitute "sporting purposes" under the statute, and that this shotgun was not suitable for traditional sporting purposes, such as hunting, and trap and skeet shooting. Accordingly, importation was denied. Attachment 4.

Thereafter, in 1986, the Gilbert Equipment Company requested that the USAS-12 shotgun be classified as a sporting firearm under section 925(d)(3). After examination and testing of the weapon, ATF found that it was a semiautomatic version of a selective fire military-type assault shotgun. In this case, ATF determined that, due to its weight, size, bulk, designed magazine capacity, configuration, and other factors, the USAS-12 was not particularly suitable for or readily adaptable to sporting purposes. Again, ATF refused to recognize police/combat competitions as a sporting purpose under section 925(d)(3). The shotgun was reviewed on the basis of its suitability for traditional shotgun sports of hunting, and trap and skeet shooting and its importation was denied. Attachment 5. This decision was upheld by the United States District Court in Gilbert Equipment Company, Inc. v. Higgins, 709 F. Supp. 1071 (S.D. Ala. 1989). The case is currently on appeal to the Eleventh Circuit.

These two cases involving shotguns represent ATF's first thorough examination of the suitability of certain combat-type weapons for sporting purposes. In these cases ATF adopted an interpretation of sporting as being limited to certain traditional sports and not simply any lawful activity in which the weapons might be employed.

ANALYSIS

A. Defining the type of weapon under review.

As noted above, section 925(d)(3) expressly provides that the Secretary shall authorize the importation of a firearm that is of a type that is generally recognized as particularly suitable for sporting purposes. The legislative history also makes it clear that the Secretary shall scrutinize types of firearms in exercising his authority under section 925(d). Specifically, in its explanation of section 925(d)(3), the Senate Report on the Gun Control Act stated:

> This subsection gives the Secretary authority to permit the importation of ammunition and certain types of firearms--(1) those imported for scientific or research purposes or for use in competition or training under chapter 401 of title 10 of the United States Code; (2) an unserviceable firearm other than a machinegun; (3) those firearms not coming within the purview of the National Firearms Act (26 U.S.C. 5801, et seq.) and suitable for sporting purposes (in the case of surplus military weapons this type is limited to shotguns and rifles) and those taken out of the United States. (Emphasis added.)

S. Rep. No. 1501, 90th Cong. 2d Sess. 38 (1968).

In light of the statutory mandate that types of firearms be scrutinized, the working group first attempted to determine whether the semiautomatic rifles suspended from importation fall within a type of firearm.

The working group determined that the semiautomatic rifles in question are generally semiautomatic versions of true selective fire military assault rifles.[3] As a class or type of firearm they are often referred to as "assault rifles," "assault-type rifles," "military style rifles," or "paramilitary rifles."[4] Since we are only concerned with semiautomatic rifles, it is somewhat of a misnomer to refer to these weapons as "assault rifles." True assault rifles are selective fire weapons that will fire in a fully automatic mode.[5] For the purposes of this paper, it was necessary to settle on one term that best describes the weapons under consideration, and we will refer to these weapons as "semiautomatic assault rifles." They represent a distinctive type of rifle distinguished by certain general characteristics which are common to the modern military assault rifle. The modern military assault rifle, such as the U.S. M16, German G3, Belgian FN/FAL, and Soviet AK47, is a weapon designed for killing or disabling the enemy and, as described below, has characteristics designed to accomplish this purpose.

We found that the modern military assault rifle contains a variety of physical features and characteristics designed for military applications which distinguishes it from traditional sporting rifles.[6] These military features and characteristics (other than selective fire) are carried over to the semiautomatic versions of the original military rifle. These features and characteristics are as follows:

1. Military Configuration.

a. Ability to accept a detachable magazine. Virtually allmodern military firearms are designed to accept large, detachable magazines.[7] This provides the soldier with a fairly large ammunition supply and the ability to rapidly reload. Thus, large capacity magazines are indicative of military firearms. While detachable magazines are not limited to military firearms, most traditional semiautomatic sporting firearms, designed to accommodate a detachable magazine, have a relatively small magazine capacity. In addition, some States have a limit on the magazine capacity allowed for hunting, usually 8 rounds or less.[8] That a firearm is designed and sold with a large capacity magazine, e.g., 20-30 rounds, is a factor to be considered in determining whether a firearm is a semiautomatic assault rifle.

b. Folding/telescoping stocks. Many military firearms incorporate folding or telescoping stocks.[9] The main advantage of this item is portability, especially for airborne troops. These stocks allow the firearm to be fired from the folded position, yet it cannot be fired nearly as accurately as with an open stock. With respect to possible sporting uses of this feature, the folding stock makes it easier to carry the firearm when hiking or backpacking. However, its predominant advantage is for military purposes, and it is normally not found on the traditional sporting rifle.

c. Pistol grips. The vast majority of military firearms employ a well-defined pistol grip that protrudes conspicuously beneath the action of the weapon.[10] In most cases, the "straight line design" of themilitary weapon dictates a grip of this type so that the shooter can hold and fire the weapon. Further, a pistol grip can be an aid in one-handed firing of the weapon in a combat situation. Further, such grips were designed to assist in controlling machineguns during automatic fire. On the other hand, the vast majority of sporting firearms employ a more traditional pistol grip built into the wrist of the stock of the firearm since one-handed shooting is not usually employed in hunting or competitive target competitions.

d. Ability to accept a bayonet. A bayonet has distinct military purposes.[11] First, it has a psychological affect on the enemy. Second, it enables soldiers to fight in close quarters with a knife attached to their rifles. We know of no traditional sporting application for a bayonet.

e. Flash suppressor. A flash suppressor generally serves one or two functions. First, in military firearms it disperses the muzzle flash when the firearm is fired to help conceal the shooter's position, especially at night. A second purpose of some flash suppressors is to assist in controlling the "muzzle climb" of the rifle, particularly when fired fully automatic.[12] From the standpoint of a traditional sporting firearm, there is no particular benefit in suppressing muzzle flash. Those flash suppressors which also serve to dampen "muzzle climb" have a limited benefit in sporting uses by allowing the shooter to reacquire the target for a second shot. However, the barrel of a sporting rifle can be modified by "magna-porting" to achieve the same result. There are also muzzle attachments for sporting firearms to assist in the reduction of muzzle climb. In the case of military-style weapons that have flash suppressors incorporated in their design, the mere removal of the flash suppressor may have an adverse impact on the accuracy of the firearm.

f. Bipods. The majority of military firearms have bipods as an integral part of the firearm or contain specific mounting points to which bipods may be attached.[13] The military utility of the bipod is primarily to provide stability and support for the weapon when fired from the prone position, especially when fired fully automatic. Bipods are available accessory items for sporting rifles and are used primarily in long-range shooting to enhance stability. However, traditional sporting rifles do not come equipped with bipods, nor are they specifically designed to accommodate them. Instead, bipods for sporting firearms are generally designed to attach to a detachable "sling swivel mount" or simply clamp onto the firearm.

g. Grenade launcher. Grenade launchers are incorporated in the majority of military firearms as a device to facilitate the launching of explosive grenades.[14] Such launchers are generally of two types. The first type is a flash suppressor designed to function as a grenade launcher. The second type attaches to the barrel of the rifle either by screws or clamps. We are not aware of any particular sporting use for grenade launchers.

h. Night sights. Many military firearms are equipped with luminous sights to facilitate sight alignment and target acquisition in poor light or darkness.[15] Their uses are generally for military and law enforcement purposes and are not usually found on sporting firearms since it is generally illegal to hunt at night.

2. Whether the weapon is a semiautomatic version of a machinegun.

The vast majority of modern military firearms are selective fire, i.e., they can shoot either fully automatic or semiautomatic. Since machineguns are prohibited from importation (except for law enforcement use) the manufacturers of such weapons have developed semiautomatic versions of these firearms.[16]

3. Whether the rifle is chambered to accept a centerfire cartridge case having a length of 2.25 inches or less.

Modern military assault rifles and submachineguns are generally chambered to accept a centerfire cartridge case of 2.25 inches or less.[17] On the other hand, while many traditional sporting rifles will fire a cartridge of 2.25 inches or less, such firearms usually do not have the other military features outlined in Items 1a-h.

These features and characteristics are not usually found on traditional sporting firearms.[18] This is not to say that a particular rifle having one or more of the listed features should necessarily be classified as a semiautomatic assault rifle. Indeed, many traditional sporting firearms are . semiautomatic or have detachable magazines. Thus, the criteria must be viewed in total to determine whether the overall configuration places the rifle fairly within the semiautomatic assault rifle category.

Using these criteria, we determined that, on balance, all of the firearms on the original suspension list are properly included in the semiautomatic assault rifle category, with the exception of the .22 rimfire caliber rifles and the Valmet Hunter. While the .22 rimfire caliber rifles bear a striking resemblance to the true assault rifle, these rifles employ, by and large, conventional .22 rimfire caliber semiautomatic mechanisms.[19] Moreover, they are not semiautomatic versions of a machinegun and contain only a few of the other relevant characteristics. Further, the working group determined that, in general, .22 caliber rifles are generally recognized as suitable for small game hunting. The Valmet Hunter, while based on the operating mechanism of the AK47 assault rifle, has been substantially changed so that it is now akin to a traditional sporting rifle and does not properly fall within the semiautomatic assault rifle category. More specifically, its receiver has been modified and its pistol grips, bayonet, and flash suppressor have been removed. The trigger mechanism has been moved to the rear of the modified receiver to facilitate its use with a traditional sporting stock. Also, its military-style sights have been replaced with traditional sporting-style sights. See Attachment 6.

B. Scope of "Sporting Purposes".

The second step of our process was to determine the scope of "sporting purposes" as used in the statute. This is a critical aspect of the process. The broadest interpretation could take in virtually any lawful activity or competition which any person or groups of persons might undertake. Under this interpretation, any rifle could meet the "sporting purposes" test. A narrower interpretation which focuses on the traditional sports of hunting and organized marksmanship competition would result in a more selective importation process.[20]

To determine the proper interpretation, we consulted the statute itself, its legislative history, applicable case law, the work of the original Firearms Evaluation Panel, and prior interpretations by ATF. In terms of the statute itself, the structure of the importation provisions would suggest a somewhat narrow interpretation. In this regard, firearms are prohibited from importation (section 922(l)) with certain specific exceptions (section 925(d)(3)). A broad interpretation which permits virtually any firearm to be imported because someone may wish to use it in some lawful shooting activity would render the statute meaningless.

As discussed earlier, the legislative history suggests a narrow meaning and indicates that the term "sporting purposes" refers to the traditional sports of target shooting, skeet and trap shooting, and hunting. Moreover, the history discussed earlier strongly suggests that Congress intended the provision to allow the importation of traditional sporting type rifles while excluding military type rifles. There is nothing in its history to indicate that it was intended to recognize every conceivable type of activity or competition which might employ a firearm. To the contrary, the history indicates that mere use in some competition would not make the rifle a sporting rifle.

Finally, the 1968 Firearms Evaluation Panel specifically addressed at least one informal shooting activity and determined that it was not a legitimate sporting purpose under the statute. The panel addressed what is commonly referred to as "plinking" (shooting at randomly selected targets such as bottles and cans). It was the Panel's view that "while many persons participated in this type of activity and much ammunition was expended in such endeavors, it was primarily a pastime and could not be considered a sport for the purposes of importation. . ."
See Attachment 3.

Based on the above, the working group determined that the term "sporting purpose" should properly be given a narrow reading. It was determined that while hunting has been a recognized rifle sport for centuries, and competitive target shooting is a recognized rifle sport, the so-called activity of plinking is not a recognized sport. Moreover, we believe that reference to sporting purposes was intended also to stand in contrast to military and law enforcement applications. Consequently, the working group does not

believe that police/combat-type competitions should be treated as sporting activities. This position is supported by the court's decision in Gilbert Equipment Company, Inc., v Higgins, 709 F. Supp. 1071 (S.D. Ala. 1989) and is consistent with prior interpretations of ATF as noted on pages 4 and 5 in discussing the Striker-12 shotgun and USAS-12 shotgun.

C. Suitability.

The final step in our review involved an evaluation of whether semiautomatic assault rifles are a type of rifle generally recognized as particularly suitable for or readily adaptable to the traditional sporting applications discussed above.

The criminal misuse of semiautomatic assault rifles is a matter of significant public concern and was an important factor in the decision to suspend their importation. Nevertheless, the working group did not consider criminal misuse as a factor in its analysis of the importability of this type of rifle. Instead, the working group confined its analysis to the question of whether this type of rifle meets the test provided in section 925(d)(3).

Rather than criminal misuse, our comprehensive examination of this issue focused on the legal analysis and technical assessment of these firearms discussed earlier. In addition, the working group used the information gathered under Items 1-7 outlined in the next section in determining whether this type of firearm is generally recognized as particularly suitable for sporting purposes. These items take into account technical and marketing data, expert opinions, the recommended uses of the firearms, and data on the actual uses for which the weapons are employed in this country.

In evaluating these firearms, we believe that all rifles which are fairly typed as semiautomatic assault rifles should be treated the same. Therefore, the fact that there may be some evidence that a particular rifle of this type is used or recommended for sporting purposes should not control its importability.[21] Rather, all findings as to suitability of these rifles as a whole should govern each rifle within this type.

This is consistent with the approach taken with respect to handguns since 1968. Although certain handguns may be used or recommended for sporting purposes, they may fall within the type of easily concealable handguns barred from importation by the administrative factoring criteria used by ATF to determine the importability of handguns. Furthermore, a pistol specifically designed for target shooting, but lacking a safety as required by the factoring criteria, would be a type of handgun prohibited from importation as not particularly suitable for sporting purposes for this reason. Finally, just as ATF allows handguns to be modified so as to meet the factoring criteria, a semiautomatic assault rifle could be modified into a sporting configuration and be importable, as was done in the case of the Valmet Hunter referred to earlier.

D. Evaluation of Information from Outside Sources

As part of our comprehensive analysis as to whether semiautomatic assault rifles meet the statutory criteria for importation, the following sources of information were also considered:

1. How has the weapon been advertised, marketed and categorized by the manufacturer and/or importer?

2. How has the use of the rifle been described by firearms technical writers?

3. What is the rifle's reported use by importers?

4. Do hunting guides recommend the rifle?

5. Do editors of hunting magazines recommend the rifle?

6. Is the rifle used in target shooting competitions?

7. Do State game commissions allow the use of the rifle to hunt?

Items 1-6 focus upon how the rifles are marketed, advertised, and recommended for use. Item 7 addresses the legal restrictions pertaining to the use of the weapons for sporting purposes.

The working group reviewed the advertising and marketing literature concerning each of the weapons (Item 1) and reviewed evaluations of the firearms by technical writers (Item 2). In addition, the working group solicited information from the importers of the weapons and other knowledgeable sources (Items 3-6).

Questionnaires were drafted and sent out to licensed hunting guides, State game and fish commissions, local hunting associations, competitive shooting groups, and hunting/shooting magazine editors to determine the extent to which the weapons are used for sporting purposes or recommended for such use. The working group believed that the actual uses of the weapons for sporting purposes would be a factor to be considered in determining whether this type of rifle meets the sporting purposes test.

The review of advertising and marketing literature indicates that these rifles are not generally marketed for hunting or competitive shooting. The review of the technical evaluations revealed that these rifles are not regarded as suitable for these sporting activities.22

To the extent that the technical evaluations made recommendations with respect to the use of the rifles suspended from importation, the majority recommended them for law enforcement or military use or for activities such as collecting, plinking, home and self-defense, and combat target shooting. Only 5 of over 50 evaluations reviewed contained recommendations for the use of these firearms for hunting purposes.

The importers were asked to submit information concerning the sporting uses of the semiautomatic rifles they import. Thirty-nine importers were asked to submit this information and 19 responded. In general, their comments were conclusory and stated that their weapons could be used for sporting purposes. A small number of importers, e.g., Gun South, Inc., and Heckler & Koch, Inc., provided more specific data showing the sporting uses made of their firearms by their customers.

Of 3 hunting associations to whom questionnaires were sent, 2 responded. They stated that they place no restrictions on the use of semiautomatic rifles by their members, on the minimum caliber of ammunition used to hunt large game, or on the number of rounds allowed in semiautomatic rifle magazines. However, over 1,800 hunting guides were sent questionnaires and, of these, 706 responded. Over 73 percent of those responding indicated that their patrons used either bolt or lever action rifles for hunting. Only 10 of the 706 guides indicated that their patrons had used any of the rifles whose importation had been temporarily suspended.

Of the 20 hunting/shooting editors to whom questionnaires were sent, 14 responded. Nine of the fourteen editors recommended semiautomatic rifles for use in hunting large game, including 5 who recommended use of any of the rifles subject to the temporary suspension. Eleven of the fourteen editors recommended semiautomatic rifles for target competitions, including 7 who recommended semiautomatic assault rifles for such use.

The recommendations of editors were contradictory. One editor pointed out that what made the assault rifle successful as a military weapon made the semiautomatic version totally unfit for any other use. On the other hand, another editor stated that semiautomatic rifles had certain advantages over conventional sporting rifles especially for the physically disabled and left-handed shooters. While this may be true, there appears to be no advantage to using a semiautomatic assault rifle as opposed to a semiautomatic sporting rifle.

A total of 54 competitive shooting groups were sent a questionnaire and 53 groups responded (some of the responses were from unsolicited groups). Fifty of these groups indicated that they sponsor high power rifle competition events. While none of the groups prohibited the use of the semiautomatic assault rifles in their competitions, none stated that any of the rifles covered by the temporary suspension were used in a specific event.

Finally, the information gathered under Item 7 reveals that most of these weapons could legally be used in most States for most hunting purposes.

The working group reviewed all of the information gathered under Items 1-6 and determined that while these weapons may legally be used for sporting purposes in most States, the evidence was compelling that, as a type of firearm, the semiautomatic assault rifle is not generally recognized as particularly suitable for sporting purposes. The working group found persuasive the technical and expert evaluations of these firearms which generally did not recommend them as particularly suitable for sporting purposes. The group was also impressed by the comments of the hunting guides which showed that these rifles were not widely used for hunting purposes. The comments of the hunting guides are consistent with the opinion of the technical experts who generally do not recommend the rifles for hunting purposes.

The opinions of the editors were fairly divided with respect to the sporting uses of these rifles. The importers generally recommended their own weapons for such uses. The competitive shooting groups indicated that the rifles could be used in certain shooting events. Thus, while there was some evidence that these rifles could be used for hunting and target shooting, there was no evidence of any widespread use for such purposes. The mere fact that they are not generally prohibited from use for sporting purposes does not mean that the rifles meet the test for importation.

CONCLUSIONS

The working group has dealt with a complex issue, the resolution of which has required the group to take into account interpretations of law, technical assessments of firearms and their physical characteristics, marketing data, the assessment of data compiled from responses to questionnaires and, finally, Bureau expertise with respect to firearms. We fully recognize that particular findings as well as the results will be controversial.

From the cross section of representation within ATF, we have brought to bear our technical, legal, and administrative expertise to resolve the issues in what we believe to be a fair manner, taking into consideration all points of view. While some of the issues were difficult to resolve, in the end we believe that the ultimate conclusion is clear and compelling. These semiautomatic assault rifles were designed and intended to be particularly suitable for combat rather than sporting applications. While these weapons can be used, and indeed may be used by some, for hunting and target shooting, we believe it is clear that they are not generally recognized as particularly suitable for these purposes.

The purpose of section 925(d)(3) was to make a limited exception to the general prohibition on the importation of firearms, to preserve the sportsman's right to sporting firearms. This decision will in no way preclude the importation of true sporting firearms. It will only prevent the importation of military-style firearms which, although popular among some gun owners for collection, self-defense, combat competitions, or plinking, simply cannot be fairly characterized as sporting rifles.

Therefore, it is the finding of the working group that the semiautomatic assault rifle is not a type of firearm generally recognized as particularly suitable for or readily adaptable to sporting purposes and that importation of these rifles should not be authorized under 18 U.S.C. § 925(d)(3).

Based on our evaluation, we recommend that the firearms listed on Attachment 7 not be authorized for importation. For the reasons discussed in this report, we recommend that the firearms listed on Attachment 8 be authorized for importation. These are the .22 rimfire caliber rifles and the Valmet Hunter which we do not believe are properly included in the category of semiautomatic assault rifles. Attachment 9 is a compilation of the responses from the questionnaires. Attachment 10 combines the criteria for identifying semiautomatic assault rifles and the items considered in assessing suitability. Attachments 11 and 12 contain the data compiled for each of the criteria listed in Attachment 10. Finally, Attachment 13 contains the source materials used in locating persons and organizations who were sent questionnaires.

NOTES

1. Paul Wahl, ed., Gun Trader's Guide, 13th Edition, (South Hackensack, NJ. 1987), 155-162.

2. Although a firearm might be recognized as "suitable" for use in traditional sports, it would not meet the statutory criteria unless it were recognized as particularly suitable for such use. Indeed, Senator Dodd made clear that the intent of the legislation was to" [regulate] the importation of firearms by excluding surplus military handguns; and rifles and shotguns that are not truly suitable for sporting purposes." 114 Cong. Rec. 13325 (1968) (Statement of Sen. Dodd) [emphasis added].

   Similarly, it is apparent that the drafters of the legislation did not intend for "sports" to include every conceivable type of activity or competition which might employ a firearm; otherwise a "sporting purpose" could be advanced for every firearm sought to be imported. For example, in response to Sen. Hansen's question concerning the meaning of "sporting purposes" in the bill which became section 925(d), Senators Dodd and Hansen engaged in the following colloquy:

   > Mr. HANSEN. Would the Olympic shooting competition be a "sporting purpose? "
   >
   > Mr. DODD. I would think so.
   >
   > Mr. HANSEN. What about trap and skeet shooting?
   >
   > Mr. DODD. I would think so. I would think trap and skeet shooting would certainly be a sporting activity.
   >
   > Mr. HANSEN. Would the Camp Perry national matches be considered a "sporting purpose?"
   >
   > Mr. DODD. Yes: that would not [sic] fall in that arena. It should be described as a sporting purpose.
   >
   > Mr. HANSEN. I understand the only difference is in the type of firearms used at Camp Perry which includes a wide variety of military types as well as commercial.

> Would all of these firearms be classified as weapons constituting a "sporting purpose?"
>
> Mr. DODD. No. I would not say so. I think when we get into that, we definitely get into military type of weapon for use in matches like these at Camp Perry; but I do not think it is generally described as a sporting weapon. It is a military weapon. I assume they have certain types of competition in which they use these military weapons as they would in an otherwise completely sporting event. I do not think that fact would change the nature of the weapon from a military to a sporting one.
>
> Mr. HANSEN. Is it not true that military weapons are used in Olympic competition also?
>
> Mr. DODD. I do not know. Perhaps the Senator can tell me. I am not well informed on that.
>
> Mr. HANSEN. It is my understanding that they are. Would the Senator be inclined to modify his response if
> I say that is true? (27461)
>
> Mr. DODD. It is not that I doubt the Senator's word. Here again I would have to say that if a military weapon is used in a special sporting event, it does not become a sporting weapon. It is a military weapon used in a special sporting event. I think the Senator would agree with that. I do not know how else we could describe it.
>
> Mr. HANSEN. <u>If I understand the Senator correctly, he said that despite the fact that a military weapon may be used in a sporting event it did not, by that action become a sporting rifle Is that correct</u>?
>
> Mr. DODD. That would seem right to me ….. As I said previously the language says no firearms will be admitted into this country unless they are genuine sporting weapons…… I think the Senator and I know what a genuine sporting gun is.

114 Cong. Rec. 27461-62 (1968).(Emphasis added.)

3. Ken Warner, ed., <u>Gun Digest 1989</u>, (Northbrook, Il. 1988), pp. 293-300; William S. Jarrett, ed., <u>Shooter's Bible, No. 80</u>, (Hackensack, NJ. 1988), pp. 345-363; Edward Clinton Ezell, <u>Small Arms of the World</u>, (Harrisburg, Pa. 1983), p. 844; Pete Dickey, "The Military Look-Alikes," <u>American Rifleman</u>, (April 1980), p. 31. Also, see generally, Ian V. Hogg, ed., <u>Jane's Infantry Weapons, 1987-88</u>, (New York 1987); Jack Lewis, ed., <u>The Gun Digest Book of Assault Weapons</u>, (Northbrook, Il. 1986).

4. Art Blatt, "Tomorrow's State-of-the-Art Sporting Rifle," <u>Guns & Ammo</u>, (July 1981), p. 48; Jarrett, pp. 345-363; Warner, pp. 293-300.

5. Daniel D. Musgrave and Thomas B.Nelson, <u>The World's Assault Rifles</u>, (Virginia, 1967), p. 1.

6. See generally, Angus Laidlaw, ed., <u>Paul Wahl's Big Gun Catalog/1</u>, (Bogota, NJ. 1988); Musgrave and Nelson; Hogg; Jarrett; and Warner.

7. Ibid.

8. Arizona, 5 rounds; Colorado, 6 rounds; Michigan 6 rounds; New Hampshire, 5 rounds; New York, 6 rounds; North Carolina, 6 rounds; North Dakota, 8 rounds; Oregon, 5 rounds; Pennsylvania, semiautomatic rifles prohibited; Vermont, 6 rounds.

9. See generally, Hogg; Musgave and Nelson; Ezell; Warner; Jarrett; Laidlaw; and Lewis.

10. Ibid.

11. Ibid.

12. Ibid.

13. Ibid.

14. Ibid.

15. Ibid.

16. Ezell, p. 844; Dickey, p. 31.

17. Musgrave and Nelson, pp. 11-29; and, see generally, Hogg; and Ezell.

18. Ezell, pp.844-866; and, see generally, Warner; Jarrett; and Laidlaw.

19. See, for example, Walter Rickell, "The Plinker's AK GunsMagazine, (July 1986) p. 21; John Lachuk, "Bantam Battle Rifles," Guns & Ammo, (January 1987), p. 37; John Lachuk, ".22 Erma Carbine," Guns & Ammo, (May 1968), p. 58; JackLewis, "Something New: The AK in Twenty-Two," Gun World, (July 1985), p. 32; Roger Combs, "A Most Unique Carbine," Gun World, (December 1985), p. 28; Garry James, "Mitchell Arms AK-22," Guns & Ammo, (November 1985), p. 72.

20. See note 2, colloquy between Senators Dodd and Hansen.

21. Ibid.

22. See generally, bibliography.

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NOTE: This information was extracted from the document titled, **"Report and Recommendation of the ATF Working Group on the Importability of Certain Semiautomatic Rifles"**, published in a memorandum to the Director, Stephen E. Higgins from the Associate Director, Daniel R. Black and approved on July 6, 1989.

Exhibit R

DEPARTMENT OF THE TREASURY

STUDY ON THE SPORTING SUITABILITY OF MODIFIED SEMIAUTOMATIC ASSAULT RIFLES

APRIL 1998

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EXECUTIVE SUMMARY

On November 14, 1997, the President and the Secretary of the Treasury ordered a review of the importation of certain modified versions of semiautomatic assault rifles into the United States.[1] The decision to conduct this review stemmed in part from concerns expressed by members of Congress and others that the rifles being imported were essentially the same as semiautomatic assault rifles previously determined to be nonimportable in a 1989 decision by the Bureau of Alcohol, Tobacco and Firearms (ATF). The decision also stemmed from the fact that nearly 10 years had passed since the last comprehensive review of the importation of rifles, and many new rifles had been developed during this time.

Under 18 U.S.C. section 925(d)(3), the Secretary shall approve applications for importation only when the firearms are generally recognized as particularly suitable for or readily adaptable to sporting purposes (the "sporting purposes test"). In 1989, ATF denied applications to import a series of semiautomatic versions of automatic-fire military assault rifles. When ATF examined these semiautomatic assault rifles, it found that the rifles, while no longer machineguns, still had a military configuration that was designed for killing and disabling the enemy and that distinguished the rifles from traditional sporting rifles. This distinctively military configuration served as the basis for ATF's finding that the rifles were not considered sporting rifles under the statute.

The military configuration identified by ATF incorporated eight physical features: ability to accept a detachable magazine, folding/telescoping stocks, separate pistol grips, ability to accept a bayonet, flash suppressors, bipods, grenade launchers, and night sights. In 1989, ATF took the position that any of these military configuration features, other than the ability to accept a detachable magazine, would make a semiautomatic rifle not importable.

Subsequent to the 1989 decision, certain semiautomatic assault rifles that failed the 1989 sporting purposes test were modified to remove all of the military configuration features other than the ability to accept a detachable magazine. Significantly, most of these modified rifles not only still had the ability to accept a detachable magazine but, more specifically, still had the ability to accept a detachable large capacity magazine that

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[1] The President and the Secretary directed that all pending and future applications for importation of these rifles not be acted upon until completion of the review. They also ordered that outstanding permits for importation of the rifles be suspended for the duration of the review period. The existence of applications to import 1 million new rifles and outstanding permits for nearly 600,000 other rifles threatened to defeat the purpose of the expedited review unless the Department of the Treasury deferred action on additional applications and temporarily suspended the outstanding permits. (See exhibit 1 for a copy of the November 14, 1997, memorandum directing this review.)

The rifles that are the subject of this review are referred to in this report as "study rifles."

was originally designed and produced for the military assault rifles from which they were derived. These magazines are referred to in this report as "large capacity military magazines." Study rifles with the ability to accept such magazines are referred to in this report as "large capacity military magazine rifles," or "LCMM rifles." It appears that only one study rifle, the VEPR caliber .308 (an AK47 variant), is not an LCMM rifle. Based on the standard developed in 1989, these modified rifles were found to meet the sporting purposes test. Accordingly, the study rifles were approved for import into the United States.

These modified rifles are the subject of the present review. Like the rifles banned in 1989, the study rifles are semiautomatic rifles based on AK47, FN-FAL, HK91 and 93, Uzi, and SIG SG550 military assault rifles. While there are at least 59 specific model designations of the study rifles, they all fall within the basic designs listed above. There are at least 39 models based on the AK47 design, 8 on the FN-FAL design, 7 on the HK91 and 93 designs, 3 on the Uzi design, and 2 on the SIG SG550 design (see exhibit 2 for a list of the models). Illustrations of some of the study rifles are included in exhibit 3 of this report.

This review takes another look at the entire matter to determine whether the modified rifles approved for importation since 1989 are generally recognized as particularly suitable for or readily adaptable to sporting purposes.[2] We have explored the statutory history of the sporting purposes test and prior administrative and judicial interpretations; reexamined the basic tenets of the 1989 decision; analyzed the physical features of the study rifles, as well as information from a wide variety of sources relating to the rifles' use and suitability for sporting purposes; and assessed changes in law that might have bearing on the treatment of the rifles.

This review has led us to conclude that the basic finding of the 1989 decision remains valid and that military-style semiautomatic rifles are not importable under the sporting purposes standard. Accordingly, we believe that the Department of the Treasury correctly has been denying the importation of rifles that had any of the distinctly military configuration features identified in 1989, other than the ability to accept a detachable magazine. Our review, however, did result in a finding that the ability to accept a detachable large capacity magazine originally designed and produced for a military assault weapon should be added to the list of disqualifying military configuration features identified in 1989.

Several important changes have occurred since 1989 that have led us to reevaluate the importance of this feature in the sporting purposes test. Most significantly, by passing the 1994 bans on semiautomatic assault weapons and large capacity ammunition feeding

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2 The study was carried out by a working group composed of ATF and Treasury representatives. The working group's activities and findings were overseen by a steering committee composed of ATF and Treasury officials.

devices, Congress sent a strong signal that firearms with the ability to expel large amounts of ammunition quickly are not sporting; rather, firearms with this ability have military purposes and are a crime problem. Specifically, Congress found that these magazines served "combat-functional ends" and were attractive to criminals because they "make it possible to fire a large number of rounds without reloading, then to reload quickly when those rounds are spent."[3] Moreover, we did not find any evidence that the ability to accept a detachable large capacity military magazine serves any sporting purpose. Accordingly, we found that the ability to accept such a magazine is a critical factor in the sporting purposes test, which must be given the same weight as the other military configuration features identified in 1989.

In addition, the information we collected on the use and suitability of LCMM rifles for hunting and organized competitive target shooting demonstrated that the rifles are not especially suitable for sporting purposes. Although our review of this information indicated that, with certain exceptions, the LCMM rifles sometimes are used for hunting, their actual use in hunting is limited. There are even some general restrictions and prohibitions on the use of semiautomatic rifles for hunting game. Similarly, although the LCMM rifles usually may be used, with certain exceptions, and sometimes are used for organized competitive target shooting, their suitability for this activity is limited. In fact, there are some restrictions and prohibitions on their use.

Furthermore, the information we gathered demonstrated that the LCMM rifles are attractive to certain criminals. We identified specific examples of the LCMM rifles' being used in violent crime and gun trafficking. In addition, we found some disturbing trends involving the LCMM rifles, including a rapid and continuing increase in crime gun trace requests after 1991 and a rapid "time to crime." Their ability to accept large capacity military magazines likely plays a role in their appeal to these criminals.

After weighing all the information collected, we found that the LCMM rifles are not generally recognized as particularly suitable for or readily adaptable to sporting purposes and are therefore not importable. However, this decision will in no way preclude the importation of true sporting firearms.

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[3] H. Rep. No. 103-489, at 18-19.

BACKGROUND

Importation of Firearms Under the Gun Control Act

The Gun Control Act of 1968 (GCA)[4] generally prohibits the importation of firearms into the United States.[5] However, the GCA creates four narrow categories of firearms that the Secretary of the Treasury shall authorize for importation. The category that is relevant to this study is found at 18 U.S.C. section 925(d)(3).

> The Secretary shall authorize a firearm . . . to be imported or brought into the United States . . . if the firearm . . .
>
> > (3) is of a type that does not fall within the definition of a firearm as defined in section 5845(a) of the Internal Revenue Code of 1954 and **is generally recognized as particularly suitable for or readily adaptable to sporting purposes**, excluding surplus military firearms, except in any case where the Secretary has not authorized the importation of the firearm pursuant to this paragraph, it shall be unlawful to import any frame, receiver, or barrel of such firearm which would be prohibited if assembled. (Emphasis added)

This provision originally was enacted, in a slightly different form, by Title IV of the Omnibus Crime Control and Safe Streets Act of 1968[6] and also was contained in Title I of the GCA, which amended Title IV later that year.

The GCA was enacted in large part "to assist law enforcement authorities in the States and their subdivisions in combating the increasing prevalence of crime in the United States." However, the Senate Report to the act also made clear that Congress did not intend the GCA to place any undue or unnecessary restrictions or burdens on responsible, law-abiding citizens with respect to acquiring, possessing, transporting, or using firearms for lawful activities.[7]

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[4] Pub. L. No. 90-618.

[5] 18 U.S.C. section 922(l).

[6] Pub. L. No. 90-351.

[7] S. Rep. No. 1501, 90th Cong. 2d Sess. 22 (1968).

Consistent with this general approach, legislative history indicates that Congress intended the importation standard provided in section 925(d)(3) to exclude military-type weapons from importation to prevent such weapons from being used in crime, while allowing the importation of high-quality sporting rifles. According to the Senate Report, section 925(d)(3) was intended to "curb the flow of surplus military weapons and other firearms being brought into the United States which are not particularly suitable for target shooting or hunting."[8] The report goes on to explain that "[t]he importation of certain foreign-made and military surplus nonsporting firearms has an important bearing on the problem which this title is designed to alleviate [crime]. Thus, the import provisions of this title seem entirely justified."[9] Indeed, during debate on the bill, Senator Dodd, the sponsor of the legislation, stated that "Title IV prohibits importation of arms which the Secretary determines are not suitable for . . . sport . . . . The entire intent of the importation section is to get those kinds of weapons that are used by criminals and have no sporting purpose."[10]

The Senate Report, however, also makes it clear that the importation standards "are designed and intended to provide for the importation of quality made, sporting firearms, including . . . rifles such as those manufactured and imported by Browning and other such manufacturers and importers of firearms."[11] (The rifles being imported by Browning at that time were semiautomatic and manually operated traditional sporting rifles of high quality.) Similarly, the report states that the importation prohibition "would not interfere with the bringing in of currently produced firearms, such as rifles . . . of recognized quality which are used for hunting and for recreational purposes."[12] The reference to recreational purposes is not inconsistent with the expressed purpose of restricting importation to firearms particularly suitable for target shooting or hunting, because firearms particularly suitable for these purposes also can be used for other purposes such as recreational shooting.

During debate on the bill, there was discussion about the meaning of the term "sporting purposes." Senator Dodd stated:

> [h]ere again I would have to say that if a military weapon is used in a

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[8] S. Rep. No. 1501, 90th Cong. 2d Sess. 22 (1968).

[9] S. Rep. No. 1501, 90th Cong. 2d Sess. 24 (1968).

[10] 114 Cong. Rec. S 5556, 5582, 5585 (1968).

[11] S. Rep. No. 1501, 90th Cong. 2d. Sess. 38 (1968).

[12] S. Rep. No. 1501, 90th Cong. 2d. Sess. 22 (1968).

> special sporting event, it does not become a sporting weapon. It is a military weapon used in a special sporting event . . . . As I said previously the language says no firearms will be admitted into this country unless they are genuine sporting weapons.[13]

Legislative history also shows that the determination of a weapon's suitability for sporting purposes is the direct responsibility of the Secretary of the Treasury. The Secretary was given this discretion largely because Congress recognized that section 925(d)(3) was a difficult provision to implement. Immediately after discussing the large role cheap imported .22 caliber revolvers were playing in crime, the Senate Report stated:

> [t]he difficulty of defining weapons characteristics to meet this target without discriminating against sporting quality firearms, was a major reason why the Secretary of the Treasury has been given fairly broad discretion in defining and administering the import prohibition.[14]

Indeed, Congress granted this discretion to the Secretary even though some expressed concern with its breadth:

> [t]he proposed import restrictions of Title IV would give the Secretary of the Treasury unusually broad discretion to decide whether a particular type of firearm is generally recognized as particularly suitable for, or readily adaptable to, sporting purposes. If this authority means anything, it permits Federal officials to differ with the judgment of sportsmen expressed through consumer preference in the marketplace . . . . [15]

Section 925(d)(3) provides that the Secretary shall authorize the importation of a firearm if it is of a "type" that is generally recognized as particularly suitable for or readily adaptable to sporting purposes. The legislative history also makes it clear that the Secretary shall scrutinize types of firearms in exercising his authority under section 925(d). Specifically, the Senate Report to the GCA states that section 925(d) "gives the

Secretary authority to permit the importation of ammunition and certain types of firearms."[16]

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[13] 114 Cong. Rec. 27461-462 (1968).

[14] S. Rep. No. 1501, 90th Cong. 2d Sess. 38 (1968).

[15] S. Rep. No. 1097, 90th Cong. 2d. Sess. 2155 (1968) (views of Senators Dirksen, Hruska, Thurmond, and Burdick). In Gun South, Inc. v. Brady, F.2d 858, 863 (11th Cir. 1989), the court, based on legislative history, found that the GCA gives the Secretary "unusually broad discretion in applying section 925(d)(3)."

[16] S. Rep. No. 1501, 90th Cong. 2d. Sess. 38 (1968).

The Senate Report to the GCA also recommended that the Secretary establish a council that would provide him with guidance and assistance in determining which firearms meet the criteria for importation into the United States.[17] Accordingly, following the enactment of the GCA, the Secretary established the Firearms Evaluation Panel (FEP) (also known as the Firearms Advisory Panel) to provide guidelines for implementation of the "sporting purposes" test. This panel was composed of representatives from the military, the law enforcement community, and the firearms industry. At the initial meeting of the FEP, it was understood that the panel's role would be advisory only.[18] The panel focused its attention on handguns and recommended the adoption of factoring criteria to evaluate the various types of handguns. These factoring criteria are based upon such considerations as overall length of the firearm, caliber, safety features, and frame construction. ATF thereafter developed an evaluation sheet (ATF Form 4590) that was put into use for evaluating handguns pursuant to section 925(d)(3). (See exhibit 4.)

The FEP did not propose criteria for evaluating rifles and shotguns under section 925(d)(3). Other than surplus military firearms, which Congress addressed separately, the rifles and shotguns being imported prior to 1968 were generally conventional rifles and shotguns specifically intended for sporting purposes. Therefore, in 1968, there was no cause to develop criteria for evaluating the sporting purposes of rifles and shotguns.

1984 Application of the Sporting Purposes Test

The first time that ATF undertook a meaningful analysis of rifles or shotguns under the sporting purposes test was in 1984. At that time, ATF was faced with a new breed of imported shotgun, and it became clear that the historical assumption that all shotguns were sporting was no longer viable. Specifically, ATF was asked to determine whether the Striker-12 shotgun was suitable for sporting purposes. This shotgun is a military/law enforcement weapon initially designed and manufactured in South Africa for riot control. When the importer was asked to submit evidence of the weapon's sporting purposes, it provided information that the weapon was suitable for police/combat-style competitions. ATF determined that this type of competition did not constitute a sporting purpose

under the statute, and that the shotgun was not suitable for the traditional shotgun sports of hunting, and trap and skeet shooting.

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[17] S. Rep. No. 1501, 90th Cong. 2d Sess. 38 (1968).

[18] Gilbert Equipment Co. v. Higgins, 709 F. Supp. 1071, 1083, n. 7 (S.D. Ala. 1989), aff'd without op., 894 F.2d 412 (11th Cir. 1990).

1986 Firearms Owners Protection Act

On May 19, 1986, Congress passed the Firearms Owners Protection Act,[19] which amended section 925(d)(3) to provide that the Secretary "shall" (instead of "may") authorize the importation of a firearm that is of a type that is generally recognized as particularly suitable for or readily adaptable to sporting purposes. The Senate Report to the law stated "it is anticipated that in the vast majority of cases, [the substitution of 'shall' for 'may' in the authorization section] will not result in any change in current practices."[20] As the courts have found, "[r]egardless of the changes made [by the 1986 law], the firearm must meet the sporting purposes test and it remains the Secretary's obligation to determine whether specific firearms satisfy this test."[21]

1986 Application of the Sporting Purposes Test

In 1986, ATF again had to determine whether a shotgun met the sporting purposes test, when the Gilbert Equipment Company requested that the USAS-12 shotgun be classified as a sporting firearm under section 925(d)(3). Again, ATF refused to recognize police/combat-style competitions as a sporting purpose. After examining and testing the weapon, ATF determined its weight, size, bulk, designed magazine capacity, configuration, and other factors prevented it from being classified as particularly suitable for or readily adaptable to the traditional shotgun sports of hunting, and trap and skeet shooting. Accordingly, its importation was denied.

When this decision was challenged in Federal court, ATF argued, in part, that large magazine capacity and rapid reloading ability are military features. The court accepted this argument, finding "the overall appearance and design of the weapon (especially the detachable box magazine . . .) is that of a combat weapon and not a sporting weapon."[22] In reaching this decision, the court was not persuaded by the importer's argument that box magazines can be lengthened or shortened depending on desired shell capacity.[23] The court also agreed with ATF's conclusion that police/combat-style competitions were not considered sporting purposes.

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19 Pub. L. No. 99-308.

20 S. Rep. No. 98-583, 98th Cong. 1st Sess. 27 (1984).

21 Gilbert Equipment Co., 709 F. Supp. at 1083.

22 Id. at 1089.

23 Id. at 1087, n. 20 and 1089.

1989 Report on the Importability of Semiautomatic Assault Rifles

In 1989, after five children were killed in a California schoolyard by a gunman with a semiautomatic copy of an AK47, ATF decided to reexamine whether certain semiautomatic assault-type rifles met the sporting purposes test. This decision was reached after consultation with the Director of the Office of National Drug Control Policy. In March and April 1989, ATF announced that it was suspending the importation of certain "assault-type rifles." For the purposes of this suspension, assault-type rifles were those rifles that generally met the following criteria: (1) military appearance; (2) large magazine capacity; and (3) semiautomatic version of a machinegun. An ATF working group was established to reevaluate the importability of these assault-type rifles. On July 6, 1989, the group issued its Report and Recommendation of the ATF Working Group on the Importability of Certain Semiautomatic Rifles (hereinafter 1989 report).

In the 1989 report, the working group first discussed whether the assault-type rifles under review fell within a "type" of firearm for the purposes of section 925(d)(3). The working group concluded that most of the assault-type rifles under review represented "a distinctive type of rifle [which it called the "semiautomatic assault rifle"] distinguished by certain general characteristics which are common to the modern military assault rifle."[24] The working group explained that the modern military assault rifle is a weapon designed for killing or disabling the enemy and has characteristics designed to accomplish this purpose. Moreover, it found that these characteristics distinguish modern military assault rifles from traditional sporting rifles.

The characteristics of the modern military assault rifle that the working group identified were as follows: (1) military configuration (which included: ability to accept a detachable magazine, folding/telescoping stocks, separate pistol grips, ability to accept a bayonet, flash suppressors, bipods, grenade launchers, and night sights) (see exhibit 5 for a thorough discussion of each of these features); (2) ability to fire automatically (i.e., as a machinegun); and (3) chambered to accept a centerfire cartridge case having a length of 2.25 inches or less.[25] In regards to the ability to accept a detachable magazine, the working group explained that:

> [v]irtually all modern military firearms are designed to accept large, detachable magazines. This provides the soldier with a fairly large ammunition supply and the ability to rapidly reload. Thus, large capacity magazines are indicative of military firearms. While detachable

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[24] 1989 report at 6.

[25] 1989 report at 6.

> magazines are not limited to military firearms, most traditional semiautomatic sporting firearms, designed to accommodate a detachable magazine, have a relatively small magazine capacity.[26]

The working group emphasized that these characteristics had to be looked at as a whole to determine whether the overall configuration of each of the assault-type rifles under review placed the rifle fairly within the semiautomatic assault rifle type. The semiautomatic assault rifles shared all the above military assault rifle characteristics other than being machineguns.[27]

The working group also addressed the scope of the term "sporting purposes." It concluded that the term should be given a narrow interpretation that focuses on the traditional sports of hunting and organized competitive target shooting. The working group made this determination by looking to the statute, its legislative history, applicable case law, the work of the FEP, and prior interpretations by ATF. In addition, the working group found that the reference to sporting purposes was intended to stand in contrast to military and law enforcement applications. Consequently, it determined that police/combat-type competitions should not be treated as sporting activities.[28]

The working group then evaluated whether the semiautomatic assault rifle type of firearm is generally recognized as particularly suitable for or readily adaptable to traditional sporting applications. This examination took into account technical and marketing data, expert opinions, the recommended uses of the firearms, and information on the actual uses for which the weapons are employed in this country. The working group, however, did not consider criminal use as a factor in its analysis of the importability of this type of firearm.

After analyzing this information, the working group concluded that semiautomatic assault rifles are not a type of firearm generally recognized as particularly suitable for or readily adaptable to sporting purposes. Accordingly, the working group concluded that semi-automatic assault rifles should not be authorized for importation under section 925(d)(3). However, the working group found that some of the assault-type rifles under review (the Valmet Hunter and .22 rimfire caliber rifles), did not fall within the semiautomatic assault rifle type. In the case of the Valmet Hunter, the working group found that although it was based on the operating mechanism of the AK47 assault rifle, it had been substantially

[26] 1989 report at 6 (footnote omitted).

[27] The semiautomatic assault rifles were semiautomatic versions of machineguns.

[28] 1989 report at 9-11.

changed so that it was similar to a traditional sporting rifle.[29] Specifically, it did not have any of the military configuration features identified by the working group, except for the ability to accept a detachable magazine.

Following the 1989 study, ATF took the position that a semiautomatic rifle with any of the eight military configuration features identified in the 1989 report, other than the ability to accept a detachable magazine, failed the sporting purposes test and, therefore, was not importable.

Gun South, Inc. v. Brady

Concurrent with its work on the 1989 report, ATF was involved in litigation with Gun South, Inc. (GSI). In October 1988 and February 1989, ATF had granted GSI permits to import AUG-SA rifles. As mentioned previously, in March and April of 1989, ATF imposed a temporary suspension on the importation of rifles being reviewed in the 1989 study, which included the AUG-SA rifle. GSI filed suit in Federal court, seeking to prohibit the Government from interfering with the delivery of firearms imported under permits issued prior to the temporary suspension.

The court of appeals found that the Government had the authority to suspend temporarily the importation of GSI's AUG-SA rifles because the GCA "impliedly authorizes" such action.[30] In addition, the court rejected GSI's contention that the suspension was arbitrary and capricious because the AUG-SA rifle had not physically changed, explaining the argument "places too much emphasis on the rifle's structure for determining whether a firearm falls within the sporting purpose exception. While the Bureau must consider the rifle's physical structure, the [GCA] requires the Bureau to equally consider the rifle's use."[31] In addition, the court found that ATF adequately had considered sufficient evidence before imposing the temporary suspension, citing evidence ATF had considered demonstrating that semiautomatic assault-type rifles were being used with increasing frequency in crime.[32]

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[29] This finding reflects the fact that the operating mechanism of the AK47 assault rifle is similar to the operating mechanism used in many traditional sporting rifles.

[30] Gun South, Inc. v. Brady, 877 F.2d 858 (11th Cir. 1989). The court of appeals issued its ruling just days before the 1989 report was issued. However, the report was complete before the ruling was issued.

[31] Id.

[32] Id.

Although GSI sued ATF on the temporary suspension of its import permits, once the 1989 report was issued, no one pursued a lawsuit challenging ATF's determination that the semiautomatic assault rifles banned from importation did not meet the sporting purposes test.[33]

Violent Crime Control and Law Enforcement Act of 1994

On September 13, 1994, Congress passed the Violent Crime Control and Law Enforcement Act of 1994,[34] which made it unlawful, with certain exceptions, to manufacture, transfer, or possess semiautomatic assault weapons as defined by the statute.[35] The statute defined semiautomatic assault weapons to include 19 named models of firearms (or copies or duplicates of the firearms in any caliber);[36] semiauto-matic rifles that have the ability to accept detachable magazines and have at least two of five features specified in the law; semiautomatic pistols that have the ability to accept detachable magazines and have at least two of five features specified in the law; and semiautomatic shotguns that have at least two of four features specified in the law.[37] However, Congress

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[33] After the 1989 report was issued, Mitchell Arms, Inc. asserted takings claims against the Government based upon the suspension and revocation of four permits allowing for the importation of semiautomatic assault rifles and ATF's temporary moratorium on import permits for other rifles. The court found for the Government, holding the injury complained of was not redressable as a taking because Mitchell Arms did not hold a property interest within the meaning of the Just Compensation Clause of the Fifth Amendment. Mitchell Arms v. United States, 26 Cl. Ct. 1 (1992), aff'd, 7 F.3d 212 (Fed. Cir. 1993), cert. denied, 511 U.S. 1106 (1994).

[34] Pub. L. No. 103-22. Title XI, Subtitle A of this act may be cited as the "Public Safety and Recreational Firearms Use Protection Act."

[35] 18 U.S.C. section 922(v).

[36] Chapter 18 U.S.C. section 921(a)(30)(A) states that the term "semiautomatic assault weapon" means "any of the firearms, or copies or duplicates of the firearms in any caliber, known as -," followed by a list of named firearms. Even though section 921(a)(3) defines "firearm" as used in chapter 18 to mean, in part, "the frame or receiver of any such weapon," the use of "firearm" in section 921(a)(30)(A) has not been interpreted to mean a frame or receiver of any of the named weapons, except when the frame or receiver actually is incorporated in one of the named weapons.

Any other interpretation would be contrary to Congress' intent in enacting the assault weapon ban. In the House Report to the assault weapon ban, Congress emphasized that the ban was to be interpreted narrowly. For example, the report explained that the present bill was more tightly focused than earlier drafts which gave ATF authority to ban any weapon which "embodies the same configuration" as the named list of guns in section 921(a)(30)(A); instead, the present bill "contains a set of specific characteristics that must be present in order to ban any additional semiautomatic assault weapons [beyond the listed weapons]." H. Rep. 103-489 at 21.

[37] 18 U.S.C. section 921(a)(30).

exempted from the assault weapon ban any semiautomatic rifle that cannot accept a detachable magazine that holds more than five rounds of ammunition and any semiautomatic shotgun that cannot hold more than five rounds of ammunition in a fixed or detachable magazine.[38]

Although the 1994 law was not directly addressing the sporting purposes test in section 925(d)(3), section 925(d)(3) had a strong influence on the law's content. The technical work of ATF's 1989 report was, to a large extent, incorporated into the 1994 law. The House Report to the 1994 law explained that although the legal question of whether semiautomatic assault weapons met section 925(d)(3)'s sporting purposes test "is not directly posed by [the 1994 law], the working group's research and analysis on assault weapons is relevant on the questions of the purposes underlying the design of assault weapons, the characteristics that distinguish them from sporting guns, and the reasons underlying each of the distinguishing features."[39] As in the 1989 study, Congress focused on the external features of firearms, rather than on their semiautomatic operating mechanism.

The 1994 law also made it unlawful to possess and transfer large capacity ammunition feeding devices manufactured after September 13, 1994.[40] A large capacity ammunition feeding device was generally defined as a magazine, belt, drum, feed strip, or similar device that has the capacity of, or that can be readily restored or converted to accept, more than 10 rounds of ammunition.[41]

Congress passed these provisions of the 1994 law in response to the use of semiautomatic assault weapons and large capacity ammunition feeding devices in crime. Congress had been presented with much evidence demonstrating that these weapons were "the weapons of choice among drug dealers, criminal gangs, hate groups, and mentally deranged persons bent on mass murder."[42] The House Report to the 1994 law recounts numerous crimes that had occurred involving semiautomatic assault weapons and large capacity magazines that were originally designed and produced for military assault rifles.[43]

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[38] 18 U.S.C. sections 922(v)(3)(C)&(D).

[39] H. Rep. No. 103-489, at 17, n. 19.

[40] 18 U.S.C. section 922(w).

[41] 18 U.S.C. section 921(a)(31).

[42] H. Rep. No. 103-489, at 13.

[43] H. Rep. No. 103-489, at 14-15.

In enacting the semiautomatic assault weapon and large capacity ammunition feeding device bans, Congress emphasized that it was not preventing the possession of sporting firearms. The House Report, for example, stated that the bill differed from earlier bills in that "it is designed to be more tightly focused and more carefully crafted to clearly exempt legitimate sporting guns."[44] In addition, Congress specifically exempted 661 long guns from the assault weapon ban which are "most commonly used in hunting and recreational sports."[45]

Both the 1994 law and its legislative history demonstrate that Congress recognized that ammunition capacity is a factor in determining whether a firearm is a sporting firearm. For example, large capacity ammunition feeding devices were banned, while rifles and shotguns with small ammunition capacities were exempted from the assault weapon ban. Moreover, the House Report specifically states that the ability to accept a large capacity magazine was a military configuration feature which was not "merely cosmetic," but "serve[d] specific, combat-functional ends."[46] The House Report also explains that, while "[m]ost of the weapons covered by the [ban] come equipped with magazines that hold 30 rounds [and can be replaced with magazines that hold 50 or even 100 rounds], . . . [i]n contrast, hunting rifles and shotguns typically have much smaller magazine capabilities--from 3-5."[47]

Finally, it must be emphasized that the semiautomatic assault weapon ban of section 922(v) is distinct from the sporting purposes test governing imports of section 925(d)(3). Clearly, any weapon banned under section 922(v) cannot be imported into the United States because its possession in the United States would be illegal. However, it is possible that a weapon not defined as a semiautomatic assault weapon under section 922(v) still would not be importable under section 925(d)(3). In order to be importable, the firearm must be of a type generally recognized as particularly suitable for or readily adaptable to sporting purposes regardless of its categorization under section 922(v). The

Secretary's discretion under section 925(d)(3) remains intact for all weapons not banned by the 1994 statute.

<u>The Present Review</u>

Prior to the November 14, 1997, decision to conduct this review, certain members of

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[44] H. Rep. No. 103-489, at 21.

[45] H. Rep. No. 103-489, at 20. None of these 661 guns are study rifles.

[46] H. Rep. No. 103-489, at 18.

[47] H. Rep. No. 103-489, at 19 (footnote omitted).

Congress strongly urged that it was necessary to review the manner in which the Treasury Department is applying the sporting purposes test to the study rifles, in order to ensure that the present practice is consistent with section 925(d)(3) and current patterns of gun use. The fact that it had been nearly 10 years since the last comprehensive review of the importation of rifles (with many new rifles being developed during this time) also contributed to the decision to conduct this review.

DEFINING THE TYPE OF WEAPON UNDER REVIEW

Section 925 (d) (3) provides that the Secretary shall authorize the importation of a firearm if it is of a “type” that meets the sporting purposes test. Given this statutory mandate, we had to determine whether the study rifles suspended from importation fell within one type of firearm. Our review of the study rifles demonstrated that all were derived from semiautomatic assault rifles that failed to meet the sporting purposes test in 1989 but were later found to be importable when certain military features were removed.

Within this group, we determined that virtually all of the study rifles shared another important feature: The ability to accept a detachable large capacity magazine (e.g., more than 10 rounds) that was originally designed and produced for one of the following military assault rifles: AK47, FN-FAL, HK91 or 93, SIG SG550, or Uzi. (This is the only military configuration feature cited in the 1989 study that remains with any of the study rifles).

We determined that all of the study rifles that shared both of these characteristics fell within a type of firearm which, for the purposes of this report, we call “large capacity military magazine rifles” or “LCMM rifles.” It appears that only one study rifle, the VEPR caliber .308--which is based on the AK47 design--does not fall within this type because it does not have the ability to accept a large capacity military magazine.

SCOPE OF "SPORTING PURPOSES"

As in the 1989 study, we had to determine the scope of "sporting purposes" as used in section 925(d)(3). Looking to the statute, its legislative history, the work of the Firearms Evaluation Panel (see exhibit 6), and prior ATF interpretations, we determined sporting purposes should be given a narrow reading, incorporating only the traditional sports of hunting and organized competitive target shooting (rather than a broader interpretation that could include virtually any lawful activity or competition.)

In terms of the statute itself, the structure of the importation provisions suggests a somewhat narrow interpretation. Firearms are prohibited from importation (section 922(l)), with four specific exceptions (section 925(d)). A broad interpretation permitting a firearm to be imported because someone may wish to use it in some lawful shooting activity would render the general prohibition of section 922(l) meaningless.

Similarly, as discussed in the "Background" section, the legislative history of the GCA indicates that the term sporting purposes narrowly refers to the traditional sports of hunting and organized competitive target shooting. There is nothing in the history to indicate that it was intended to recognize every conceivable type of activity or competition that might employ a firearm.

In addition, the FEP specifically addressed the informal shooting activity of "plinking" (shooting at randomly selected targets such as bottles and cans) and determined that it was not a legitimate sporting purpose under the statute. The panel found that, "while many persons participate in this type of activity and much ammunition was expended in such endeavors, it was primarily a pastime and could not be considered a sport for the purposes of importation. . . ." (See exhibit 6.)

Finally, the 1989 report determined that the term sporting purposes should be given a narrow reading incorporating the traditional rifle sports of hunting and organized competitive target shooting. In addition, the report determined that the statute's reference to sporting purposes was intended to stand in contrast with military and law enforcement applications. This is consistent with ATF's interpretation in the context of the Striker-12 shotgun and the USAS-12 shotgun. It is also supported by the court's decision in Gilbert Equipment Co. v. Higgins.

We received some comments urging us to find "practical shooting" is a sport for the purposes of section 925(d)(3).[48] Further, we received information showing that practical shooting is gaining in popularity in the United States and is governed by an organization that has sponsored national events since 1989. It also has an international organization.

While some may consider practical shooting a sport, by its very nature it is closer to police/combat-style competition and is not comparable to the more traditional types of sports, such as hunting and organized competitive target shooting. Therefore, we are not convinced that practical shooting does, in fact, constitute a sporting purpose under section 925(d)(3).[49] However, even if we were to assume for the sake of argument that practical shooting is a sport for the purposes of the statute, we still would have to decide whether a firearm that could be used in practical shooting meets the sporting purposes test. In other words, it still would need to be determined whether the firearm is of a type that is generally recognized as particularly suitable for or readily adaptable to practical shooting and other sporting purposes.[50] Moreover, the legislative history makes clear that the use of a military weapon in a practical shooting competition would not make that weapon

[48] Practical shooting involves moving, identifying, and engaging multiple targets and delivering a num ber of shots rapidly. In doing this, practical shooting participants test their defensive skills as they encounter props, including walls and barricades, with full or partial targets, "no-shoots," steel reaction targets, movers, and others to challenge them.

[49] As noted earlier, ATF has taken the position that police/combat-style competitions do not constitute a "sporting purpose." This position was upheld in Gilbert Equipment Co., 709 F. Supp. at 1077.

[50] Our findings on the use and suitability of the LCMM rifles in practical shooting competitions are contained in the "Suitability for Sporting Purposes" section of this report.

sporting: "if a military weapon is used in a special sporting event, it does not become a sporting weapon. It is a military weapon used in a special sporting event."[51] While none of the LCMM rifles are military weapons, they still retain the military feature of the ability to accept a large capacity military magazine.

[51] 114 Cong. Rec. 27461-462 (1968) (Sen. Dodd).

METHOD OF STUDY

As explained in the "Executive Summary" section of this report, the purpose of this study is to review whether modified semiautomatic assault rifles are properly importable under 18 U.S.C. section 925(d)(3). More specifically, we reexamined the conclusions of the 1989 report as applied today to determine whether we are correct to allow importation of the study rifles that have been modified by having certain military features removed. To determine whether such rifles are generally recognized as particularly suitable for or readily adaptable to sporting purposes, the Secretary must consider both the physical features of the rifles and the actual uses of the rifles.[52] Because it appears that all of the study rifles that have been imported to date have the ability to accept a large capacity military magazine,[53] all of the information collected on the study rifles' physical features and actual uses applies only to the LCMM rifles.

Physical features:

The discussion of the LCMM rifles' physical features are contained in the "Suitability for Sporting Purposes" section of this report.

Use:

We collected relevant information on the use of the LCMM rifles. Although the 1989 study did not consider the criminal use of firearms in its importability analysis, legislative history demonstrates and the courts have found that criminal use is a factor that can be considered in determining whether a firearm meets the requirements of section 925(d)(3).[54] Accordingly, we decided to consider the criminal use of the LCMM rifles in the present analysis.

The term "generally recognized" in section 925(d)(3) indicates that the Secretary should base his evaluation of whether a firearm is of a type that is particularly suitable for or readily adaptable to sporting purposes, in part, on a "community standard" of the firearm's use.[55] The community standard "may change over time even though the firearm remains the same. Thus, a changing pattern of use may significantly affect whether a firearm is generally recognized as particularly suitable for or readily adaptable to a sporting purpose."[56] Therefore, to assist the Secretary in determining whether the LCMM rifles presently are of a type generally recognized as particularly suitable for or readily adaptable to sporting purposes, we gathered information from the relevant "community." The relevant community was defined as persons and groups who are

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52 Gun South, Inc., 877 F.2d at 866.

53 The VEPR caliber .308 discussed on page 16 has not yet been imported.

54 114 Cong. Rec. S 5556, 5582, 5585 (1968)("[t]he entire intent of the importation section [of the sporting purposes test] is to get those kinds of weapons that are used by criminals and have no sporting purposes") (Sen. Dodd); Gun South, Inc., 877 F.2d at 866.

55 Gun South, Inc., 877 F.2d at 866.

56 Id.

knowledgeable about the uses of these firearms or have relevant information about whether these firearms are particularly suitable for sporting purposes. We identified more than 2,000 persons or groups we believed would be able to provide relevant, factual information on these issues. The individuals and groups were selected to obtain a broad range of perspectives on the issues. We conducted surveys to obtain specific information from hunting guides, editors of hunting and shooting magazines, organized competitive shooting groups, State game commissions, and law enforcement agencies and organizations. Additionally, we asked industry members, trade associations, and various interest and information groups to provide relevant information.[57] A detailed presentation of the surveys and responses is included as an appendix to this report.

We also reviewed numerous advertisements and publications, both those submitted by the editors of hunting and shooting magazines and those collected internally, in our search for material discussing the uses of the LCMM rifles. Further, we collected importation data, tracing data, and case studies.[58]

Our findings on use are contained in the "Suitability for Sporting Purposes" section of this report.

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57 **Hunting guides**: Guides were asked about specific types of firearms used by their clients. The guides were an easily definable group, versus the entire universe of hunters. We obtained the names of the hunting guides surveyed from the States.

Editors of hunting and shooting magazines: Editors were surveyed to determine whether they recommended the LCMM rifles for hunting or organized competitive target shooting and whether they had written any articles on the subject. The list of editors we surveyed was obtained from a directory of firearms-related organizations.

Organized competitive shooting groups: Organized groups were asked whether they sponsored competitive events with high-power semiautomatic rifles and whether the LCMM rifles were allowed in those competitions. We felt it was significant to query those who are involved with organized events rather than unofficial activities with no specific rules or guidelines. As with the editors above, the list of groups was obtained from a directory of firearms-related organizations.

State game commissions: State officials were surveyed to determine whether the use of the LCMM rifles was prohibited or restricted for hunting in each State.

Law enforcement agencies and organizations: Specific national organizations and a sampling of 26 police departments across the country were contacted about their knowledge of the LCMM rifles' use in crime. The national organizations were surveyed with the intent that they would gather input from the wide range of law enforcement agencies that they represent or that they would have access to national studies on the subject.

Industry members and trade associations: These groups were included because of their knowledge on the issue.

Interest and information groups: These organizations were included because of their wide range of perspectives on the issue.

58 To assist us with our review of the crime-related information we collected, we obtained the services of Garen J. Wintemute, MD, M.P.H. Director of the Violence Prevention Research Program, University of California, Davis, and Anthony A. Braga, Ph.D., J.F.K. School of Government, Harvard University.

SUITABILITY FOR SPORTING PURPOSES

The next step in our review was to evaluate whether the LCMM rifles, as a type, are generally recognized as particularly suitable for or readily adaptable to hunting and organized competitive target shooting.[59] The standard applied in making this determination is high. It requires more than a showing that the LCMM rifles may be used or even are sometimes used for hunting and organized competitive target shooting; if this were the standard, the statute would be meaningless. Rather, the standard requires a showing that the LCMM rifles are especially suitable for use in hunting and organized competitive target shooting.

As discussed in the "Method of Study" section, we considered both the physical features of the LCMM rifles and the actual uses of the LCMM rifles in making this determination.

Physical Features

The ability to accept a detachable large capacity magazine that was originally designed and produced for one of the following military assault rifles: AK47, FN-FAL, HK91 or 93, SIG SG550, or Uzi.

Although the LCMM rifles have been stripped of many of their military features, they all still have the ability to accept a detachable large capacity magazine that was originally designed and produced for one of the following military assault rifles: AK47, FN-FAL, HK91 and 93, SIG SG550, or Uzi; in other words, they still have a feature that was designed for killing or disabling an enemy. As the 1989 report explains:

> Virtually all modern military firearms are designed to accept large, detachable magazines. This provides the soldier with a fairly large ammunition supply and the ability to rapidly reload. Thus, large capacity magazines are indicative of military firearms. While detachable magazines are not limited to military firearms, most traditional

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[59] One commenter suggests that the Secretary has been improperly applying the "readily adaptable to sporting purposes" provision of the statute. Historically, the Secretary has considered the "particularly suitable for or readily adaptable to" provisions as one standard. The broader interpretation urged by the commenter would make the standard virtually unenforceable. If the Secretary allowed the importation of a firearm which is readily adaptable to sporting purposes, without requiring it actually to be adapted prior to importation, the Secretary would have no control over whether the adaptation actually would occur following the importation.

> semiautomatic sporting firearms, designed to accommodate a detachable magazine, have a relatively small magazine capacity.[60]

Thus, the 1989 report found the ability to accept a detachable large capacity magazine originally designed and produced for a military assault rifle was a military, not a sporting, feature. Nevertheless, in 1989 it was decided that the ability to accept such a large capacity magazine, in the absence of other military configuration features, would not be viewed as disqualifying for the purposes of the sporting purposes test. However, several important developments, which are discussed below, have led us to reevaluate the weight that should be given to the ability to accept a detachable large capacity military magazine in the sporting purposes test.

Most significantly, we must reevaluate the significance of this military feature because of a major amendment that was made to the GCA since the 1989 report was issued. In 1994, as discussed in the "Background" section of this report, Congress passed a ban on large capacity ammunition feeding devices and semiautomatic assault weapons.[61] In enacting these bans, Congress made it clear that it was not preventing the possession of sporting firearms.[62] Although the 1994 law was not directly addressing the sporting purposes test, section 925(d)(3) had a strong influence on the law's content. As discussed previously, the technical work of ATF's 1989 report was, to a large extent, incorporated into the 1994 law.

Both the 1994 law and its legislative history demonstrate that Congress found that ammunition capacity is a factor in whether a firearm is a sporting firearm. For example, large capacity ammunition feeding devices were banned, while rifles and shotguns with small ammunition capacities were exempted from the assault weapon ban. In other words, Congress found magazine capacity to be such an important factor that a semiautomatic rifle that cannot accept a detachable magazine that holds more than five rounds of ammunition will not be banned, even if it contains all five of the assault

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[60] 1989 report at 6 (footnote omitted). This was not the first time that ATF considered magazine capacity to be a relevant factor in deciding whether a firearm met the sporting purposes test. See Gilbert Equipment Co., 709 F. Supp. at 1089 ("the overall appearance and design of the weapon (especially the detachable box magazine . . .) is that of a combat weapon and not a sporting weapon."

[61] The ban on large capacity ammunition feeding devices does not include any such device manufactured on or before September 13, 1994. Accordingly, there are vast numbers of large capacity magazines originally designed and produced for military assault weapons that are legal to transfer and possess ("grandfathered" large capacity military magazines). Presently these grandfathered large capacity military magazines fit the LCMM rifles.

[62] See, for example, H. Rep. No. 103-489, at 21.

weapon features listed in the law. Moreover, unlike the assault weapon ban in which a detachable magazine and at least two physical features are required to ban a rifle, a large capacity magazine in and of itself is banned.

In addition, the House Report specifically states that the ability to accept a large capacity magazine is a military configuration characteristic that is not "merely cosmetic," but "serve[s] specific, combat-functional ends."[63] The House Report also explains that large capacity magazines

> make it possible to fire a large number of rounds without re-loading, then to reload quickly when those rounds are spent. Most of the weapons covered by the proposed legislation come equipped with magazines that hold 30 rounds. Even these magazines, however, can be replaced with magazines that hold 50 or even 100 rounds. Furthermore, expended magazines can be quickly replaced, so that a single person with a single assault weapon can easily fire literally hundreds of rounds within minutes. . . . In contrast, hunting rifles and shotguns typically have much smaller magazine capabilities--from 3-5.[64]

Congress specifically exempted 661 long guns from the assault weapon ban that are "most commonly used in hunting and recreational sports."[65] The vast majority of these long guns do not use large capacity magazines. Although a small number of the exempted long guns have the ability to accept large capacity magazines, only four of these exempted long guns were designed to accept large capacity military magazines.[66]

The 1994 law also demonstrates Congress' concern about the role large capacity magazines and firearms with the ability to accept these large capacity magazines play in

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63 H. Rep. No. 103-489, at 18.

64 H. Rep. No. 103-489, at 19 (footnote omitted). The fact that 12 States place a limit on the magazine capacity allowed for hunting, usually 5 or 6 rounds, is consistent with this analysis. (See exhibit 7).

65 H. Rep. 103-489, at 20.

66 These four firearms are the Iver Johnson M-1 carbine, the Iver Johnson 50th Anniversary M-1 carbine, the Ruger Mini-14 autoloading rifle (without folding stock), and the Ruger Mini Thirty rifle. All of these weapons are manufactured in the United States and are not the subject of this study. In this regard, it should also be noted that Congress can distinguish between domestic firearms and foreign firearms and impose different requirements on the importation of firearms. For example, Congress may ban the importation of certain firearms although similar firearms may be produced domestically. See, for example, B-West Imports v. United States, 75 F.3d 633 (Fed. Cir. 1996).

crime. The House Report for the bill makes reference to numerous crimes involving these magazines and weapons, including the following:[67]

> The 1989 Stockton, California, schoolyard shooting in which a gunman with a semiautomatic copy of an AK47 and 75-round magazines fired 106 rounds in less than 2 minutes. Five children were killed and twenty-nine adults and children were injured.
>
> The 1993 shooting in a San Francisco, California, office building in which a gunman using 2 TEC DC9 assault pistols with 50-round magazines killed 8 people and wounded 6 others.
>
> A 1993 shooting on the Long Island Railroad that killed 6 people and wounded 19 others. The gunman had a Ruger semiautomatic pistol, which he reloaded several times with 15-round magazines, firing between 30 to 50 rounds before he was overpowered.

The House Report also includes testimony from a representative of a national police officers' organization, which reflects the congressional concern with criminals' access to firearms that can quickly expel large amounts of ammunition:

> In the past, we used to face criminals armed with a cheap Saturday Night Special that could fire off six rounds before [re]loading. Now it is not at all unusual for a cop to look down the barrel of a TEC-9 with a 32 round clip. The ready availability of and easy access to assault weapons by criminals has increased so dramatically that police forces across the country are being required to upgrade their service weapons merely as a matter of self-defense and preservation. The six-shot .38 caliber service revolver, standard law enforcement issue for years, is just no match against a criminal armed with a semiautomatic assault weapon.[68]

Accordingly, by passing the 1994 law, Congress signaled that firearms with the ability to accept detachable large capacity magazines are not particularly suitable for sporting purposes. Although in 1989 we found the ability to accept a detachable large capacity military magazine was a military configuration feature, we must give it more weight, given this clear signal from Congress.

The passage of the 1994 ban on large capacity magazines has had another effect. Under the 1994 ban, it generally is unlawful to transfer or possess a large capacity magazine

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[67] H. Rep. No. 103-489, at 15 (two of these examples involve handguns).

[68] H. Rep. 103-489, at 13-14 (footnote omitted).

manufactured after September 13, 1994. Therefore, if we require the LCMM rifles to be modified so that they do not accept a large capacity military magazine in order to be importable, a person will not be able to acquire a newly manufactured large capacity magazine to fit the modified rifle. Thus, the modified rifle neither will be able to accept a grandfathered large capacity military magazine, nor can a new large capacity magazine be manufactured to fit it. Accordingly, today, making the ability to accept a large capacity military magazine disqualifying for importation will prevent the importation of firearms which have the ability to expel large amounts of ammunition quickly without reloading.

This was not the case in 1989 or prior to the 1994 ban.

It is important to note that even though Congress reduced the supply of large capacity military magazines by passing the 1994 ban, there are still vast numbers of grandfathered large capacity military magazines available that can be legally possessed and transferred. These magazines currently fit in the LCMM rifles. Therefore, the 1994 law did not eliminate the need to take further measures to prevent firearms imported into the United States from having the ability to accept large capacity military magazines, a nonsporting factor.

Another impetus for reevaluating the existing standard is the development of modified weapons. The 1989 report caused 43 different models of semiautomatic assault rifles to be banned from being imported into the United States. The effect of that determination was that nearly all semiautomatic rifles with the ability to accept detachable large capacity military magazines were denied importation. Accordingly, at the time, there was no need for the ability to accept such a magazine to be a determining factor in the sporting purposes test. This is no longer the case. As discussed earlier, manufacturers have modified the semiautomatic assault rifles disallowed from importation in 1989 by removing all of their military configuration features, except for the ability to accept a detachable magazine. As a result, semiautomatic rifles with the ability to accept detachable large capacity military magazines (and therefore quickly expel large amounts of ammunition) legally have been entering the United States in significant numbers. Accordingly, the development of these modified weapons necessitates reevaluating our existing standards.

Thus, in order to address Congress' concern with firearms that have the ability to expel large amounts of ammunition quickly, particularly in light of the resumption of these weapons coming into the United States, the ability to accept a detachable large capacity military magazine must be given greater weight in the sporting purposes analysis of the LCMM rifles than it presently receives.[69]

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[69] A firearm that can be easily modified to accept a detachable large capacity military magazine with only minor adjustments to the firearm or the magazine is considered to be a firearm with the ability to accept these magazines. The ROMAK4 is an example of such a firearm: With minor modifications to either the

Derived from semiautomatic assault rifles that failed to meet the sporting purposes test in 1989 but were later found importable when certain military features were removed.

All rifles that failed to meet the sporting purposes test in 1989 were found to represent a distinctive type of rifle distinguished by certain general characteristics that are common to the modern military assault rifle. Although the LCMM rifles are based on rifle designs excluded from importation under the 1989 standard, they all were approved for import when certain military features were removed. However, the LCMM rifles all still maintain some characteristics common to the modern military assault rifle. Because the outward appearance of most of the LCMM rifles continues to resemble the military assault rifles from which they are derived, we have examined the issue of outward appearance carefully. Some might prefer the rugged, utilitarian look of these rifles to more traditional sporting guns. Others might recoil from using these rifles for sport because of their nontraditional appearance. In the end, we concluded that appearance alone does not affect the LCMM rifles' suitability for sporting purposes. Available information leads us to believe that the determining factor for their use in crime is the ability to accept a detachable large capacity military magazine.

Use

In the 1989 study, ATF found that all rifles fairly typed as semiautomatic assault rifles should be treated the same. Accordingly, the report stated "[t]he fact that there may be some evidence that a particular rifle of this type is used or recommended for sporting purposes should not control its importability. Rather, all findings as to suitability of these rifles as a whole should govern each rifle within this type."[70] We adopt the same approach for the present study.

Use for hunting:

The information we collected on the actual use of the LCMM rifles for hunting medium or larger game suggests that, with certain exceptions, the LCMM rifles sometimes are used for hunting; however, their actual use in hunting is limited.[71] In fact, there are some

firearm or a large capacity magazine that was originally designed and produced for a semiautomatic assault rifle based on the AK47 design, the ROMAK4 has the ability to accept the magazine.

70 1989 report at 11.

71 We targeted the surveys toward the hunting of medium and larger game (e.g., turkey and deer) because the LCMM rifles chamber centerfire cartridges and therefore likely would be most suitable for hunting this type of game. We also learned that the LCMM rifles were used to shoot certain varmints (e.g., coyotes and groundhogs), which are generally considered to be pests, not game. Many commented that the LCMM

general restrictions and prohibitions on the use of any semiautomatic rifle for hunting game. Almost half of the States place restrictions on the use of semiautomatic rifles in hunting, mostly involving magazine capacity (5-6 rounds) and what can be hunted with the rifles (see exhibit 7).

Of the 198 hunting guides who responded to our survey, only 26 stated that they had clients who used the LCMM rifles on hunting trips during the past 2 hunting seasons and only 10 indicated that they recommend the LCMM rifles for hunting. In contrast, the vast majority of the guides (152) indicated that none of their clients used the LCMM rifles on hunting trips during the past 2 hunting seasons. In addition, the hunting guides indicated that the most common semiautomatic rifles used by their clients were those made by Browning and Remington.[72] We found significant the comments of the hunting guides indicating that the LCMM rifles were not widely used for hunting.

Of the 13 editors of hunting and shooting magazines who responded to our survey, only 2 stated that their publications recommend specific types of centerfire semiautomatic rifles for use in hunting medium or larger game. These two respondents stated that they recommend all rifles that are safe and of appropriate caliber for hunting, including the LCMM rifles. However, they did not recommend the LCMM rifles based on the Uzi design for hunting big game; these rifles use a 9mm cartridge, which is not an appropriate caliber for this type of game, according to the editors. It is important to note that the LCMM rifles use different cartridges. The LCMM rifles based on the FN-FAL, SIG SG550, and HK91 and 93 designs are chambered for either the .308 Winchester cartridge or the .223 Remington cartridge, depending on the specific model; the LCMM rifles based on the Uzi design are chambered for the 9mm Parabellum cartridge; and the majority of the LCMM rifles based on the AK47 design are chambered for the 7.62 x 39mm cartridge (some are chambered for the .223 Remington cartridge).

Of the five interest and information groups that responded to our survey, three supported the use of the LCMM rifles for hunting. However, one of these groups stated that the

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rifles were particularly useful on farms and ranches because of their ruggedness, utilitarian design, and reliability.

72 According to a 1996 study conducted for the Fish and Wildlife Service, only 2 percent of big game hunters surveyed used licensed hunting guides. Therefore, it should be noted that the information provided by the guides we surveyed may not be representative of all hunters. However, we believe that the hunting guides' information is reliable and instructive because of their high degree of experience with and knowledge of hunting.

ammunition used by the LCMM rifle models based on the Uzi design were inadequate for shooting at long distances (i.e., more than 100 yards).

Out of the 70 published articles reviewed from various shooting magazines, only 5 contained relevant information. One of these five articles stated that, in the appropriate calibers, the LCMM rifles could make "excellent" hunting rifles. Two of the articles stated that the 7.62 x 39mm cartridge (used in LCMM rifles based on the AK47 design) could be an effective hunting cartridge. One of the articles that recommended the rifles also recommended modifications needed to improve their performance in hunting. None of the articles suggested that LCMM rifles based on the Uzi design were good hunting rifles. Thus, although the LCMM rifles could be used in hunting, the articles provided limited recommendations for their use as hunting weapons.

In their usage guides, ammunition manufacturers recommend the .308 and the 7.62 x 39mm cartridges (used in LCMM rifles based on the FN-FAL and HK 91 designs, and the AK47 design respectively) for medium game hunting. However, the usage guides do not identify the 9mm cartridge (used in the Uzi design rifles) as being suitable for hunting.

A majority of the importers who provided information said that the LCMM rifles they import are used for hunting deer and similar animals. However, they provided little evidence that the rifles were especially suitable for hunting these animals. Two of the importers who responded also provided input from citizens in the form of letters supporting this position. The letters show a wide variety of uses for the LCMM rifles, including deer hunting, plinking, target shooting, home defense, and competitive shooting.

Our review of all of this information indicates that while these rifles are used for hunting medium and larger game, as well as for shooting varmints, the evidence was not persuasive that there was widespread use for hunting. We did not find any evidence that the ability to accept a large capacity military magazine serves any hunting purpose. Traditional hunting rifles have much smaller magazine capabilities. Furthermore, the mere fact that the LCMM rifles are used for hunting does not mean that they are particularly suitable for hunting or meet the test for importation.

Use for organized competitive target shooting:

Of the 31 competitive shooting groups we surveyed that stated they have events using high-power semiautomatic rifles, 18 groups stated that they permit the use of the LCMM rifles for all competitions. However, 13 respondents stated that they restrict or prohibit the LCMM rifles for some competitions, and one group stated that it prohibits the LCMM rifles for all competitions. These restrictions and prohibitions generally were enacted for the following reasons:

1. High-power rifle competitions generally require accuracy at ranges beyond the capabilities of the 9mm cartridge, which is used by the LCMM rifles based on the Uzi design.

2. The models based on the AK47 design are limited to competitions of 200 yards or less because the 7.62 x 39mm cartridge, which is used by these models, generally has an effective range only between 300 and 500 yards.

3. Certain matches require U.S. military service rifles, and none of the LCMM rifles fall into this category.

The LCMM rifles are permitted in all United States Practical Shooting Association (USPSA) rifle competitions. The USPSA Practical Shooting Handbook, Glossary of Terms, states that "[y]ou can use any safe firearm meeting the minimum caliber (9mm/.38) and power factor (125PF) requirements." The USPSA has stated that "rifles with designs based on the AR15, AK47, FN-FAL, HK91, HK93, and others are allowed and must be used to be competitive." Moreover, we received some information indicating that the LCMM rifles actually are used in practical shooting competitions.[73] However, we did not receive any information demonstrating that an LCMM rifle's ability to accept large capacity military magazines was necessary for its use in practical shooting competitions.

A couple of the interest groups recommended the LCMM rifles for organized competitive target shooting.

None of the 70 published articles read mentioned the use of the LCMM rifles in organized competitive target shooting.

All of the major ammunition manufacturers produce .308 Winchester ammunition (which is used in the LCMM rifle models based on the HK 91 and FN-FAL designs) and .223 Remington ammunition (which is used in the HK 93, the SIG SG550, and some of the study rifle models based on the AK47 design) specifically for competitive shooting for rifles. The major manufacturers and advertisers of 9mm ammunition (which is used in the LCMM rifles based on the Uzi design) identify it as being suitable for pistol target shooting and self-defense.

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[73] Merely because a rifle is used in a sporting competition, the rifle does not become a sporting rifle. 114 Cong. Rec. 27461-462 (1968).

A majority of the importers who provided information stated that the LCMM rifles they import are permitted in and suitable for organized competitive target shooting. Two of the importers who responded also provided input from citizens in the form of letters and petitions supporting this position. However, the importers provided little evidence that the rifles were especially suitable for organized competitive target shooting.

The information collected on the actual use of the LCMM rifles for organized competitive target shooting suggests that, with certain exceptions, the LCMM rifles usually may be used and sometimes are used for organized competitive target shooting; however, their suitability for this activity is limited. In fact, there are some restrictions and prohibitions on their use. The use of the rifles in competitive target shooting appears more widespread than for hunting and their use for practical shooting was the most significant. Although we are not convinced that practical shooting does in fact constitute a sporting purpose under section 925(d), we note that there was no information demonstrating that rifles with the ability to accept detachable large capacity military magazines were necessary for use in practical shooting. Once again, the presence of this military feature on LCMM rifles suggests that they are not generally recognized as particularly suitable for or readily adaptable to sporting purposes.

Use in crime:

To fully understand how the LCMM rifles are used, we also examined information available to us on their use in crime. Some disturbing trends can be identified, and it is clear the LCMM rifles are attractive to criminals.

The use of LCMM rifles in violent crime and firearms trafficking is reflected in the cases cited below. It should be noted that the vast majority of LCMM rifles imported during the period 1991-1997 were AK47 variants, which explains their prevalence in the cited cases.

North Philadelphia, Pennsylvania

From April 1995 to November 1996, a convicted felon used a straw purchaser to acquire at least 55 rifles, including a number of MAK90s. The rifles were then trafficked by the prohibited subject to individuals in areas known for their high crime rates. In one case, the rifles were sold from the parking lot of a local elementary school.

Oakland, California

On July 8, 1995, a 32-year-old Oakland police officer assisted a fellow officer with a vehicle stop in a residential area. As the first officer searched the rear compartment of the stopped vehicle, a subject from a nearby residence used a Norinco model NMH 90 to shoot the 32-year old officer in the back. The officer later died from the wound.

El Paso, Texas

On April 15, 1996, after receiving information from the National Tracing Center, ATF initiated an undercover investigation of a suspected firearms trafficker who had purchased 326 MAK90 semiautomatic rifles during a 6-month period. The individual was found to be responsible for illegally diverting more than 1,000 firearms over the past several years. One of the MAK90 rifles that the subject had purchased was recovered from the scene of a 1996 shootout in Guadalajara, Mexico, between suspected drug traffickers and Mexican authorities. Another MAK90 was recovered in 1997 from the residence of a former Mexican drug kingpin following his arrest for drug-related activities.

Charlotte, North Carolina

On May 24, 1996, four armed subjects—one with a MAK90 rifle—carried out a home invasion robbery during which they killed the resident with a 9mm pistol. All four suspects were arrested.

Dallas, Texas

In September 1997, an investigation was initiated on individuals distributing crack cocaine from a federally subsidized housing community. During repeated undercover purchases of the narcotics, law enforcement officials noticed that the suspects had firearms in their possession. A search warrant resulted in the seizure of crack cocaine, a shotgun, and a North China Industries model 320 rifle.

Chesterfield, Virginia

In November 1997, a MAK90 rifle was used to kill two individuals and wound three others at a party in Chesterfield, Virginia.

Orange, California

In December 1997, a man armed with an AKS 762 rifle and two other guns drove to where he was previously employed and opened fire on former coworkers, killing four and injuring three, including a police officer.

Baltimore, Maryland

In December 1997, a search warrant was served on a homicide suspect who was armed at the time with three pistols and a MAK90 rifle.

We also studied import and trace information to learn whether the LCMM rifles are used in crime.

Between 1991 and 1997, there were 425,114 LCMM rifles imported into the United States. This represents 7.6 percent of the approximately 5 million rifles imported during this period. The breakdown of the specific variants of LCMM rifles imported follows:

AK-47 variants:	377,934
FN-FAL variants:	37,534
HK variants:	6,495
Uzi variants:	3,141
SIG SG550 variants:	10

During this same time period, ATF traced 632,802 firearms.[74] This included 81,842 rifles of which approximately 3,176 were LCMM rifles.[75] While this number is relatively low compared to the number of total traces, it must be viewed in light of the small number of LCMM rifles imported during this time period and the total number of rifles, both imported domestic, that were available in the United States. A more significant trend is reflected in figure 1.

[74] ATF traces crime guns recovered and submitted by law enforcement officials. A crime gun is defined, for purposes of firearms tracing, as any firearm that is illegally possessed, used in a crime, or suspected by law enforcement of being used in a crime. Trace information is used to establish links between criminals and firearms, to investigate illegal firearm trafficking, and to identify patterns of crime gun traces by jurisdiction. A substantial number of firearms used in crime are not recovered by law enforcement agencies and therefore not traced. In addition, not all recovered crime guns are traced. Therefore, trace requests substantially underestimate the number of firearms involved in crimes, and trace numbers contain unknown statistical biases. These problems are being reduced as more law enforcement agencies institute policies of comprehensive crime gun tracing.

[75] The vast majority of LCMM rifles traced during this time period were AK47 variants. Specifically, AK47 variants comprised 95.6 percent of the LCMM rifles traced. This must be viewed within the context that 88 percent of the LCMM rifles imported during this period were AK47 variants.

Firearms Traces 1991-1997

Year	Total Firearms Traced	Total Rifles Traced	Total Assault[76] Rifles Traced	Total LCMM Rifles Traced
1991	42,442	6,196	656	7
1992	45,134	6,659	663	39
1993	54,945	7,690	852	182
1994	83,137	9,201	735	596
1995	76,847	9,988	717	528
1996	136,062	17,475	1,075	800
1997	194,235	24,633	1,518	1,024
Cumulative Total	632,802	81,842	6,216	3,176

Figure 1

The figures in this table show that between 1991 and 1994, trace requests involving LCMM rifles increased rapidly, from 7 to 596. During the same period, trace requests for assault rifles increased at a slower rate, from 656 to 735. The years 1991 to 1994 are significant because they cover a period between when the ban on the importation of semiautomatic assault rifles was imposed and before the September 13, 1994, ban on semiautomatic assault weapons was enacted. Thus, during the years leading up to the 1994 ban, traces of LCMM rifles were increasing much more rapidly than the traces of the rifles that had been the focus of the 1989 ban, as well as the rifles that were the focus of the 1994 congressional action.

We also compared patterns of importation with trace requests to assess the association of LCMM rifles with criminal involvement. The comparison shows that importation of LCMM rifles in the early 1990s was followed immediately by a rapid rise in the number of trace requests involving LCMM rifles. This is shown in figures 2 and 3.

76 For purposes of this table, assault rifles include (1) semiautomatic assault rifles banned from importation in 1989 but still available domestically because they had been imported into the United States prior to the ban, (2) domestically produced rifles that would not have qualified for importation after 1989, and (3) semiautomatic assault rifles that were banned in 1994.

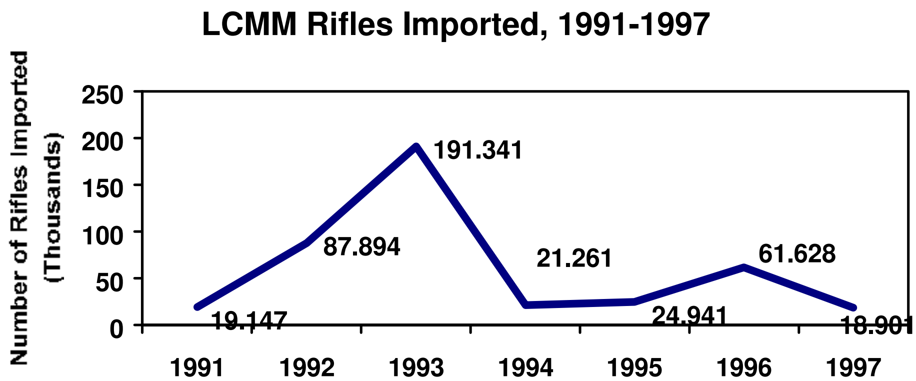

Figure 2

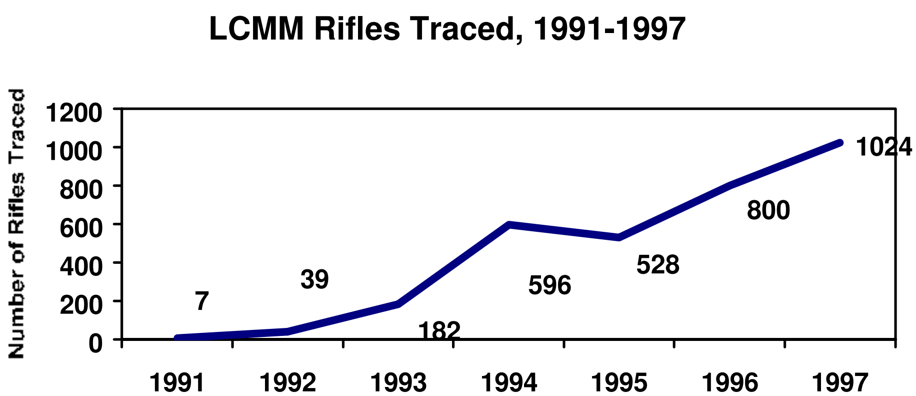

Figure 3

Two aspects of the relationship between importation and trace request patterns are significant. First, the rapid rise in traces following importation indicates that, at least in some cases, very little time elapsed between a particular LCMM rifle's importation and its recovery by law enforcement. This time lapse is known as "time to crime." A short time to crime can be an indicator of illegal trafficking. Therefore, trace patterns suggest what the case examples show: LCMM rifles have been associated with illegal trafficking. Second, while LCMM rifles have not been imported in large numbers since 1994,[77] the number of trace requests for LCMM rifles continues to rise. This reflects a sustained and

[77] One reason is that there has been an embargo on the importation of firearms from China since May 1994.

continuing pattern of criminal association for LCMM rifles despite the fact that there were fewer new LCMM rifles available.[78] Moreover, it is reasonable to conclude that if the importation of LCMM rifles resumes, the new rifles would contribute to the continuing rise in trace requests for them.[79]

All of the LCMM rifles have the ability to accept a detachable large capacity military magazine. Thus, they all have the ability to expend large amounts of ammunition quickly. In passing the 1994 ban on semiautomatic assault rifles and large capacity ammunition feeding devices, Congress found that weapons with this ability are attractive to criminals.[80] Thus, we can infer that the LCMM rifles may be attractive to criminals because in some ways they remain akin to military assault rifles, particularly in their ability to accept a detachable large capacity military magazine.

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78 The increase in trace requests also reflects the fact that law enforcement officials were making trace requests for all types of firearms much more frequently beginning in 1996. There were 76,847 trace requests in 1995, 136,062 trace requests in 1996, and 194,235 trace requests in 1997. Traces for assault rifles were increasing by approximately the same percentage as traces for LCMM rifles during these years.

79 In addition to looking at case studies and tracing and import information, we attempted to get information on the use of the LCMM rifles in crime by surveying national law enforcement agencies and organizations, as well as metropolitan police departments. Twenty-three national law enforcement agencies and organizations were surveyed and five responded. Three of the respondents stated they had no information. The other two provided information that was either outdated or not specific enough to identify the LCMM rifles.

The 26 metropolitan police departments surveyed provided the following information:

17 departments had no information to provide.
5 departments stated that the LCMM rifles were viewed as crime guns.
1 department stated that the LCMM rifles were nonsporting.
2 departments stated that the LCMM rifles were used to hunt coyotes in their areas.
1 department stated that the LCMM rifles were used for silhouette target shooting.

80 H. Rep. No. 103-489, at 13, 18, 19.

DETERMINATION

In 1989, ATF determined that the type of rifle defined as a semiautomatic assault rifle was not generally recognized as particularly suitable for or readily adaptable to sporting purposes. Accordingly, ATF found that semiautomatic assault rifles were not importable into the United States. This finding was based, in large part, on ATF's determination that semiautomatic assault rifles contain certain general characteristics that are common to the modern military assault rifle. These characteristics were designed for killing and disabling the enemy and distinguish the rifles from traditional sporting rifles. One of these characteristics is a military configuration, which incorporates eight physical features: Ability to accept a detachable magazine, folding/telescoping stocks, separate pistol grips, ability to accept a bayonet, flash suppressors, bipods, grenade launchers, and night sights. In 1989, ATF decided that any of these military configuration features, other than the ability to accept a detachable magazine, would make a semiautomatic assault rifle not importable.

Certain semiautomatic assault rifles that failed the 1989 sporting purposes test were modified to remove all of the military configuration features, except for the ability to accept a detachable magazine. Significantly, most of these modified rifles not only still have the ability to accept a detachable magazine but, more specifically, still have the ability to accept a large capacity military magazine. It appears that only one of the current study rifles, the VEPR caliber .308 (an AK47 variant), does not have the ability to accept a large capacity military magazine and, therefore, is not an LCMM rifle. Based on the standard developed in 1989, these modified rifles were found not to fall within the semiautomatic assault rifle type and were found to meet the sporting purposes test. Accordingly, these rifles were approved for import into the United States.

Members of Congress and others have expressed concerns that these modified semiautomatic assault rifles are essentially the same as the semiautomatic assault rifles determined to be not importable in 1989. In response to such concerns, the present study reviewed the current application of the sporting purposes test to the study rifles to determine whether the statute is being applied correctly and to ensure that the current use of the study rifles is consistent with the statute's criteria for importability.

Our review took another look at the entire matter. We reexamined the basic tenets of the 1989 study, conducted a new analysis of the physical features of the rifles, surveyed a wide variety of sources to acquire updated information relating to use and suitability, and assessed changes in law that might have bearing on the treatment of the study rifles.

This review has led us to conclude that the basic finding of the 1989 decision remains valid and that military-style semiautomatic rifles are not importable under the sporting purposes standard. Accordingly, we believe that the Department of the Treasury correctly has been denying the importation of rifles that had any of the distinctly military configuration features identified in 1989, other than the ability to accept a detachable magazine. Our review, however, did result in a finding that the ability to accept a detachable large capacity magazine originally designed and produced for a military assault weapon should be added to the list of disqualifying military configuration features identified in 1989.

Several important changes have occurred since 1989 that have led us to reevaluate the importance of this feature in the sporting purposes test. Most significantly, by passing the 1994 bans on semiautomatic assault weapons and large capacity ammunition feeding devices, Congress sent a strong signal that firearms with the ability to expel large amounts of ammunition quickly are not sporting; rather, firearms with this ability have military purposes and are a crime problem. The House Report to the 1994 law emphasizes that the ability to accept a large capacity magazine "serve[s] specific, combat-functional ends."[81] Moreover, this ability plays a role in increasing a firearm's "capability for lethality," creating "more wounds, more serious, in more victims."[82] Furthermore, the House Report noted semiautomatic assault weapons with this ability are the "weapons of choice among drug dealers, criminal gangs, hate groups, and mentally deranged persons bent on mass murder."[83]

Moreover, we did not find any evidence that the ability to accept a detachable large capacity military magazine serves any sporting purpose. The House Report to the 1994 law notes that, while most of the weapons covered by the assault weapon ban come equipped with detachable large capacity magazines, hunting rifles and shotguns typically have much smaller magazine capabilities, from 3 to 5 rounds.[84] Similarly, we found that a number of States limit magazine capacity for hunting to 5 to 6 rounds. We simply found no information showing that the ability to accept a detachable large capacity military magazine has any purpose in hunting or organized competitive target shooting.

Accordingly, we find that the ability to accept a detachable large capacity military magazine is a critical factor in the sporting purposes test that must be given the same weight as the other military configuration features identified in 1989.

The information we collected on the use and suitability of the LCMM rifles for hunting and organized competitive target shooting demonstrated that the rifles are not especially suitable for sporting purposes. Although our study found that the LCMM rifles, as a type, may sometimes be used for hunting, we found no evidence that they are commonly used for hunting. In fact, some of the rifles are unsuitable for certain types of hunting.

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[81] H. Rep. No. 103-489, at 18.

[82] H. Rep. No. 103-489, at 19.

[83] H. Rep. No. 103-489, at 13.

[84] H. Rep. No. 103-489, at 19 (footnote omitted).

The information we collected also demonstrated that although the LCMM rifles, as a type, may be used for organized competitive target shooting, their suitability for these competitions is limited. There are even some restrictions or prohibitions on their use for certain types of competitions. In addition, we believe that all rifles which are fairly typed as LCMM rifles should be treated the same. Therefore, the fact that there may be some evidence that a particular rifle of this type is used or recommended for sporting purposes should not control its importability. Rather, all findings as to suitability of LCMM rifles as a whole should govern each rifle within this type. The findings as a whole simply did not satisfy the standard set forth in section 925(d)(3).

Finally, the information we gathered demonstrates that the LCMM rifles are attractive to certain criminals. We find that the LCMM rifles' ability to accept a detachable large capacity military magazine likely plays a role in their appeal to these criminals. In enacting the 1994 bans on semiautomatic assault weapons and large capacity ammunition feeding devices, Congress recognized the appeal large magazine capacity has to the criminal element.

Weighing all this information, the LCMM rifles, as a type, are not generally recognized as particularly suitable for or readily adaptable to sporting purposes. As ATF found in conducting its 1989 study, although some of the issues we confronted were difficult to resolve, in the end we believe the ultimate conclusion is clear and compelling. The ability of all of the LCMM rifles to accept a detachable large capacity military magazine gives them the capability to expel large amounts of ammunition quickly; this serves a function in combat and crime, but serves no sporting purpose. Given the high standard set forth in section 925(d)(3) and the Secretary's discretion in applying the sporting purposes test, this conclusion was clear.

This decision will in no way preclude the importation of true sporting firearms. It will prevent only the importation of firearms that cannot fairly be characterized as sporting rifles.

Individual importers with existing permits for, and applications to import involving, the LCMM rifles will be notified of this determination in writing. Each of these importers will be given an opportunity to respond and present additional information and arguments. Final action will be taken on permits and applications only after an affected importer has an opportunity to makes its case.

Exhibit 1

THE WHITE HOUSE

WASHINGTON

November 14, 1997

MEMORANDUM FOR THE SECRETARY OF THE TREASURY

SUBJECT: Importation of Modified Semiautomatic Assault-Type Rifles

The Gun Control Act of 1968 restricts the importation of firearms unless they are determined to be particularly suitable for or readily adaptable to sporting purposes. In 1989, the Department of the Treasury (the Department) conducted a review of existing criteria for applying the statutory test based on changing patterns of gun use. As a result of that review, 43 assault-type rifles were specifically banned from importation. However, manufacturers have modified many of those weapons banned in 1989 to remove certain military features without changing their essential operational mechanism. Examples of such weapons are the Galil and the Uzi.

In recent weeks Members of Congress have strongly urged that it is again necessary to review the manner in which the Department is applying the sporting purposes test, in order to ensure that the agency's practice is consistent with the statute and current patterns of gun use. A letter signed by 30 Senators strongly urged that modified assault-type weapons are not properly importable under the statute and that I should use my authority to suspend temporarily their importation while the Department conducts an intensive, expedited review. A recent letter from Senator Dianne Feinstein emphasized again that weapons of this type are designed not for sporting purposes but for the commission of crime. In addition, 34 Members of the House of Representatives signed a letter to Israeli Prime Minister Binyamin Netanyahu requesting that he intervene to stop all sales of Galils and Uzis into the United States. These concerns have caused the Government of Israel to announce a temporary moratorium on the exportation of Galils and Uzis so that the United States can review the importability of these weapons under the Gun Control Act.

The number of weapons at issue underscores the potential threat to the public health and safety that necessitates immediate action. Firearms importers have obtained permits to import nearly 600,000 modified assault-type rifles. In addition, there are pending before the Department applications to import more than 1 million additional such weapons. The number of rifles covered by outstanding permits is comparable to that which existed in 1989 when the Bush Administration temporarily suspended import permits for assault-type rifles. The number of weapons for which permits for importation are being sought through pending applications is approximately 10 times greater than in 1989. The number of such firearms for which import applications have been filed has skyrocketed from 10,000 on October 9, 1997, to more than 1 million today.

My Administration is committed to enforcing the statutory restrictions on importation of firearms that do not meet the sporting purposes test. It is necessary that we ensure that the statute is being correctly applied and that the current use of these modified weapons is consistent with the statute's criteria for importability. This review should be conducted at once on an expedited basis. The review is directed to weapons such as the Uzi and Galil that failed to meet the sporting purposes test in 1989, but were later found importable when certain military features were removed. The results of this review should be applied to all pending and future applications.

The existence of outstanding permits for nearly 600,000 modified assault-type rifles threatens to defeat the purpose of the expedited review unless, as in 1989, the Department temporarily suspends such permits. Importers typically obtain authorization to import firearms in far greater numbers than are actually imported into the United States. However, gun importers could effectively negate the impact of any Department determination by simply importing weapons to the maximum amount allowed by their permits. The public health and safety require that the only firearms allowed into the United States are those that meet the criteria of the statute.

Accordingly, as we discussed, you will:

1) Conduct an immediate expedited review not to exceed 120 days in length to determine whether modified semiautomatic assault-type rifles are properly importable under the statutory sporting purposes test. The results of this review will govern action on pending and future applications for import permits, which shall not be acted upon until the completion of this review.

2) Suspend outstanding permits for importation of modified semiautomatic assault-type rifles for the duration of the 120-day review period. The temporary suspension does not constitute a permanent revocation of any license. Permits will be revoked only if and to the extent that you determine that a particular weapon does not satisfy the statutory test for importation, and only after an affected importer has an opportunity to make its case to the Department.

Exhibit 2

STUDY RIFLE MODELS

AK47 Variants:			FN-FAL Variants:
MAK90*	SA2000	Saiga rifle	L1A1 Sporter
314*	ARM	Galil Sporter	FAL Sporter
56V*	MISR	Haddar	FZSA
89*	MISTR	Haddar II	SAR4800
EXP56A*	SA85M	WUM 1	X FAL
SLG74	Mini PSL	WUM 2	C3
NHM90*	ROMAK 1	SLR95	C3A
NHM90-2*	ROMAK 2	SLR96	LAR Sporter
NHM91*	ROMAK 4	SLR97	
SA85M	Hunter rifle	SLG94	
SA93	386S	SLG95	
A93	PS/K	SLG96	
AKS 762	VEPR caliber 7.62 x 39mm		
VEPR caliber .308			

HK Variants:	Uzi Variants:	SIG SG550 Variants:
BT96	Officers 9*	SG550-1
Centurian 2000	320 carbine*	SG550-2
SR9	Uzi Sporter	
PSG1		
MSG90		
G3SA		
SAR8		

- These models were manufactured in China and have not been imported since the 1994 embargo on the importation of firearms from China.

Exhibit 3

STUDY RIFLES

The study rifles are semiautomatic firearms based on the AK47, FN-FAL, HK 91 and 93, Uzi, and SIG SG550 designs. Each of the study rifles is derived from a semiautomatic assault rifle. The following are some examples of specific study rifle models grouped by design type. In each instance, a semiautomatic assault rifle is shown above the study rifles for comparison.

AK47 Variants

AK47 semiautomatic assault rifle

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MISR

ARM

MAK90

WUM 1

Exhibit 3

FN-FAL Variants

FN-FAL semiautomatic assault rifle

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L1A1 Sporter

SAR 4800

HK 91 and 93 Variants

HK91 semiautomatic assault rifle

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SR9

SAR 8

Exhibit 3

Uzi Variants

Uzi semiautomatic assault rifle

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320 carbine

SIG SG550 Variants

The following illustration depicts the configuration of a semiautomatic assault rifle based on the SIG SG550 design. No illustrations of modified semiautomatic versions are available.

SIG SG550 semiautomatic assault rifle

Exhibit 4

DEPARTMENT OF THE TREASURY
BUREAU OF ALCOHOL, TOBACCO AND FIREARMS

FACTORING CRITERIA FOR WEAPONS

NOTE: The Bureau of Alcohol, Tobacco and Firearms reserves the right to preclude importation of any revolver or pistol which achieves an apparent qualifying score but does not adhere to the provisions of section 925(d)(3) of Amended Chapter 44, Title 18, U.S.C.

PISTOL

MODEL:

PREREQUISITES

1. The pistol must have a positive manually operated safety device.
2. The combined length and height must not be less than 10" with the height (right angle measurement to barrel without magazine or extension) being at least 4" and the length being at least 6"

INDIVIDUAL CHARACTERISTICS	POINT VALUE	POINT SUB-TOTAL
OVERALL LENGTH		
FOR EACH 1/4" OVER 6"	1	
FRAME CONSTRUCTION		
INVESTMENT CAST OR FORGED STEEL	15	
INVESTMENT CAST OR FORGED HTS ALLOY	20	
WEAPON WEIGHT W/MAGAZINE *(Unloaded)*		
PER OUNCE	1	
CALIBER		
.22 SHORT AND .25 AUTO	0	
.22 LR AND 7.65mm TO .380 AUTO	3	
9mm PARABELLUM AND OVER	10	
SAFETY FEATURES		
LOCKED BREECH MECHANISM	5	
LOADED CHAMBER INDICATOR	5	
GRIP SAFETY	3	
MAGAZINE SAFETY	5	
FIRING PIN BLOCK OR LOCK	10	
MISCELLANEOUS EQUIPMENT		
EXTERNAL HAMMER	2	
DOUBLE ACTION	10	
DRIFT ADJUSTABLE TARGET SIGHT	5	
CLICK ADJUSTABLE TARGET SIGHT	10	
TARGET GRIPS	5	
TARGET TRIGGER	2	
SCORE ACHIEVED *(Qualifying score is 75 points)*		

REVOLVER

MODEL:

PREREQUISITES

1. Must pass safety test.
2. Must have overall frame (with conventional grips) length (not diagonal) of 4½" minimum.
3. Must have a barrel length of at least 3".

INDIVIDUAL CHARACTERISTICS	POINT VALUE	POINT SUB-TOTAL
BARREL LENGTH *(Muzzle to Cylinder Face)*		
LESS THAN 4"	0	
FOR EACH 1/4" OVER 4"	1/2	
FRAME CONSTRUCTION		
INVESTMENT CAST OR FORGED STEEL	15	
INVESTMENT CAST OR FORGED HTS ALLOY	20	
WEAPON WEIGHT *(Unloaded)*		
PER OUNCE	1	
CALIBER		
.22 SHORT TO .25 ACP	0	
.22 LR AND .30 TO .38 S&W	3	
.38 SPECIAL	4	
.357 MAG AND OVER	5	
MISCELLANEOUS EQUIPMENT		
ADJUSTABLE TARGET SIGHTS *(Drift or Click)*	5	
TARGET GRIPS	5	
TARGET HAMMER AND TARGET TRIGGER	5	
SCORE ACHIEVED *(Qualifying score is 45 points)*		

SAFETY TEST

A Double Action Revolver must have a safety feature which automatically (or in a Single Action Revolver by manual operation) causes the hammer to retract to a point where the firing pin does not rest upon the primer of the cartridge. The safety device must withstand the impact of a weight equal to the weight of the revolver dropping from a distance of 36" in a line parallel to the barrel upon the rear of the hammer spur, a total of 5 times.

Exhibit 5

MILITARY CONFIGURATION

1. Ability to accept a detachable magazine. Virtually all modern military firearms are designed to accept large, detachable magazines. This provides the soldier with a fairly large ammunition supply and the ability to rapidly reload. Thus, large capacity magazines are indicative of military firearms. While detachable magazines are not limited to military firearms, most traditional semiautomatic sporting firearms, designed to accommodate a detachable magazine, have a relatively small magazine capacity. Additionally, some States have a limit on the magazine capacity allowed for hunting, usually five or six rounds.

2. Folding/telescoping stock. Many military firearms incorporate folding or telescoping stocks. The main advantage of this item is portability, especially for airborne troops. These stocks allow the firearm to be fired from the folded position, yet it cannot be fired nearly as accurately as with an open stock. With respect to possible sporting uses of this feature, the folding stock makes it easier to carry the firearm when hiking or backpacking. However, its predominant advantage is for military purposes, and it is normally not found on the traditional sporting rifle.

3. Pistol grips. The vast majority of military firearms employ a well-defined separate pistol grip that protrudes conspicuously beneath the action of the weapon. In most cases, the “straight line design” of the military weapon dictates a grip of this type so that the shooter can hold and fire the weapon. Further, a pistol grip can be an aid in one-handed firing of the weapon in a combat situation. Further, such grips were designed to assist in controlling machineguns during automatic fire. On the other hand, the vast majority of sporting firearms employ a more traditional pistol grip built into the wrist of the stock of the firearm since one-handed shooting is not usually employed in hunting or organized competitive target competitions.

4. Ability to accept a bayonet. A bayonet has distinct military purposes. First, it has a psychological effect on the enemy. Second, it enables soldiers to fight in close quarters with a knife attached to their rifles. No traditional sporting use could be identified for a bayonet.

5. Flash suppressor. A flash suppressor generally serves one or two functions. First, in military firearms it disperses the muzzle flash when the firearm is fired to help conceal the shooter’s position, especially at night. A second purpose of some flash suppressors is to assist in controlling the "muzzle climb" of the rifle, particularly when fired as a fully automatic weapon. From the standpoint of a traditional sporting firearm, there is no particular benefit in suppressing muzzle flash. Flash suppressors that also serve to dampen muzzle climb have a limited benefit in sporting uses by allowing the shooter to reacquire

the target for a second shot. However, the barrel of a sporting rifle can be modified by "magna-porting" to achieve the same result. There are also muzzle attachments for sporting firearms to assist in the reduction of muzzle climb. In the case of military-style weapons that have flash suppressors incorporated in their design, the mere removal of the flash suppressor may have an adverse impact on the accuracy of the firearm.

6. Bipods. The majority of military firearms have bipods as an integral part of the firearm or contain specific mounting points to which bipods may be attached. The military utility of the bipod is primarily to provide stability and support for the weapon when fired from the prone position, especially when fired as a fully automatic weapon. Bipods are available accessory items for sporting rifles and are used primarily in long-range shooting to enhance stability. However, traditional sporting rifles generally do not come equipped with bipods, nor are they specifically designed to accommodate them. Instead, bipods for sporting firearms are generally designed to attach to a detachable "slingswivel mount" or simply clamp onto the firearm.

7. Grenade launcher. Grenade launchers are incorporated in the majority of military firearms as a device to facilitate the launching of explosive grenades. Such launchers are generally of two types. The first type is a flash suppressor designed to function as a grenade launcher. The second type attaches to the barrel of the rifle by either screws or clamps. No traditional sporting application could be identified for a grenade launcher.

8. Night sights. Many military firearms are equipped with luminous sights to facilitate sight alignment and target acquisition in poor light or darkness. Their uses are generally for military and law enforcement purposes and are not usually found on sporting firearms since it is generally not legal to hunt at night.

Exhibit 6

[This document has been retyped for clarity.]

MEMORANDUM TO FILE

FIREARMS ADVISORY PANEL

The initial meeting of the Firearms Advisory Panel was held in Room 3313, Internal Revenue Building, on December 10, 1968, with all panel members present. Internal Revenue Service personnel in attendance at the meeting were the Director, Alcohol and Tobacco Tax Division, Harold Serr; Chief, Enforcement Branch, Thomas Casey; Chief, Operations Coordination Section, Cecil M. Wolfe, and Firearms Enforcement Officer, Paul Westenberger. Deputy Assistant Commissioner Compliance, Leon Green, visited the meeting several times during the day.

The Director convened the meeting at 10:00 a.m. by welcoming the members and outlining the need for such an advisory body. He then introduced the Commissioner of Internal Revenue, Mr. Sheldon Cohen, to each panel member.

Mr. Cohen spoke to the panel for approximately fifteen minutes. He thanked the members for their willingness to serve on the panel, explained the role of the panel and some of the background which led to the enactment of the Gun Control Act of 1968. Commissioner Cohen explained to the panel members the conflict of interest provisions of regulations pertaining to persons employed by the Federal Government and requested that if any member had any personal interest in any matter that came under discussion or consideration, he should make such interest known and request to be excused during consideration of the matter.

Mr. Seer then explained to the panel the areas in which the Division would seek the advice of the panel and emphasized that the role of the panel would be advisory only, and that it was the responsibility of the Service to make final decisions. He then turned the meeting over to the moderator, Mr. Wolfe.

Mr. Wolfe explained the responsibility of the Service under the import provisions of the Gun Control Act and under the Mutual Security Act. The import provisions were read and discussed.

The panel was asked to assist in defining Asporting purposes≅ as used in the Act. It was generally agreed that firearms designed and intended for hunting and all types of organized competitive target shooting would fall within the sporting purpose category. A discussion was held on the so-called sport of Aplinking≅. It was the consensus that, while many persons

Exhibit 6

participated in the type of activity and much ammunition was expended in such endeavors, it was primarily a pastime and could not be considered a sport for the purposes of importation since any firearm that could expel a projectile could be used for this purpose without having any characteristics generally associated with target guns.

The point system that had been developed by the Division and another point system formula suggested and furnished by the Southern Gun Distributors through Attorney Michael Desalle, was explained and demonstrated to the panel by Paul Westenberger. Each panel member was given copies of the formulas and requested to study them and endeavor to develop a formula he believed would be equitable and could be applied to all firearms sought to be imported.

A model BM59 Beretta, 7.62 mm, NATO Caliber Sporter Version Rifle was presented to the panel and their advice sought as to their suitability for sporting purposes. It was the consensus that these rifles do have a particular use in target shooting and hunting. Accordingly, it was recommended that importation of this rifle together with the SIG-AMT 7.62mm NATO Caliber Sporting Rifle and the Cetme 7.62mm NATO Caliber Sporting Rifle be authorized for importation. Importation, however, should include the restriction that these weapons must not possess combination flash suppressors/grenade adaptors with outside diameters greater than 20mm (.22 mm is the universal grade adaptor size).

The subject of ammunition was next discussed. Panel members agreed that incendiary and tracer small arms ammunition have no use for sporting purposes. Accordingly, the Internal Revenue Service will not authorize these types of small arms ammunition importation. All other conventional small arms ammunition for pistols, revolvers, rifles and shotguns will be authorized.

The meeting was adjourned at 4:00 p.m.

C.M. Wolfe

Exhibit 7

STATE FISH AND GAME COMMISSION REVIEW

STATE RESTRICTION	RIFLE RESTRICTION	MAGAZINE RESTRICTION
Alabama	Not for turkey	
Alaska		
Arizona		Not more than five rounds
Arkansas	Not for turkey	
California		
Colorado		Not more than six rounds
Connecticut*	No rifles on public land	
Delaware	No rifles	
Florida		Not more than five rounds
Georgia	Not for turkey	
Hawaii		
Idaho	Not for turkey	
Illinois	Not for deer or turkey	
Indiana*	Not for deer or turkey	
Iowa	Not for deer or turkey No restrictions on coyote or fox	
Kansas		
Kentucky		
Louisiana	Not for turkey	
Maine*	Not for turkey	
Maryland*		

Exhibit 7

STATE RESTRICTION	RIFLE RESTRICTION	MAGAZINE RESTRICTION
Massachusetts	Not for deer or turkey	
Michigan	Not for turkey	Not more than six rounds
Minnesota		
Mississippi	Not for turkey	
Missouri	Not for turkey	Chamber and magazine not more than 11 rounds
Montana		
Nebraska		Not more than six rounds
Nevada	Not for turkey	
New Hampshire*	Not for turkey	Not more than five rounds
New Jersey	No rifles	
New Mexico	Not for turkey	
New York*		Not more than six rounds
North Carolina	Not for turkey	
North Dakota	Not for turkey	
Ohio	Not for deer or turkey	
Oklahoma		Not more than seven rounds for .22 caliber
Oregon*		Not more than five rounds
Pennsylvania*	No semiautomatics	

Exhibit 7

STATE RESTRICTION	RIFLE RESTRICTION	MAGAZINE RESTRICTION
Rhode Island	Prohibited except for woodchuck in summer	
South Carolina	Not for turkey	
South Dakota		Not more than five rounds
Tennessee	Not for turkey	
Texas		
Utah	Not for turkey	
Vermont		Not more than six rounds
Virginia*		
Washington	Not for turkey	
West Virginia		
Wisconsin		
Wyoming		

* Limited restrictions (e.g., specified areas, county restrictions, populated areas, time of day).

DEPARTMENT OF THE TREASURY
BUREAU OF ALCOHOL, TOBACCO AND FIREARMS
WASHINGTON, D.C. 20226

DIRECTOR

O:F:S:DMS
3310

Dear Sir or Madam:

On November 14, 1997, the President and the Secretary of the Treasury decided to conduct a review to determine whether modified semiautomatic assault rifles are properly importable under Federal law. Under 18 U.S.C. section 925(d)(3), firearms may be imported into the United States only if they are determined to be of a type generally recognized as particularly suitable for or readily adaptable to sporting purposes. The firearms in question are semiautomatic rifles based on the AK47, FN-FAL, HK91, HK93, SIG SG550-1, and Uzi designs.

As part of the review, the Bureau of Alcohol, Tobacco and Firearms (ATF) is interested in receiving information that shows whether any or all of the above types of semiautomatic rifles are particularly suitable for or readily adaptable to hunting or organized competitive target shooting. We are asking that you voluntarily complete the enclosed survey to assist us in gathering this information. We anticipate that the survey will take approximately 15 minutes to complete.

Responses must be received no later than January 9, 1998; those received after that date cannot be included in the review. Responses should be forwarded to the Bureau of Alcohol, Tobacco and Firearms, Department HG, P.O. Box 50860, Washington, DC 20091. We appreciate any information you care to provide.

Sincerely yours,

John W. Magaw

John W. Magaw
Director

Enclosure

OMB No. 1512-0542

ATF SURVEY OF HUNTING GUIDES FOR RIFLE USAGE

*Please report only on those clients who **hunted medium game (for example, turkey) or larger game (for example, deer) with a rifle.***

For the purposes of this survey, please count only individual clients and NOT the number of trips taken by a client. For example, if you took the same client on more than one trip, count the client only once.

1. What is the approximate number of your clients who have ever used **manually operated rifles** during the past two hunting seasons of 1995 and 1996?

__________number of clients.

2. What is the approximate number of your clients who have ever used **semiautomatic rifles** during the past two hunting seasons of 1995 and 1996?

__________number of clients.

3. What is the approximate number of your clients who have ever used semiautomatic rifles whose design is based on the **AK 47, FN-FAL, HK91, HK93, SIG 550-1, or Uzi** during the past two hunting seasons of 1995 and 1996?

__________number of clients.

4. From your knowledge, for your clients who use **semiautomatic rifles**, please list the three most commonly used rifles.

Make	Model	Caliber

5. Do you **recommend** the use of any specific rifles by your clients?

_____Yes *(Continue to #6)* _____No (*You are finished with the survey. Thank you.*)

OMB No. 1512-0542

ATF SURVEY OF HUNTING GUIDES FOR RIFLE USAGE

6. If your answer to item 5 is "Yes", please identify the specific rifles you **recommend**.

Make	Model	Caliber

7. Do you **recommend** the use of any semiautomatic rifles whose design is based on the **AK 47, FN-FAL, HK91, HK93, SIG 550-1, or Uzi**?

_____Yes *(Continue to #8)* _____No (*You are finished with the survey. Thank you.*)

8. If your answer to item 7 is "Yes", please identify the specific rifles whose design is based on the **AK 47, FN-FAL, HK91, HK93, SIG 550-1, or Uzi** that you recommend.

Make	Model	Caliber

Hunting Guides

		Number of clients Using			Recommend	
case		Manual	Semiauto	AK47 et.al.	Any	AK47 et.al.
A	1	28	0	0	No	
A	2	100	10	0	Yes	No
A	3	18	0	0	No	
A	4	120	40	0	Yes	No
A	5	12	0	0	Yes	No
A	6	80	40	0	No	
A	7	275	25	0	No	
A	8					
A	9	0	0	0		
A	10	0				
A	11	2	5	0	Yes	Yes
A	12	12	0	0	Yes	No
A	13	10	6	0	No	No
A	14	5	7	0	No	
A	15	0	0	0		
A	16	20	0	0	No	No
A	17					
A	18	0	0	0	No	
A	19	17	6	0	No	
A	20	30	8	0	No	
A	21	117	7	0	Yes	No
A	22	160	0	0	Yes	No
A	23	23	1	0	Yes	No
A	24	100	5	0	Yes	No
A	25	210	10	0	Yes	No
A	26	12	4	1	Yes	Yes
A	27	24	3	0	Yes	No
A	28	20	15	0	Yes	No
A	29	4	0	0	No	No
A	30	4	0	0	Yes	No
A	31	100	5	0	No	No
A	32	1	0	0	No	No
A	33			0	No	No
A	34	142	1	0	No	
A	35	78	2	0	Yes	No
A	36	600	200		No	
A	37	20	13	1	No	
A	38	45	15	0	No	
A	39	100	10	0	No	
A	40	80	6	2	Yes	No
A	41	250	25	0	Yes	No
A	42	4	0	0	No	
A	43	14	2	0	No	No
A	44	171	15	0	Yes	No
A	45	54	6	0	Yes	No
A	46	10	6	0	No	
A	47	0	0	0	No	No
A	48	24	0	0	No	
A	49	180	2	0	Yes	No
A	50					
A	51					

Hunting Guides

		Number of clients Using			Recommend	
case		Manual	Semiauto	AK47 et.al.	Any	AK47 et.al.
A	52	24	16	0	No	
A	53	600	100	12	No	
A	54	18	6	0	No	
A	55	0	0	0	No	
A	56	0	0	0	No	
A	57	40	4	0	No	
A	58					
A	59	40	10	0	No	No
A	60	60	2	0	No	No
A	61	63	4	0	Yes	No
A	62	40	4	0	No	
A	63	8	0	0	Yes	No
A	64	27	1	0	Yes	No
A	65	50	9	0	Yes	No
A	66	35	2	0	No	
A	67	6	0	0	Yes	No
A	68	6	3		No	
A	69	50	20	0	No	
A	70		0	0	Yes	No
A	71	27	1	0	Yes	
A	72	85	0	0	Yes	No
A	73	56	24	0	Yes	No
A	74	25	25	0	Yes	No
A	75	100	20	0	No	
A	76	50	15	3	No	
A	77	15	4	0	No	
A	78	12	0	0	Yes	No
A	79	75	0	0	No	
A	80					
A	81	0	0	0	No	
A	82	0	0	0	No	
A	83	12	4	0	No	No
A	84	40	0	0	Yes	No
A	85	24	0	0	No	
A	86	17	0	0	No	No
A	87	16	3	0	Yes	No
A	88	45	10	0	No	
A	89	11	7	7	Yes	Yes
A	90	35	1	0	Yes	No
A	91	25	2	0	Yes	No
A	92	0	0	0		
A	93	75	40	0	Yes	No
A	94	60	2	0	Yes	No
A	95	26	0	0	No	
A	96	20	0		No	No
A	97	65	11	0	Yes	No
A	98	40	5	0	Yes	No
A	99	26	5	0	No	
A	100	13	2	0	No	
A	101					
A	102	45	6	0	No	No

Hunting Guides

case		Number of clients Using			Recommend	
		Manual	Semiauto	AK47 et.al.	Any	AK47 et.al.
A	103	120	4	0	No	
A	104				Yes	
A	105	150	50	0	No	No
A	106	80	20	0	Yes	No
A	107	40	0	0	No	No
A	108	10	0	0	No	
A	109	160	40	0	Yes	No
A	110	10	10	0	No	No
A	111	6	0	0	No	
A	112					
A	113	150	150	100	Yes	Yes
A	114	50	25	0	No	No
A	115	19	0	0	Yes	No
A	116	80	3	0	No	
A	117	40	10	0	Yes	No
A	118					
A	119	50	0	0	Yes	No
A	120	0	0	0	No	
A	121	0	0	0		
A	122	120	15	0	Yes	No
A	123	10	0	0	Yes	No
A	124	22	0	0	Yes	No
A	125	40	40	20	No	
A	126	50	10	0	Yes	No
A	127	60	20	0	Yes	No
A	128	14	0	0	No	No
A	129	13	16	4	No	
A	130	80	4	0	Yes	No
A	131	12	2	0	Yes	No
A	132		4	0	Yes	No
A	133	50	26	7	No	No
A	134	12	0	0	No	
A	135	2	10	3	No	
A	136	2	1	1	Yes	No
A	137	28	0	0	Yes	No
A	138	45	10		No	
A	139	46	59	0	Yes	No
A	140			0	Yes	No
A	141	40	10	0	No	No
A	142	70	20	0	Yes	No
A	143	50	3	0	No	No
A	144	60	6	0	Yes	No
A	145	140	0	0	Yes	No
A	146	20	4	1	Yes	No
A	147	10	1	0	Yes	No
A	148	0	0	0	No	No
A	149	37	0	0	Yes	No
A	150			0	Yes	No
A	151	6	10	0	No	No
A	152	110	5	0	No	
A	153	15	17		Yes	No

Hunting Guides

		Number of clients Using			Recommend	
case		Manual	Semiauto	AK47 et.al.	Any	AK47 et.al.
A	154	18	4	0	No	
A	155	25	3	0	Yes	No
A	156	60	6	3	No	
A	157	20	0	0	No	
A	158	88	46	0	No	No
A	159	68	19	3	Yes	Yes
A	160	25	5	0	No	
A	161	15	0	0	No	
A	162	75	10	0	No	
B	1				No	
C	1	25	0	0	Yes	No
C	2	55	10	6	Yes	Yes
C	3	60	30	0	No	
C	4	80	20	0	No	
C	5	10	0	0	No	No
C	6	25	6	0	No	
C	7	66	10	1	No	
C	8	24	0	0	Yes	No
C	9	10	15	15	No	
C	10	35	15	9	Yes	Yes
C	11			0	No	
C	12					No
C	13	25	10	0	No	
C	14	60	20	0	Yes	No
C	15	20	0	0	Yes	No
C	16	14	0	0	No	
C	17		0	0	Yes	No
C	18	18	25	5	Yes	Yes
C	19	125	50	5	Yes	No
C	20	20	5	2	No	
C	21		0	0	Yes	No
C	22	30	0	0	No	No
C	23	150	20	0	Yes	No
C	24	60	0	0	No	
C	25	16	7	6	Yes	Yes
C	26	300	650	400	No	
C	27	20	15	8	Yes	Yes
C	28	3	5	2	No	
C	29	45	6	0	Yes	No
C	30				No	
C	31	30	0	0	Yes	No
C	32			0	Yes	No
C	33	35	4	0	Yes	No
C	34	25	5	0	Yes	No
C	35				Yes	No

Hunting Guides

Q4. Three most commonly used rifles					
case		Make	Other Make	Model	Caliber
A	1				
A	2				
A	3				
A	4	Browning		BAR	300
A	5				
A	6	Remington		742	30.06
A	7	Browning		BAR	30.06, .270, 7MM, 300 Mag
A	8				
A	9				
A	10				
A	11	Remington		740-7400	20, 30
A	12				
A	13	Remington		700	7 mm mag
A	14	Remington		7400	270
A	15				
A	16				
A	17				
A	18				
A	19	Browning			30.06
A	20	Remington		742	30.06
A	21				
A	22				
A	23	Browning		?	300 mag
A	24	Remington			30.06
A	25	Remington			30.06
A	26	Browning		BAR	30.06
A	27	Remington			30.06
A	28		?	?	06
A	29				
A	30				
A	31	Browning		automatics	
A	32				
A	33				
A	34	Remington			.3006
A	35	Browning			7 mm
A	36	Browning			30.06
A	37	Browning		BAR	30.06
A	38	Browning		br	7 mm, 300win, 30.06
A	39	Remington		7600	.270 win, .30-06, .280 rem
A	40	Browning		Bar mark II	300 win mag
A	41	Remington			
A	42				
A	43	Remington		7600	243 - 7 mm mag
A	44				30.06, 300 winmag, .338, 270
A	45	Browning		BAR Automatic	30.06

Hunting Guides

Q4. Three most commonly used rifles					
A	46	Browning		BAR	7 mm, 30.06
A	47				
A	48				
A	49				
A	50				
A	51				
A	52	Browning		BAR	7 mm mag/30.06
A	53	Browning		BAR	30.06, 300 wm
A	54	Browning		BAR	30.06
A	55				
A	56				
A	57	Browning		semi-auto	300 mag
A	58				
A	59				
A	60				
A	61	Browning			30.06
A	62	Browning			7 mm
A	63	Browning		BAR	.270 - 300 win mag
A	64	Browning		BAR	30.06
A	65	Browning		semi-auto	.308
A	66	Browning			
A	67				
A	68	Remington		7400	30.06
A	69	Browning			
A	70				
A	71	Browning		Not sure	
A	72				
A	73	Browning		BARR	30.06
A	74	Browning		BAR	300
A	75	Remington		7400 old 752	270 and 30.06
A	76	Browning		BAR	308, 30.06, 300win, 338 win
A	77	Remington			308
A	78	Browning			300, 270, 30.06
A	79				
A	80				
A	81				
A	82				
A	83				30 caliber or bigger for elk
A	84				
A	85				
A	86				
A	87	Browning			30.06 and 7 mm
A	88	Browning		BAR	7 mm, .300, .270
A	89	Other	Russian	SKS	7.62
A	90	Browning			1 or 2 in over 50 years
A	91	Browning			300 win mag

Hunting Guides

Q4. Three most commonly used rifles					
A	92				
A	93				
A	94	Browning		BAR	
A	95				
A	96				
A	97	Browning		BAR	300-06-270
A	98	Browning			300, 30.06
A	99	Other	Savage		7 mm
A	100	Browning		?	7 mm mag
A	101				
A	102	Browning	Only 1 I recall	BAR	30.06
A	103				
A	104				
A	105				
A	106	Browning		BAR	300 win mag
A	107				
A	108				
A	109	Browning			30.06
A	110	Remington		700	30.06, 270, 7 mm
A	111				
A	112				
A	113	Other	Weatherby		300 mag
A	114	Browning			7 m mag
A	115				
A	116				
A	117	Browning			
A	118				
A	119				
A	120				
A	121				
A	122	Browning		U/K	.338 mag
A	123				
A	124				
A	125				
A	126	Remington		742	243, 30.06
A	127	Winchester		?	30.06
A	128	Winchester			270, 306
A	129	Browning		BAR	7 mm and 243
A	130	Browning			30.06
A	131	Browning		BAR	.7 mm mag
A	132	Remington			30.06
A	133			AK 47	223
A	134				
A	135	Remington			270
A	136	Browning		BAR	
A	137				

Q4. Three most commonly used rifles					
A	138	Winchester			30.06
A	139	Browning		BAR	270, 7 mm
A	140	Browning			7 mm
A	141				
A	142	Browning			7 mm mag
A	143				
A	144	Browning			30.06
A	145				
A	146	Browning		BDL	7mg
A	147	Browning		BAR	308
A	148				
A	149				
A	150	Remington			
A	151	Browning		BAR	308
A	152	Remington			various 270 - 338
A	153	Browning			30
A	154	Browning		BAR	7 mm mag
A	155				30.06
A	156	Other	BAR		
A	157				
A	158	Remington		280	280
A	159	Browning			7 mm mag
A	160	Remington		Semiauto	30.06
A	161				
A	162	Browning			30.06
B	1				.308, 30-06, .270
C	1				
C	2	Other	AK-47	Antelope Hunter	30
C	3	Browning		Auto	30.06
C	4	Browning		Bar	7mm
C	5				
C	6				
C	7	Browning			30.06
C	8				
C	9	Other	FN-FAL		308
C	10	Remington		742	30.06
C	11	Browning			306
C	12				
C	13	Remington			.06 - 7mm
C	14	Browning		BAR	7mm
C	15				
C	16				
C	17				
C	18	Ruger		Ranch Rifle	223
C	19	Other	AK47		
C	20	Browning		BAR	300 win mag

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Q4. Three most commonly used rifles					
C	21	Other	Bolt-action or pump		
C	22				
C	23	Browning			30.06
C	24				
C	25	Other	AK47		7.62-39
C	26	Other	HK	93	.308
C	27	Browning		BAR	7mm
C	28	Other	Norinco	SKS Type 56	7.62X39
C	29	Browning		BAR	30.06 -.300
C	30				
C	31				
C	32	Browning			3.06 - 7mm
C	33	Remington			30.06
C	34	Remington		741	.270 - 30.06
C	35	Remington			.270
A	1				
A	2				
A	3				
A	4	Remington		7400	30.06
A	5				
A	6	Browning			30.06
A	7	Remington		700	30.03, 270, 7 mm
A	8				
A	9				
A	10				
A	11	Winchester		100	30
A	12				
A	13	Winchester		70	300 mag
A	14	Remington		7400	30.06
A	15				
A	16				
A	17				
A	18				
A	19	Remington		7400	30.06
A	20	Browning			7 mm mag
A	21				
A	22				
A	23				
A	24	Browning			30.06
A	25	Browning			30.03 to 300 mag
A	26	Remington		Fieldmaster	30.06
A	27				
A	28				
A	29				
A	30				
A	31	Remington		automatics	

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Q4. Three most commonly used rifles					
A	32				
A	33				
A	34				
A	35				
A	36	Remington			270 - 30.06
A	37	Remington		7400	30.06
A	38				
A	39	Browning		BAR	.270 win, 7 mm mag
A	40	Remington		7400	30.06
A	41	Browning			
A	42				
A	43	Browning		BAR	243 - 7 mm mag
A	44				
A	45				
A	46	Remington		1100	12 gauge
A	47				
A	48				
A	49				
A	50				
A	51				
A	52	Remington		7400	30.06
A	53	Remington		7400/742	30.06
A	54				
A	55				
A	56				
A	57	Remington		semi-auto	30.06
A	58				
A	59				
A	60				
A	61	Other	Savage		7 mm mag
A	62	Remington			30.06
A	63	Remington		742	.270 - 30.06
A	64				
A	65	Winchester		semi-auto	.308
A	66	Remington			
A	67				
A	68	Remington		7400	.308
A	69	Remington			
A	70				
A	71	Remington		742	30.06
A	72				
A	73	Remington			30.06
A	74	Remington		?600	30.06
A	75	Browning		BAR	270/338 and 30.06
A	76	Other	AK-47		30
A	77	Remington			30.06

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Q4. Three most commonly used rifles					
A	78	Remington		?	300, 270, 30.06
A	79				
A	80				
A	81				
A	82				
A	83				
A	84				
A	85				
A	86				
A	87	Remington			30.06
A	88	Remington		742, 7400	30.06. .270
A	89	Other	Heckler-Koch	HK91	308
A	90	Remington			
A	91	Remington			30.06
A	92				
A	93				
A	94				
A	95				
A	96				
A	97				
A	98	Remington		760	.300, 30.06, 270
A	99	Browning			7 mm
A	100	Remington		742	30.06
A	101				
A	102				
A	103				
A	104				
A	105				
A	106				
A	107				
A	108				
A	109	Winchester			308
A	110				
A	111				
A	112				
A	113	Remington		700	7 mm mag
A	114	Remington		742 Wingmaster	30.06
A	115				
A	116				
A	117	Remington			
A	118				
A	119				
A	120				
A	121				
A	122				
A	123				

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Q4. Three most commonly used rifles					
A	124				
A	125				
A	126	Ruger		22	
A	127	Marlin		?	.308
A	128	Remington			7 m
A	129				
A	130				
A	131	Browning		BAR	30.06
A	132				
A	133	Ruger		Mini 14	223
A	134				
A	135	Remington			243
A	136	Other	HK 91		
A	137				
A	138	Browning			308
A	139	Remington		742	30.06 - 6 mm
A	140	Remington			30.06
A	141				
A	142	Browning			300 win mag
A	143				
A	144	Browning			7 mm mag
A	145				
A	146	Browning		BDL	300
A	147				
A	148				
A	149				
A	150	Winchester			
A	151	Remington		742	30.06
A	152	Ruger			various 270 - 338
A	153	Winchester			30
A	154	Browning		BAR	30.06
A	155				
A	156	Other	AK-47		
A	157				
A	158	Winchester			338
A	159	Remington			30.06
A	160				
A	161				
A	162	Remington		742	30.06, 270
B	1				
C	1				
C	2				
C	3	Winchester		Auto	30.06
C	4	Browning		Bar	338
C	5				
C	6				

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Q4. Three most commonly used rifles					
C	7	Remington			30.06
C	8				
C	9	Other	Uzi		9mm
C	10	Other	AK-47	Hunter	7.62x39
C	11	Other	Weatherby		300
C	12				
C	13	Winchester			.06 - 7mm
C	14	Browning			300
C	15				
C	16				
C	17				
C	18	Other	AK-47		
C	19	SigArms		550-1	
C	20	Ruger		Mini 14	.223
C	21				
C	22				
C	23	Remington		742	30.06
C	24				
C	25	Other	MAK-90		7.62-39
C	26	Other	HK	91	0.223
C	27	Remington		7400 Series	30.06
C	28	Remington		7600	30.06
C	29	Remington		742	.308 - 3.06
C	30				
C	31				
C	32	Remington			30.06 - 7mm
C	33	Browning			300 win
C	34	Browning			.270 - 30.06
C	35	Browning			300
A	1				
A	2				
A	3				
A	4	Ruger		Mini 14	223
A	5				
A	6	Other	Savage		270
A	7				
A	8				
A	9				
A	10				
A	11				
A	12				
A	13	Browning		A-bolt	270
A	14				
A	15				
A	16				
A	17				

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Q4. Three most commonly used rifles					
A	18				
A	19				
A	20				
A	21				
A	22				
A	23				
A	24				
A	25				
A	26	Other	China	SKS	7.62x37
A	27				
A	28				
A	29				
A	30				
A	31				
A	32				
A	33				
A	34				
A	35				
A	36	Winchester			270 - 30.06
A	37				
A	38				
A	39				
A	40	Ruger			44 mag
A	41				
A	42				
A	43	Ruger			223 - 30.06
A	44				
A	45				
A	46				
A	47				
A	48				
A	49				
A	50				
A	51				
A	52				
A	53	Ruger		Mini-14	.223
A	54				
A	55				
A	56				
A	57	Ruger		semi-auto	35 cal
A	58				
A	59				
A	60				
A	61				
A	62	Ruger		Mini 14	223
A	63				

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Q4. Three most commonly used rifles					
A	64				
A	65				
A	66				
A	67				
A	68				
A	69				
A	70				
A	71				
A	72				
A	73				
A	74	Browning		BAR	30.06
A	75				
A	76	Remington			30.06, 270
A	77	Browning			300
A	78				
A	79				
A	80				
A	81				
A	82				
A	83				
A	84				
A	85				
A	86				
A	87				
A	88				
A	89	Other	Springfield Armory	FNG	308
A	90				
A	91				
A	92				
A	93				
A	94				
A	95				
A	96				
A	97				
A	98				
A	99				
A	100				
A	101				
A	102				
A	103				
A	104				
A	105				
A	106				
A	107				
A	108				
A	109				

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Q4. Three most commonly used rifles					
A	110				
A	111				
A	112				
A	113	Other	All		30.06
A	114	Remington		721	270
A	115				
A	116				
A	117				
A	118				
A	119				
A	120				
A	121				
A	122				
A	123				
A	124				
A	125				
A	126	Browning	Remington	Shotguns	12 gauge
A	127	Remington			.308 or 30.06
A	128	Other	Savage		308
A	129				
A	130				
A	131				
A	132				
A	133	Browning		BAR	7 mm
A	134				
A	135	Browning		742	30.06
A	136	Other	AK 47		
A	137				
A	138				
A	139	Other	Weatherby		300 m
A	140				
A	141				
A	142				
A	143				
A	144				
A	145				
A	146	Ruger		#1	7 mag
A	147				
A	148				
A	149				
A	150	Browning			
A	151				
A	152	Browning			various 270 - 338
A	153				
A	154	Browning		BAR	8 mm mag
A	155				

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Q4. Three most commonly used rifles					
A	156	Other	Uzi		
A	157				
A	158	Browning			300
A	159				
A	160				
A	161				
A	162				
B	1				
C	1				
C	2				
C	3	Browning		Auto	270
C	4	Browning		Bar	300
C	5				
C	6				
C	7				
C	8				
C	9	Other	HK91		
C	10	Browning		BAR	30.06
C	11				
C	12				
C	13	Browning			300
C	14				
C	15				
C	16				
C	17				
C	18				
C	19				
C	20	Other	AK47		7.62 x 39
C	21				
C	22				
C	23	Remington		742	308, 270
C	24				
C	25		M1-A1		.223
C	26				
C	27	Winchester	Various	M1 Garand	30.06
C	28				
C	29			M1A1	30.06
C	30				
C	31				
C	32				
C	33				
C	34				
C	35				

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Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	1				
A	2	Ruger			30.06
A	3				
A	4	Other	Weatherby	Mark V	300
A	5				30.06
A	6				
A	7				
A	8				
A	9				
A	10				
A	11				
A	12				
A	13				
A	14				
A	15				
A	16				
A	17				
A	18				
A	19				
A	20				
A	21	Winchester			30.06, .270
A	22	Remington		700	7 mm or larger
A	23	Winchester		70	25 to 30
A	24	Remington		710	30.06
A	25		Any make	Bolt action	Does not recommend
A	26	Winchester		70	30.06 or larger
A	27	Other	Weatherby		300
A	28	Other	bolt action		270 and up
A	29				
A	30		hunter's choice		.270
A	31				
A	32				
A	33				
A	34				
A	35	Winchester		70	300 win mag
A	36				
A	37				
A	38				
A	39				
A	40	Remington			30.06 - 300 win mag
A	41				
A	42				
A	43				
A	44				30.06, 300winmag, 338, 270
A	45	Browning		Bolt Action	25.06 - 328

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Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	46				
A	47				
A	48				
A	49	Other	Weatherby		300 mag
A	50				
A	51				
A	52				
A	53				
A	54				
A	55				
A	56				
A	57				
A	58				
A	59				
A	60				
A	61	Remington		Bolt Action	300 mag
A	62				
A	63	Other	bolt action repeating rifles		30.06 to .338 winmag
A	64	Winchester		70	338
A	65	Remington		bolt action	308,25-06,243,7 mm mag,30.06,22-250,300 mag all
A	66				
A	67	Ruger		#1	7 mm, 30.06, 7 mm mag
A	68				
A	69				
A	70	Other		Bolt Action	30.06
A	71				300 mag
A	72	Other	Any make	Any model	7 mm, 270, 30.06, 25.06
A	73				
A	74	Browning		BAR	300 win mag
A	75				
A	76				
A	77				
A	78	Browning		Bolt action	
A	79				
A	80				
A	81				
A	82				
A	83				
A	84				
A	85				
A	86				
A	87	Remington		700	30.06, 7 mm, 270
A	88				
A	89	Other	Russian	SKS	7.62
A	90	Other	Weatherby		7 mm mag

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Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	91	Remington		700	7 mag
A	92				
A	93	Winchester		70	300 mag
A	94	Other	Any bolt action		270 or larger
A	95				
A	96				
A	97	Other	Any bolt action		30 or larger, on semiauto same
A	98				
A	99				
A	100				
A	101				
A	102				
A	103				
A	104				
A	105				
A	106	Other	Weatherby		300 magnum
A	107				
A	108				
A	109	Remington		70	7 mm
A	110				
A	111				
A	112				
A	113				
A	114				
A	115				
A	116				
A	117				magnum
A	118				
A	119	Remington		700	7 mm
A	120				
A	121				
A	122				
A	123				
A	124				
A	125				
A	126				300 mag, 338 mag, 30.06
A	127				
A	128				
A	129				
A	130	Remington		700	7 mm magnum
A	131				
A	132	Other	Weatherby		300 mag
A	133				
A	134				
A	135				

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Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	136				
A	137	Remington		700	7 mm
A	138				
A	139	Browning		BAR	7 m or 270
A	140				
A	141				
A	142				30.06
A	143				
A	144	Browning			from 7 mm mag to 338 mag for deer and elk
A	145	Winchester			30.06
A	146	Browning		BDL	7 mag
A	147	Remington		700 BDL	7 mm
A	148				
A	149				
A	150	Browning		Bolt action	
A	151				
A	152				
A	153	Remington		700	30
A	154				
A	155	Other	Weatherby		300
A	156				
A	157				
A	158				
A	159	Browning	Ruger		243, 30.06, 7 mm mag, 340 weather, .338
A	160				
A	161				
A	162				
B	1				7.62 x 39
C	1	Other	Manually operated		
C	2	Ruger		77	300
C	3				
C	4				
C	5				
C	6				
C	7				
C	8	Remington		700	270
C	9				
C	10	Other	HK	91	.308
C	11				
C	12				
C	13				
C	14	Other	Bolt-action w/ belted mag		Calibers, make and model mean nothing
C	15	Other	Bolt-action		30.06-7mm
C	16				
C	17	Other	Bolt-action		

Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
C	18	Ruger		Ranch Rifle	223
C	19				.243 and larger
C	20				
C	21				
C	22				
C	23	Other	Bolt-action		7mm mag
C	24				
C	25	Other	Savage		7mm mag
C	26				
C	27	Winchester		70	30.06
C	28				
C	29	Winchester		70	30.06 - .338
C	30				
C	31	Winchester		Manual, bolt	300
C	32	Remington		All	270 - 7mm
C	33	Winchester		70	30.06 - .300 win
C	34	Other	Bolt-action		270 or larger for elk and deer
C	35	Other	Bolt-action or semiautos		.270 or larger
A	1				
A	2	Remington			7 mm
A	3				
A	4	Winchester		70	300
A	5				
A	6				
A	7				
A	8				
A	9				
A	10				
A	11				
A	12				
A	13				
A	14				
A	15				
A	16				
A	17				
A	18				
A	19				
A	20				
A	21	Remington		70	30.06
A	22	Winchester		70	7 mm or larger
A	23	Remington		700	25 to 30
A	24	Remington			300 Mag
A	25				
A	26	Browning		A bolt	30.06 or larger
A	27				300 win mag, 30.06 or 270

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Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	28				
A	29				
A	30		hunter's choice		.308
A	31				
A	32				
A	33				
A	34				
A	35	Remington		700 BDL	7 mm
A	36				
A	37				
A	38				
A	39				
A	40	Winchester			30.06 - 300 win mag
A	41				
A	42				
A	43				
A	44				
A	45	Remington		Bolt Action	25.06 - 328
A	46				
A	47				
A	48				
A	49				
A	50				
A	51				
A	52				
A	53				
A	54				
A	55				
A	56				
A	57				
A	58				
A	59				
A	60				
A	61	Other	Savage	Bolt Action	7 mm mag
A	62				
A	63				
A	64	Remington		700	300 win mag
A	65	Other	Weatherby		
A	66				
A	67	Remington		Bolt Action	7 mm, 30.06, 7 mm mag
A	68				
A	69				
A	70			Pump	30.06
A	71				7 mm mag
A	72				

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Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	73				
A	74	Winchester		7C	300 win mag
A	75				
A	76				
A	77				
A	78	Remington		Bolt Action	
A	79				
A	80				
A	81				
A	82				
A	83				
A	84				
A	85				
A	86				
A	87	Browning			308, 7 mm, 30.06
A	88				
A	89	Other	Heckler-Koch	HK-91	308
A	90				
A	91	Winchester		70	300 mag
A	92				
A	93	Browning		Mark II	300 mag, 280-270-25.06
A	94				
A	95				
A	96				
A	97	Other	Semi-auto		30 cal or larger
A	98				
A	99				
A	100				
A	101				
A	102				
A	103				
A	104				
A	105				
A	106	Remington		700	300 win mag
A	107				
A	108				
A	109	Winchester			300 mag, 30.06
A	110				
A	111				
A	112				
A	113				
A	114				
A	115				
A	116				
A	117				

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Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	118				
A	119	Other	Weatherby		300
A	120				
A	121				
A	122				
A	123				
A	124				
A	125				
A	126				
A	127				
A	128				
A	129				
A	130				
A	131				
A	132	Other	Weatherby		700 mag
A	133				
A	134				
A	135				
A	136				
A	137	Other	Weatherby		300
A	138				
A	139	Remington		742	30.06 or 6 mm
A	140				
A	141				
A	142				7 mm recommended for deer and elk
A	143				
A	144	Other	Weatherby		from 7 mm mag to 338 for deer
A	145	Other	Weatherby		300
A	146	Browning		BDC	300
A	147				
A	148				
A	149				
A	150	Winchester		Bolt Action	
A	151				
A	152				
A	153	Remington		700	7 mm
A	154				
A	155	Other	Weatherby		7 mm
A	156				
A	157				
A	158				
A	159	Winchester	Remington		340 Weather - .338 mag
A	160				
A	161				
A	162				

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Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
B	1				
C	1				
C	2	Browning			300
C	3				
C	4				
C	5				
C	6				
C	7				
C	8	Remington		700	280
C	9				
C	10	Winchester		70	.270
C	11				
C	12				
C	13				
C	14				
C	15				
C	16				
C	17	Other	Pump		
C	18	Other	AK-47		
C	19				6mm
C	20				
C	21				
C	22				
C	23	Other	Bolt-action		.30
C	24				
C	25	Other	Bolt-action		30.06
C	26				
C	27	Ruger		77	.300 win mag
C	28				
C	29	Remington		700	30.06-.338
C	30				
C	31	Remington		Manual bolt	300
C	32	Browning		All	.270 - 7mm
C	33	Ruger		77	30.06 - .300 win
C	34				
C	35				
A	1				
A	2	Winchester			375
A	3				
A	4	Winchester		70	270
A	5				
A	6				
A	7				
A	8				
A	9				

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Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	10				
A	11				
A	12				
A	13				
A	14				
A	15				
A	16				
A	17				
A	18				
A	19				
A	20				
A	21	Remington		70	.270
A	22				
A	23	Other	Any bolt action	1-5 shotmag	25 to 30
A	24	Other	Weatherby		300 mag
A	25				
A	26				
A	27				
A	28				
A	29				
A	30				
A	31				
A	32				
A	33				
A	34				
A	35				
A	36				
A	37				
A	38				
A	39				
A	40	Ruger			30.06 - 300 win mag
A	41				
A	42				
A	43				
A	44				
A	45	Winchester		Bolt Action	25.06 - 328
A	46				
A	47				
A	48				
A	49				
A	50				
A	51				
A	52				
A	53				
A	54				

Hunting Guides

Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	55				
A	56				
A	57				
A	58				
A	59				
A	60				
A	61	Other	Weatherby	Bolt Action	338 mag
A	62				
A	63				
A	64	Other	Weatherby Mark V		300 Wea Mag
A	65	Winchester	Browning		
A	66				
A	67	Winchester	Bolt Action		
A	68				
A	69				
A	70			Bolt Action	7 mm
A	71				
A	72				
A	73				
A	74	Browning		A Bolt	300 win mag
A	75				
A	76				
A	77				
A	78				
A	79				
A	80				
A	81				
A	82				
A	83				
A	84				
A	85				
A	86				
A	87	Other	Weatherby		300, 7 mm, 338
A	88				
A	89	Other	Springfield Armory	FNG	308
A	90				
A	91	Ruger		77	300 mag
A	92				
A	93	Ruger		M77	270, 26-06, 300 mag
A	94				
A	95				
A	96				
A	97				
A	98				
A	99				

Hunting Guides

Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	100				
A	101				
A	102				
A	103				
A	104				
A	105				
A	106	Browning		1895	45-70 govt
A	107				
A	108				
A	109				
A	110				
A	111				
A	112				
A	113				
A	114				
A	115				
A	116				
A	117				
A	118				
A	119	Other	Savage		270 or 30.06
A	120				
A	121				
A	122				
A	123				
A	124				
A	125				
A	126				
A	127				
A	128				
A	129				
A	130				
A	131				
A	132				
A	133				
A	134				
A	135				
A	136				
A	137				
A	138				
A	139				
A	140				
A	141				
A	142				300 winmag recommended
A	143				
A	144	Remington	Weatherby		from 270 to 338 for deer and elk

Hunting Guides

Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
A	145	Remington			270
A	146	Ruger		#1	7 mag
A	147				
A	148				
A	149				
A	150				All bolt action with a round nose point
A	151				
A	152				
A	153				
A	154				
A	155				
A	156				
A	157				
A	158				
A	159				300mag,416Rigby,375mag,270 mag,500 nitroxpress
A	160				
A	161				
A	162				
B	1				
C	1				
C	2	Other	Sako		300
C	3				
C	4				
C	5				
C	6				
C	7				
C	8				
C	9				
C	10	Winchester		100	.308
C	11				
C	12				
C	13				
C	14				
C	15				
C	16				
C	17	Other	Weatherby		243 to 300
C	18				
C	19				
C	20				
C	21				
C	22				
C	23				
C	24				
C	25				
C	26				

Hunting Guides

Q 6. Rifles recommended for clients					
case		Make	Other Make	Model	Caliber
C	27	Springfield		M Garard	30.06 - 308
C	28				
C	29	Browning		A bolt	30.06 - .338
C	30				
C	31				
C	32	Ruger		All	.270 - 7 mm
C	33	Browning		A bolt	30.06 - 300 win
C	34				
C	35				

Hunting Guides

Q 8. Recommended rifles based on AK47 et.al.					
case		Make	Other Make	Model	Caliber
A	26	AK47			7.62x37
A	89	Other	Russian	SKS	7.62
A	113	FN-FAL			
A	159	AK47			
C	2	AK47		Antelope and Varmints and Target Shooters	30
C	10	AK47			7.62x39
C	18	AK47			
C	25	AK47			7.62
C	27	FN-FAL			308
A	26		SKS		7.62x37
A	89	HK91			308
A	113		HK 99		
C	2	AK47		Antelope and Varmints and Target Shooters	243
C	10	HK91			308
C	25		MAK 90		7.62
C	27		Century	L1A1	308
A	89	Other	Springfield Armory	FNG	308
A	113	HK93			
C	10	HK93			223
C	25		M-15		223
C	27	HK91	And clones		308

Additional Comments by Hunting Guides

Additional comments:

(8) The respondent answered questions 1, 2, 3, and 5 with "None of your business." He then stated in question 4: "It's none of your business what kind, make, model or how many guns law abiding citizens of the U.S. own, prefer to shoot."

(9) The respondent wrote that he was no longer in business but that he had owned a waterfowl operation and upland bird operation (shotguns only). He added that assault rifles were not true sporting rifles and that they should be limited to use by the military and law enforcement agencies. However, he felt that true sporting weapons that can be modified into some "quasi-assault weapons" should not be restricted. He stated that he supported the effort to get military weapons off the streets but did not want the rights of true sportsmen to be affected.

(10) Although licensed, the respondent did not guide anyone during the past year.

(11) The respondent stated in question 6 that he recommends any legal caliber rifle that client is comfortable with and that is capable of killing the desired game.

(12) For question 6, the respondent replied that he didn't recommend any specific make or model, other than whatever his clients are most comfortable using so long as the weapons are legal for the particular game.

(15) The respondent stated that his organization was solely recreational wildlife watching and photography.

(17) The respondent did not answer the questions but informed us that it is illegal in Hawaii to hunt turkey with a rifle.

(23) The respondent stated that the study rifles were more suitable for militants than sportsmen. He added, "If they want to use these weapons let them go back to the service and use them to defend our country, not against it."

(25) The respondent stated that, in his 35 years of conducting big game hunts, he had never seen any of the study rifles used for hunting. He suggested that the rifles are made to kill people, not big game.

(26) The respondent recommended bolt-action rifles for his clients but stated that he doesn't demand that they use such rifles. The respondent recommended the study rifles in close-range situations in which there are multiple targets that may pose a danger to the hunter (e.g., coyotes, foxes, mountain lions, and bears).

(27) The respondent stated that he recommended the study rifles for hunting but not any specific make.

(32) The respondent said that most of his clients are bow or pistol hunters. He said that there is little if any use for the study rifles in his outfitting service because it focuses on hunts of mountain lions and bighorn sheep. However, he did recommend the study rifles on target ranges and in competitive shooting situations and cited his right to bear arms.

(35) The respondent recommended bolt-action rifles for his clients.

(40) The respondent stated that semiautomatic rifles (such as the AK47) and others are useful for predator hunting.

(41) The respondent said that he recommended only ranges of calibers deemed suitable but not makes and models of specific rifles.

(44) The respondent recommended the following calibers for hunting without any specific makes or models: 30.06, 300 Win mag, 338, and 270.

(47) The respondent stated: "You are asking questions about certain makes of assault rifles, but you are going to end up going after ALL semiautomatic guns. I've spent about 21 years HUNTING with shotguns and I've used semiautomatic models. If you go down the list of times that one new law didn't end up being a whole sloo [sic] of other laws I would be surprised. Maybe some face-to-face with these weapons would be a good thing for politicians. If they see how they are used in 'the Real World' then they may make better amendments."

(49) The respondent specifically recommended the study rifles only for grizzly bears or moose.

(50) The respondent stated that his business involved waterfowl hunting, which uses only shotguns.

(51) The respondent replied: "It is my opinion this is a one sided survey, and does not tell the real meaning and purpose of the survey. And that is to ban all sporting arms in the future. The way this survey is presented is out of line."

(53) The respondent stated: "I recommend to all my hunters that they join the NRA, vote Republican, and buy a good semi-auto for personal defense."

(57) The respondent stated that most of his clients use bolt-action rifles. He suggested that semiautomatics are not as accurate as bolt-action rifles.

(58) The respondent stated that the survey did not pertain to his waterfowl hunting business since only shotguns are used. He added that he did not believe semiautomatics in general present any more threat to the public than other weapons or firearms. However, he suggested that cheaply made assault-type rifles imported from China and other countries are inaccurate and not suitable for hunting.

(59) The respondent stated that he had no knowledge of the semiautomatic rifles beyond 30.06 or similar calibers for hunting. He added that he did not have a use for "automatic" weapons.

(64) The respondent stated: "We need to look at weapons and determine what the designer's intent was for the weapon. We really don't need combat weapons in the hunting environment. I personally would refuse to guide for anyone carrying such a weapon."

(65) The respondent recommended the following calibers for hunting: 7mm, 30.06, .308, .708, 25.06, .243, 22.250, and 300 mag. However, he stated that the study rifles are of no use to the sporting or hunting community whatsoever.

(71) The respondent stated that he mainly hunts elk but did not recommend any additional information about specific firearms except for using 300 mag and 7 mm mag calibers.

(73) The respondent recommended any bolt-action or semiautomatic in the 30 or 7mm calibers. However, he stated that he doesn't allow his clients to use any models based on assault rifles: "They are not needed for hunting. A good hunter does not have these."

(78) The respondent recommended bolt-action rifles for hunting, particularly Browning and Remington.

(80) Although the respondent stated that he does not conduct guides, he did not see a reason to allow any rifles other those manufactured specifically for hunting and sport shooting: "All assault rifles are for fighting war and killing humans."

(82) The respondent stated that he used shotguns only.

(84) The respondent said that he did not allow semiautomatic or automatic rifles in his business. He specifically recommended manually operated rifles.

(90) The respondent stated that all the semiautomatics like AK47s are absolutely worthless and that he found no redeeming hunting value in any AK47 type of rifle. He further explained that the purpose of hunting is to use the minimum number of shells, not the maximum: "I have only known 1 [person] in 50 years to use an AK47. He shot the deer about 30 times. That wasn't hunting, it was murder." He suggested that he would be willing to testify in Congress against such weapons.

(92) The respondent stated that he had been contacted in error, as he was not in the hunting guide business.

(98) The respondent recommended any rifle that a client can shoot the best.

(101) The respondent wrote a letter saying that his business was too new to provide us with useful information about client use; however, he stated that the Chinese AK47 does a proficient job on deer and similar sizes of game and may be the only rifle that some poor people could afford. He said that he is willing to testify to Congress about the outrageous price of certain weapons.

(102) The respondent did not recommend rifles but recommended calibers .270, 30.06, .300, and 7mm.

(103) The respondent stated that he had clients who used semiautomatic rifles, but he didn't know which makes or models.

(104) The respondent recommended any legal weapons capable of killing game, "including the types mentioned under the 2nd amendment."

(105) The respondent stated that the semiautomatic rifles used by his clients were Remingtons.

(112) The respondent stated that he could not provide any useful information because his business was too new.

(113) The respondent recommended whatever is available to knock down an elk. He recommended specific calibers: 30.06, 300, or 338.

(115) The respondent questioned why anyone would use a semiautomatic firearm to hunt game: "Anyone using such horrible arms should be shot with one themselves. Any big game animal does not have a chance with a rifle and now you say people can use semiautomatic rifles."

(116) The respondent had had three clients who used semiautomatics with 30.06 and 270-caliber ammunition; however, he didn't know the makes or models.

(118) The survey questions were not answered, but the respondent wrote: "This is a stupid survey. No one contends they hunt much for big game with an AK47. The debate is over the right to own one, which the 2nd amendment says we can."

(119) The respondent recommended bolt-action rifles for hunting.

(121) The respondent stated that he uses only shotguns in his operation.

(122) The respondent recommended rifles with the calibers of .270 - 30.06 or larger to the .300 mag or .338 mag. However, he said that anything other than a standard semiautomatic sporting rifle is illegal in Colorado, where his business is conducted.

(123) The respondent, who is a bighorn sheep outfitter, stated that the semiautomatic rifles have no place in big game hunting. He recommended basic hunting rifles with calibers of 270 or 30.06.

(124) The respondent, who hunts mainly deer and elk, recommended calibers 270, 30.06, 300 mag, 7mm, 8mm, or 338.

(125) The respondent said that his clients did use semiautomatics, but he didn't have any specific information about which ones.

(126) The respondent stated that the study rifles should remain in one's home or on private property. He would like to have some for personal use but would not recommend them for hunting. He further expressed his displeasure with the Brady bill and stated that criminals need to be held accountable for their actions.

(127) The respondent, who hunts mostly elk and deer, said that the AK47 is not powerful enough to hunt elk; however, it may be ideal for smaller game, like deer or antelope. He recommended any rifles of 30.06 caliber or larger for hunting.

(131) The respondent recommended bolt-action rifles for his clients with calibers .24, .25, 7 mm, or .30. He cited his preference because of fewer moving parts, their ease to fix, and their lack of sensitivity to weather conditions in the field. He added, however, that he had seen the study rifles used with good success.

(132) The respondent stated that the study rifles are not worth anything in cold weather.

(133) The respondent recommended handguns for hunting in calibers 41 or 44 mag.

(136) The respondent did not recommend any rifles by make, but he did recommend a caliber of .308 or larger for elk.

(140) The respondent recommended any good bolt or semiautomatic in 270 caliber and up. He added: "I feel the government is too involved in our lives and seek too much control over the people of our country. I am 65 yrs old and see more of our freedom lost every day. I believe in our country but I have little faith in [organizations] like the A.T.F."

(145) The responded stated: "Don't send these guns out west. Thanks!"

(148) The respondent did not hunt turkey or deer and had no additional information to provide.

(149) The respondent said that he recommends specific rifles to his clients if they ask, usually 270 to 7mm caliber big game rifles.

(150) The respondent recommended Winchester, Remington, or any other autoloading hunting rifle.

(152) The respondent said that he recommended caliber sizes but not specific rifles.

(159) The respondent recommended any gun with which a client can hit a target. He stated that the AK47 could be used for hunting and target shooting.

(174) The respondent recommended bolt-action rifles to his clients.

(175) The respondent said that most of his deer-hunting clients use bolt-action rifles, such as Rugers and Remingtons, in calibers of 30.06, 270, or 243. In his duck guide service, only shotguns are used.

(180) The respondent wrote: "We agree people should not be allowed to have semiautomatics and automatics. This does not mean that you silly bastards in Washington need to push complete or all gun control."

(182) The respondent felt that the survey is biased because it didn't ask about hunting varmints. He stated that many of the study rifles are suitable for such activity.

(184) The respondent did not recommend single shots or automatics and only allows bolt action or pumps for use by his clients.

(188) The respondent wrote that the study guns are good for small game hunting: "I have very good luck with them as they are small, easy to handle, fast-shooting and flat firing guns."

(192) The respondent submitted a letter with the survey: "I do not recommend the use of semiautomatic weapons for hunting in my area. Most of these weapons are prone to be unreliable because the owner does not know how to properly care for them in adverse weather. The FN-FAL, HK91, HK93, and SIG SG550-1 are excellent and expensive weapons very much suited to competition shooting.

"Have you surveyed the criminal element on their choice of weapons? I suspect the criminal use of the six weapons you mentioned do law-abiding citizens compare a very small percentage to the same weapon used. I realize that even one wrongful death is too many but now can you justify the over 300,000 deaths per year from government supported tobacco?

"Gun control does not work - it never has and it never will. What we need are police that capture criminals and a court system with the fortitude to punish them for their crimes."

(198) The respondent stated that this was his first year in and that it was mainly a bow-hunting business.

DEPARTMENT OF THE TREASURY
BUREAU OF ALCOHOL, TOBACCO AND FIREARMS
WASHINGTON, D.C. 20226

DIRECTOR

DEC 10 1997

O:F:S:DMS
3310

Dear Sir or Madam:

On November 14, 1997, the President and the Secretary of the Treasury decided to conduct a review to determine whether modified semiautomatic assault rifles are properly importable under Federal law. Under 18 U.S.C. section 925(d)(3), firearms may be imported into the United States only if they are determined to be of a type generally recognized as particularly suitable for or readily adaptable to sporting purposes. The firearms in question are semiautomatic rifles based on the AK47, FN-FAL, HK91, HK93, SIG SG550-1, and Uzi designs.

As part of the review, the Bureau of Alcohol, Tobacco and Firearms (ATF) is interested in receiving information that shows whether any or all of the above types of semiautomatic rifles are particularly suitable for or readily adaptable to hunting or organized competitive target shooting. We are asking that your organization voluntarily complete the enclosed survey to assist us in gathering this information. We anticipate that the survey will take approximately 15 minutes to complete.

Responses must be received no later than 30 days following the date of this letter; those received after that date cannot be included in the review. Responses should be forwarded to the Bureau of Alcohol, Tobacco and Firearms, Department HSE, P.O. Box 50860, Washington, DC 20091. We appreciate any information you care to provide.

Sincerely yours,

John W. Magaw

John W. Magaw
Director

Enclosure

OMB No. 1512-0542

ATF SURVEY OF HUNTING/SHOOTING EDITORS FOR RIFLE USAGE

1. Does your publication recommend specific types of centerfire semiautomatic rifles for use in **hunting medium game (for example, turkey) or larger game (for example, deer)?**

_____Yes *(Continue)* _____No *(Skip to #3)*

2. If your answer to item 1 is "Yes", please identify the specific centerfire semiautomatic rifles you recommend.

Make	Model	Caliber

3. Does your publication recommend **against** the use of any semiautomatic rifles whose design is based on the **AK 47, FN-FAL, HK91, HK93, SIG 550-1, or Uzi** for use in **hunting medium game (for example, turkey) or larger game (for example, deer)?**

_____Yes *(Continue)* _____No *(Skip to #5)*

_____Yes, in certain circumstances. Please explain ________________________________

____*(Continue)*

4. If your answer to item 3 is "Yes" or "Yes, in certain circumstances", please identify the specific rifles that you recommend **against** using for **hunting medium game (for example, turkey) or larger game (for example, deer)?**

Make	Model	Caliber

5. Does your publication recommend specific types of centerfire semiautomatic rifles for use in **high-power rifle competition**?

_____Yes *(Continue)* _____No *(Skip to #7)*

OMB No. 1512-0542

ATF SURVEY OF HUNTING/SHOOTING EDITORS FOR RIFLE USAGE

6. If your answer to item 5 is "Yes", please identify the specific centerfire semiautomatic rifles you recommend.

Make	Model	Caliber

7. Does your publication recommend **against** the use of any semiautomatic rifles whose design is based on the **AK 47, FN-FAL, HK91, HK93, SIG 550-1, or Uzi** for use in **high-power rifle competition**?

_____Yes *(Continue)* _____No *(Skip to #9)*

_____Yes, in certain circumstances. Please explain ________________________________

____*(Continue)*

8. If your answer to item 7 is "Yes" or "Yes, in certain circumstances", please identify the specific rifles your publication recommends **against** using for **high-power rifle competition**.

Make	Model	Caliber

9. Have you or any other author who contributes to your publication written any articles since 1989 concerning the use of semiautomatic rifles and their suitability for use in hunting or organized competitive shooting? *(Exclude Letters to the Editor.)*

_____Yes *(Continue)* _____No (*You are finished with the survey. Thank you.*)

10. If your answer to item 9 is "Yes", please submit a copy of the applicable article(s). Any material you are able to provide will be very beneficial to our study. Please indicate the publication, issue date and page for each article.

Editors

Comments:

2. If your answer to item 1 is "Yes," please identify the specific centerfire rifles you recommend:

   (8) Anything except Uzis.

   (9) All study rifles except Uzi.

   (12) See attached articles.

3. Please explain circumstances to question 3: Does your publication recommend against the use of any semiautomatic rifles whose design is based on the AK 47, FN-FAL, HK91, HK93, SIG 550-1, or Uzi for use in hunting medium game (for example, turkey) or larger game (for example, deer)?

   (12) When the caliber is inappropriate or illegal for the specific game species.

4. Other rifle make recommendations in response to question 4: If your answer to item 3 is "Yes" or "Yes, in certain circumstances," please identify the specific rifles that you recommend against using for hunting medium game (for example, turkey) or larger game (for example, deer)?

   (12) See attached articles.

The following two items are for the responses to question 6: If your answer to item 5 is "Yes," please identify the specific centerfire semiautomatic rifles you recommend:

Model

(5) Springfield M1A and Colt AR-15.

Caliber

(5) 7.62m (M1A) and .223 (Colt).

The following items are for questions 9 and 10 on articles written and the submission of these articles with the survey.

Article 1

(8) No articles enclosed.

(9) Semiautomatic Takes Tubb to HP Title.

(10) No articles attached.

Article 2

(9) AR-15 Spaceguns Invading Match.

DEPARTMENT OF THE TREASURY
BUREAU OF ALCOHOL, TOBACCO AND FIREARMS
WASHINGTON, D.C. 20226

DIRECTOR

DEC 10 1997

O:F:S:DMS
3310

Dear Sir or Madam:

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As part of the review, the Bureau of Alcohol, Tobacco and Firearms (ATF) is interested in receiving information that shows whether any or all of the above types of semiautomatic rifles are particularly suitable for or readily adaptable to hunting or organized competitive target shooting. We are asking that your organization voluntarily complete the enclosed survey to assist us in gathering this information. We anticipate that the survey will take approximately 15 minutes to complete.

Responses must be received no later than 30 days following the date of this letter; those received after that date cannot be included in the review. Responses should be forwarded to the Bureau of Alcohol, Tobacco and Firearms, Department FG, P.O. Box 50860, Washington, DC 20091. We appreciate any information you care to provide.

Sincerely yours,

John W. Magaw

John W. Magaw
Director

Enclosure

OMB No. 1512-0542

ATF SURVEY OF STATE FISH AND GAME COMMISSIONS FOR RIFLE USAGE

State:________________________

1. Do the laws in your state place any prohibitions or restrictions (other than seasonal) on the use of **high-power** rifles for **hunting medium game (for example, turkey) or larger game (for example, deer)?**

_____Yes *(Continue)* _____No *(Skip to #2)*

1a. If "Yes", please cite law(s) and briefly describe the restrictions.

____

____

____

____

____

____

2. Do the laws in your state place any prohibitions or restrictions (other than seasonal) on the use of **semiautomatic** rifles for **hunting medium game (for example, turkey) or larger game (for example, deer)?**

_____Yes *(Continue)* _____No *(Skip to #3)*

2a. If "Yes", please cite law(s) and briefly describe the restrictions.

____

____

____

____

____

OMB No. 1512-0542

ATF SURVEY OF STATE FISH AND GAME COMMISSIONS FOR RIFLE USAGE

____(*Continue)*

3. What, if any, is the minimum caliber or cartridge dimensions that may be used for **hunting medium game (for example, turkey) or larger game (for example, deer)?**

Caliber: ______________________________ **OR** Dimensions:____________________________

_____There is no minimum.

4. Does your commission or state collect any data on the types of rifles used in your state for **hunting medium game (for example, turkey) or larger game (for example, deer)?**

______Yes *(Continue)* _____No (*You are finished with the survey. Thank you.*)

4a. If "Yes", please provide hard copies of any such available data for the past two hunting seasons of 1995 and 1996. Any data that you provide will be most beneficial to our study.

If you would like us to contact you regarding the data, please provide your name and phone number.

Name:____Phone:_____________________

Survey Fish and Game Commissions for Rifle Usage

	Restrictions		Minimum Caliber or Cartridge		
STATE	Q1	Q2	Q3	Q4	Q5
	HiPwr	Semiauto	Minimum Caliber	Minimum Cartridge	Collect Data
Alabama	Yes	Yes	Any center fire rifle	None	No
Alaska	Yes	No	No Centerfire for big game		No
Arizona	No	Yes	.22 mag or larger		No
Arkansas	Yes	No	None	None	No
California	No	No	See Question 1a	See Question 1a	No
Colorado	Yes	Yes	0.24		No
Connecticut	Yes	Yes			
Delaware	Yes	Yes			
Florida	Yes	Yes	No rimfire for deer		No
Georgia	Yes	No	.22 Centerfire or larger		No
Hawaii	No	No			
Idaho	Yes	Yes	.22 rimfire		No
Illinois	Yes	Yes	None	None	No
Indiana	Yes	Yes	None		No
Iowa	Yes	Yes	not provided		No
Kansas	Yes	Yes	.23 caliber or larger		No
Kentucky	No	No			
Louisiana	Yes	No	.22 Centerfire		No
Maine	Yes	No	.22 mag or larger		No
Maryland	Yes	Yes			
Massachusetts	Yes	No	None	None	Yes
Michigan	Yes	Yes	.23 or larger		No
Minnesota	Yes	No	0.23	1.285"	No
Mississippi	Yes	No	None	None	No
Missouri	Yes	Yes	None	None	No
Montana	No	No	None		No
Nebraska	No	No			
Nevada	No	No			No
New Hampshire	Yes	Yes		above .22 rimfire	No
New Jersey	Yes	Yes	None	None	No
New Mexico	Yes	No	.24 centerfire or larger		No
New York	Yes	Yes	Must be centerfire		No
North Carolina	Yes	No	None	None	No
North Dakota	Yes	Yes	.22 Centerfire or larger		No
Ohio	Yes	No	None	None	No
Oklahoma	Yes	Yes	.22 magnum		No
Oregon	Yes	Yes	.22 or .24 or larger		No
Pennsylvania	Yes	Yes	None	None	No
Rhode Island	Yes	Yes		.229 maximum	No
South Carolina	Yes	No	Must be larger than .22		No
South Dakota	Yes	No	None	None	No
Tennessee	Yes	Yes	.24 or larger caliber		No
Texas	Yes	No	None	None	No
Utah	Yes	No		None	No
Vermont	Yes	No			No
Virginia	Yes	Yes	.23 caliber for deer		No
Washington	Yes	Yes	.240 or larger for coyote		No
West Virginia	No	No		Any centerfire	No
Wisconsin	Yes	No	.22 caliber or larger		No
Wyoming	Yes	No		23/100 bullet dia.	No

State Fish and Game Commissions

Restrictions for High Powered Rifles

1a. Please cite law(s) and briefly describe the restrictions.

Alabama
(19) No automatic weapons, no silenced weapons.

Alaska
(23) Bison hunters must use a caliber capable of firing a 200-grain bullet having 2,000 pounds of energy at 100 yards.

Arkansas
(11) No rifles for turkey.

California
(22) Centerfire for big game, 10 gauge or smaller for resident small game.

Colorado
(10) Semiautomatic rifle may not hold more than 6 rounds.

Connecticut
(39) Shotgun only on public lands. Can use any type of rifle on private land.

Delaware
(40) No rifles - shotguns/muzzle loaders only.

Florida
(25) Machine guns and silencers not permitted for any hunting.

Georgia
(29) No hi-power rifles allowed for turkey hunting.

Hawaii
(49) Must have discharge of 1200 foot pounds.

Idaho
(30) No hi-power rifles allowed for hunting turkey.

Illinois
(12) Turkey or deer may not be hunted with rifle. Deer may not be hunted with muzzle loading rifle. No restriction on rifles for coyote, fox, and woodchuck, etc.

Indiana
(34) No hi-power rifles allowed for deer or turkey hunting. Limited restrictions for specified areas.

Iowa
(26) Cannot use rifles for turkey or deer, only shotgun or bow and arrow. No difference if public or private lands. For coyote or fox, there is no restriction on rifles, magazine size, or caliber.

Kansas
(33) Must use ammunition specifically designed for hunting.

Louisiana
(6) No rifles for turkey hunting. Rifles for deer hunting must be no smaller than .22 centerfire.

Maine
(32) No hi-power rifles for turkey and water fowl. Some limited restrictions for specific areas.

Maryland
(42) Some restrictions based on county. They are allowed in western and southern Maryland. Shotguns only in and around Baltimore and Washington, D.C.

Massachusetts
(14) Rifles not permitted for hunting deer and turkey.

Michigan
(27) No turkey hunting with hi-power rifle. No night hunting with hi-power rifle. Deer hunting with hi-power rifle allowed only in lower southern peninsula. Limited restrictions for specific areas.

Minnesota
(13) Caliber must be at least .23. Ammunition must have a case length of at least 1.285". .30 caliber M1 carbine cartridge may not be used.

Mississippi
(15) Restricts turkey hunting to shotguns. However quadriplegics may hunt turkey with a rifle.

Missouri
(5) Rifles not permitted for turkey. Self loading firearms for deer may not have a combined magazine + chamber capacity of more than 11 cartridges.

Nebraska
(43) Allowed and frequently used, but magazine capacity maximum is six rounds.

Nevada
(1) Answer to #3 refers to NAS 501.150 and NAS 503.142. Not for turkey.

New Hampshire
(7) Magazine capacity no more than 5 rounds. Prohibits full metal jacket bullets for hunting. Prohibits deer hunting with rifles in certain towns.

New Jersey
(17) No rifles.

New Mexico
(31) No hi-power rifles allowed for hunting turkey.

New York
(24) No semiautomatics with a magazine capacity of greater than 6 rounds; machineguns and silencers not permitted for any hunting. Limited restrictions for specific areas.

North Carolina
(20) Centerfire rifles not permitted for turkey hunting.

North Dakota
(28) No hi-power rifles for turkey hunting.

Ohio
(3) Prohibits high power rifles for turkey, deer and migratory birds. High power rifles can be used on all other legal game animals.

Oklahoma
(8) Centerfire rifles only for large game. Magazines for .22 centerfire rifles may not hold more than 7 rounds.

Oregon
(2) OAR 635-65-700(1) must be .24 caliber or larger center fire rifle, no full automatic; OAR 635-65-700(2) hunters shall only use centerfire rifle .22 caliber; OAR-65-700(5) no military or full jacket bullets in original or altered form. Limited restrictions for specific areas.

Pennsylvania
(16) Rifles not permitted in Philadelphia & Pittsburgh areas.

Rhode Island
(44) .22 center fire during the summer for woodchucks.

South Carolina
(18) No rifle for turkey, rifle for deer must be larger than .22 caliber

South Dakota
(50) Magazine not more than five rounds.

Tennessee
(37) No hi-power rifles allowed for turkey hunting.

Texas
(21) Rimfire ammunition not permitted for hunting deer, antelope, and bighorn sheep; machine guns and silencers not permitted for hunting any game animals.

Utah
(9) No rifles for turkey hunting.

Vermont
(47) Turkey size less than 10 gauge. Deer/moose/beer, no restriction on caliber.

Virginia
(48) 23 caliber or larger for deer and bear. No restrictions for turkey. No magazine restrictions, shotgun limited to 3 shells. Restrictions vary from county to county - approximately 90 different rifle restrictions in the State of Virginia based on the county restrictions. Sawed-off firearms are illegal to own unless with a permit, if barrel less than 16 inches for rifle, and 18 inches for shotgun.

Washington
(46) Hunting turkey limited to shotguns. Small game limited to shotguns.

Wisconsin
(36) No .22 rimfire rifles for deer hunting.

Wyoming
(4) Big game and trophy animals, firearm must have a bore diameter of at least 23/100 of an inch.

Restrictions for Semiautomatic Rifles

2a. Please cite law(s) and briefly describe the restrictions.

Alabama
(19) Turkey may not be hunted with a centerfire rifle or rimfire rifle. Semiautomatic rifles of proper caliber are legal for all types of hunting. No restrictions on magazine capacity, except wildlife management areas where centerfire rifles are restricted to 10 round max.

Arizona
(38) Magazine cannot hold more than 5 rounds.

Colorado
(10) Semiautomatic rifle may not hold more than 6 rounds.

Connecticut
(39) Shotgun only on public lands. Any type of rifle can be used on private land.

Delaware
(40) No rifles - shotguns/muzzle loaders only.

Florida
(25) No semiautomatic centerfire rifles having a magazine capacity greater than 5 rounds.

Idaho
(30) No hi-power rifles (including semiautomatic) allowed for turkey hunting.

Illinois
(12) See #1.

Indiana
(34) No hi-power rifles allowed for turkey hunting.

Iowa
(26) Cannot use rifles for turkey or deer, only shotgun or bow and arrow. No difference in public or private land. For coyote or fox, there is no restriction on rifle, magazine size, or caliber.

Kansas
(33) Must use ammunition specifically designed for hunting.

Maryland
(42) Some restrictions. Based on county. Shotguns only in and around Baltimore and Washington, D.C.

Michigan
(27) Unlawful to hunt with semiautomatic rifles capable of holding more than 6 rounds in magazine and barrel. Rimfire (.22 cal) rifles excluded from restrictions.

Missouri
(5) Combined magazine + chamber capacity may not be more than 11 cartridges.

New Hampshire
(7) Turkey may not be hunted with rifles. Rifles may not have magazine capacity of more than 5 cartridges.

New Jersey
(17) No rifles.

New York
(24) No semiautomatics with a magazine capacity of greater than 6 rounds.

North Dakota
(28) No hi-power rifles (including semiautomatics) may be used for hunting turkey.

Oklahoma
(8) See #1.

Oregon
(2) OAR 635-65-700(1) and (2) limits magazine capacity to no more than 5 cartridges.

Pennsylvania
(16) Semiautomatic rifles are not lawful for hunting in Pennsylvania.

Rhode Island
(44) Cannot use semiautomatic during the winter, only during the summer months for woodchucks (during daylight from April 1 to September 30).

Tennessee
(37) No hi-power rifles, including semiautomatics, allowed for turkey hunting.

Vermont
(47) Semiautomatic 5 rounds or less.

Virginia
(48) Semiautomatics are legal wherever rifles can be used. 23 caliber or larger for deer and bear. No restrictions for turkey. No magazine restrictions, shotgun limited to 3 shells. Restrictions vary from county to county - approximately 90 different rifle restrictions in the State of Virginia based on the county restrictions. Sawed-off firearms are illegal to own unless with a permit, if barrel less than 16 inches for rifle, and 18 inches for shotgun. Striker 12 - drums holds 12 or more rounds and is illegal.

Washington

(46) Cannot use fully automatic for hunting.

West Virginia

(45) Cannot use fully automatic firearms for hunting.

Comments Provided by Law Enforcement Agencies

(1) No research.

(2) No research.

(3) NOBLE and others forwarded information to a U.S. Senator on circumstances concerning police officers killed or injured by these weapons. No data was provided.

(4) No research.

(7) The organization stated: "Most of the data available on guns and crime does not provide the detail needed to identify the types of guns listed. . . . We have conducted several surveys that refer to assault rifles generically, including the Survey of Inmates in State Correctional Facilities 1991, Survey of Inmates in Local Jails 1995, and the Survey of Adults on Probation 1995. The data on assault weapons has not been analyzed in the recently released Survey of Adults on Probation 1995 or in the yet to be released Survey of Inmates in Local Jails 1995.

"Our report Guns Used in Crime includes the results of an analysis of the stolen data from the FBI's National Crime Information Center database. Our analysis was limited to general categories of guns and calibers of handguns. The recent evaluation of the assault weapons ban funded by the National Institute of Justice analyzed a more recent set of the same data with an emphasis on assault weapons. The results of this evaluation were reported in Impact Evaluation of the Public Safety and Recreational Firearms Use Protection Act of 1994."

"BJS [Bureau of Justice Statistics] supports the Firearms Research Information System (FARIS). . . . This database contains firearms-related information from surveys, research, evaluations, and statistical reports. . . . We queried this database for any research on assault weapons. The results of the query include both the reports listed above, as well as several others. Please note that in BJS's report Guns Used in Crime refers to the report Assault Weapons and Homicide in New York City prepared by one of our grantees. While the data are from 1993, the report provides interesting insights into the use of assault weapons and homicide. Another source of data on assault weapons and crime is the FBI's Law Enforcement Officers Killed and Assaulted series, which records the type of gun used in killings of police officers. Several of the reports listed in the FARIS query used these data, including Cop Killers: Assault Weapons Attacks on America's Police, and Cops Under Fire: Law Enforcement Officers Killed with Assault Weapons or Guns with High Capacity Magazines."

(9) Guns in America: National Survey on Private Ownership and Use of Firearms (May 1997) states: The 1994 NSPOF (National Survey of Private Ownership of Firearms) estimates for the total number of privately owned firearms is 192 million: 65 million handguns, 70 million rifles, 49 million shotguns, and 8 million other long guns.

DEPARTMENT OF THE TREASURY
BUREAU OF ALCOHOL, TOBACCO AND FIREARMS
WASHINGTON, D.C. 20226

DIRECTOR

DEC 10 1997

O:F:S:DMS
3310

Dear Sir or Madam:

On November 14, 1997, the President and the Secretary of the Treasury decided to conduct a review to determine whether modified semiautomatic assault rifles are properly importable under Federal law. Under 18 U.S.C. section 925(d)(3), firearms may be imported into the United States only if they are determined to be of a type generally recognized as particularly suitable for or readily adaptable to sporting purposes. The firearms in question are semiautomatic rifles based on the AK47, FN-FAL, HK91, HK93, SIG SG550-1, and Uzi designs.

As part of the review, the Bureau of Alcohol, Tobacco and Firearms (ATF) is interested in receiving information that shows whether any or all of the above types of semiautomatic rifles are particularly suitable for or readily adaptable to hunting or organized competitive target shooting.

Although ATF is not required to seek public comment on this study, the agency would appreciate any factual, relevant information concerning the sporting use suitability of the rifles in question.

Your voluntary response must be received no later than 30 days from the date of this letter; those received after that date cannot be included in the review. Please forward your responses to the Bureau of Alcohol, Tobacco and Firearms, Department TA, P.O. Box 50860, Washington, DC 20091.

Sincerely yours,

John W. Magaw

John W. Magaw
Director

Comments Provided by Industry Members and Trade Associations

(12) The respondent felt that definitions and usage should be subject to rulemaking. The respondent stated that limits on "sporting" use do not take into account firearms technology and its derivative uses among millions of disparate consumers. Millions of gun owners currently engage in informal target competition.

The respondent stated that the firearms are suitable for sporting purposes and that ATF's practice of making "ad hoc" revisions to import criteria disrupts legitimate commerce. The respondent recommends that all changes to criteria should be subject to rulemaking.

(19) The respondent submitted a brochure and a statement supported by seven letters from FFL's who sell the SLR-95 and 97 and ROMAK 1 and 2. The respondent and all the supporting letters attest to the suitability of these guns for hunting because (1) they are excellent for deer or varmint hunting; (2) they are used by many for target shooting; (3) their ammunition is readily available and affordable; and (4) they are excellent for young/new hunters because of low recoil, an inexpensive purchase price, durability, and light weight, as well as being designed only for semiautomatic fire.

(20) One respondent submitted results of its independently conducted survey, which consisted of 30 questions. The results of the survey suggest that 36 percent of those queried actually use AK47-type rifles for hunting or competition, 38 percent use L1A1-type rifles for hunting or competition, and 38 percent use G3-type rifles for hunting or competition. Other uses include home defense, noncompetitive target shooting, and plinking. Of those queried who do not currently own these types of rifles, 35 percent would use AK-type rifles for hunting or competition, 36 percent would use L1A1-type rifles for hunting or competition, and 37 percent would use G3-type rifles for hunting or competition.

(22) The respondent claims that the majority of the study rifles' length and calibers can be used only for sporting purposes. The respondent asserts that the only technical detail remaining after the 1989 decision that is similar to a military rifle is the locking system. After 1989, the imported rifles have no physical features of military assault rifles. All have features which can be found on any semiautomatic sporting/hunting rifle.

However, the respondent writes that the Uzi-type carbines are "not suitable for any kind of sporting events other than law enforcement and military competitions because the caliber and locking system do not allow precise shooting over long distances."

(23) One respondent, who imports the SAR-8 and SAR-4800 that are chambered for .308 Winchester ammunition, states that neither rifle possesses any of the characteristics of either the 1989 determination or the 1994 law. The respondent states that both are permitted in match rifle and other competitions. The respondent states that only two questions should be considered to determine hunting suitability of a rifle: Whether the caliber is adequate to take one or more game species and whether the gun is safe and reliable. The respondent states that there is no factual or legal basis to conclude that the rifles are not "particularly suitable" for sporting purposes.

(24) The respondent writes: "The particular firearms differ from other guns that are universally acceptable only in cosmetic ways. There is no functional difference between semiautomatic firearms based on the external features that have been keyed on in an attempt to implement the import restrictions of the 1994 Crime Bill. As further attempts to differentiate functionally identical firearms by these features for the purposes of culling out those that might be politically suitable for an administrative import ban is wrong."

(25) The respondent writes that the SLG95 was developed exclusively for hunting and competitive shooting. The respondent points out that it is capable of single firing only and cannot be reassembled for use as an automatic weapon. It is made for endurance and accuracy to 300 meters.

(26) The respondent recommends AK47 variants specifically, but believes all study rifles are suitable or adaptable for sporting. The respondent states that a Galil-chambered .308/.223 with a two-position rear sight, adjustable front sight, or scope mount channel, are reliable, durable, accurate, and suitable for hunting and organized competitive shooting. The respondent states that the Uzi, which chambers 9mm and 40 S&W, two-position rear sight, and an adjustable front sight is suitable for organized competitive target shooting.

(27) The respondent states that the SIG-SG550-1, in its original configuration, never possessed assault rifle features. The respondent states that is was built as a semiautomatic, not a fully automatic that was converted or modified to semiautomatic. It does have protruding pistol grip, and its ergonomics are geared toward its original design of goal-precision shooting. The respondent says that the name "Sniper" was a marketing decision, and it is extremely popular in .223 competitions. Its price isolates the gun to the competitor/collector.

(28) Letters from H&K users were submitted in support of their continued importation and use as sporting arms. Specifically, the SR9 and PSG1 were said to be clearly suitable and utilized daily for hunting and target shooting. The respondent states that sport is defined as "an active pastime, diversion, recreation" and that the use of these is all the justification needed to allow their importation. The PSG1 has been imported since 1974, and the SR9 since 1990. The semiautomatic feature dates to turn of the century.

The respondent states that the cost would dissuade criminals from using them. The respondent refers to ATF's reports "Crime Gun Analysis (17 Communities)" and "Trace Reports 1993-1996" to show that the H&K SR9 and PSG1 are not used in crime. In the 4-year period covered by the reports, not one was traced.

(29) The respondent faults the 1989 report both for not sufficiently addressing the issue of ready adaptability, as well as for the limited definition of sporting purposes. The respondent states that sport is defined as "that which diverts, and makes mirth; pastime, diversion." The respondent says that the NRA sponsors many matches, and personally attests to the FN-FAL and HK91 as being perfectly suitable for such matches. The respondent states that the rifles are also used for hunting deer, rabbits, and varmints. Further, the respondent remarks that the use of these rifles in crime is minuscule.

Importer/Individual Letters

On January 15, 1998, the study group received a second submission from Heckler and Koch, dated January 14, 1998. It transmitted 69 letters from individuals who appeared to be answering an advertisement placed in <u>Shotgun News</u> by Heckler and Koch. The study group obtained a copy of the advertisement, which requested that past and current owners of certain H&K rifles provide written accounts of how they use or used these firearms. The advertisement stated that the firearms in question, the SR9 and the PSG1, were used for sporting purposes such as hunting, target shooting, competition, collecting, and informal plinking. The advertisement also referred to the 120-day study and the temporary ban on importation, indicating that certain firearms may be banned in the future.

<u>Synopses of Letters</u>:

1. The writer used his SR9 to hunt deer (photo included).

2. The writer used his SR9 to hunt deer (photo included).

3. The writer used his SR9 for informal target shooting and plinking.

4. The writer used his SR9 for target practice and recreation.

5. The writer (a police officer) used SR9 to hunt. Said that it's too heavy and expensive for criminals.

6. The writer used his SR9 for competition.

7. The writer used H&K rifles such as these around the farm to control wild dog packs.

8. The writer used his SR9 to hunt deer.

9. The writer used his SR9 to hunt, participate in target practice, and compete.

10. The writer used his H&K rifles for informal target shooting.

11. The writer used his SR9 to hunt elk because it's rugged, and to shoot targets.

12. The writer used his SR9 to target practice.

13. The writer used his HK91 to hunt varmints and compete in military rifle matches.

14. The writer does not use the firearms but is familiar with their use for target shooting, hunting, and competition.

15. The writer uses HK firearms for DCM marksmanship competition.

16. The writer used his HK93 for 100-yard club matches and NRA-high power rifle matches.

17. The writer does not own the firearms but enjoys shooting sports and collecting.

18. The writer used his HK91 to hunt deer, boar, and mountain goat and in high-power match competitions.

19. The writer used his SR9 to shoot targets and for competitions.

20. The writer used his HK91 to shoot varmints, hunt small and big game, and shoot long-range silhouettes.

21. The writer used his SR8 to hunt deer, target shoot, and plink.

22. The writer used his HK93 to shoot in club competitions.

23. The writer used his SR9 to shoot targets because the recoil does not impact his arthritis.

24. The writer (a police officer) does not own the firearm but never sees HKs used in crime.

25. The writer used his HKs for target shooting, competition, and collection.

26. The writer does not own the firearms but likes recreational target shooting.

27. Writer does not own the firearms but states, "Don't ban."

28. The writer used his SR9 for hunting deer, varmints, and groundhogs; for target shooting; and for occasional competitions.

29. The writer used his SR9 to hunt deer because it's accurate, rugged, and reliable.

30. The writer used his SR9 to hunt deer and elk.

31. The writer used his SR9 to target shoot.

32. The writer used his SR9 to hunt deer and target shoot.

33. The writer used his HK91 to shoot military rifle 100-yard competitions.

34. The writer used his SR9 for hunting varmints and coyotes, for target shooting, and for competitions.

35. The writer used his SR9 to hunt deer and target shoot.

36. The writer (a former FBI employee) used his SR9 for hunting varmints and for precision and target shooting.

37. The writer used his HK for target shooting and competition.

38. The writer used his SR9 for informal target shooting and plinking and his HK91 for bowling pin matches, high-power rifle competitions, informal target shooting, and plinking.

39. The writer used his SR9 to plink and shoot targets, saying it's too heavy for hunting.

40. The writer has an HK91 as part of his military collection and indicates it may be used for hunting.

41. The writer used his SR9 to target shoot.

42. The writer used his SR9 to hunt deer and target shoot.

43. The writer does not own the firearms but says, "Don't ban."

44. The writer used his SR9 and HK93 for hunting deer, for target shooting, and for home defense.

45. The writer states, "Don't ban."

46. Writer states, "Don't ban."

47. Writer states, "Don't ban."

48. The writer owns an SR9; no use was reported.

49. Writer used his SR9 to compete in club matches and "backyard competitions."

50. The writer used his HK to hunt boar and antelope.

51. The writer states, "Don't ban."

52. The writer (a police officer) does not own the firearms but states that the are not used by criminals.

53. The writer used his HK91 to hunt deer.

54. The writer (a police trainer) says that the PSG1 is used for police sniping and competitive shooting because it's accurate. He says that it's too heavy to hunt with and has attached an article on the PSG1.

55. The writer used her two PSG1s for target shooting and fun.

56. The writer used his SR9 and PSG1 to hunt and target shoot.

57. The writer used his two PSG1s to hunt and target shoot.

58. The writer provides an opinion that the SR9 is used to hunt and target shoot.

59. The writer used his PSG1 for hunting deer and informal target shooting.

60. The writer used his PSG1 to target shoot and plink.

61. The writer states, "Don't ban."

62. The writer used his HK91 to target shoot.

63. The writer used his HK91 to target shoot.

64. The writer (a U.S. deputy marshall) used his SR9 to shoot at the range.

65. The writer used his SR9 to hunt deer and coyotes.

66. The writer used his SR9 to competitively target shoot.

67. The writer used his SR9 to hunt deer and bear.

68. The writer uses military-type rifles like these for predator control on the farm.

69. The writer used his SR9 to target shoot, plink, and compete in DCM matches.

Comments Provided by Interest Groups

(7) Impact Evaluation of the Public Safety and Recreational Firearms Use Protection Act of 1994, Final Report. March 13, 1997.

(8) Identical comments were received from five members of the JPFO. They are against any form of gun control or restriction regardless of the type of firearm. References are made comparing gun control to Nazi Germany.

(9) The respondent contends that police/military-style competitions, "plinking," and informal target shooting should be considered sporting. Note: The narrative was provided in addition to survey that Century Arms put on the Internet.

The respondent questions ATF's definition of "sporting" purposes. The respondent contends that neither the Bill of Rights nor the Second Amendment places restrictions on firearms based on use.

(13) Citing the 1989 report, the respondent states that the drafters of the report determined what should be acceptable sports, thus excluding "plinking."

The respondent states that appearance (e.g., military looking) is not a factor in determining firearms' suitability for sporting purposes. It is their function or action that should determine a gun's suitability. Over 50 percent of those engaged in Practical Rifle Shooting use Kalashnikov variants. Further, citing U.S. vs. Smith (1973), the "readily adaptable" determination would fit all these firearms.

(14) The respondent states that the vast majority of competitive marksmen shoot either domestic or foreign service rifles. Only 2-3 participants at any of 12 matches fire bolt-action match rifles. If service rifles have been modified, they are permitted under NRA rule 3.3.1.

The respondent says that attempts to ban these rifles "is a joke."

(15) The respondent states that these firearms are used by men and women alike throughout Nebraska. All of the named firearms are used a lot all over the State for hunting. The AK47 has the same basic power of a 30/30 Winchester. All of these firearms function the same as a Browning BAR or a Remington 7400. Because of their design features, they provide excellent performance.

(16) The respondent states that the Bill of Rights does not show the second amendment connected to "sporting purposes." The respondent says that all of the firearms in question are "service rifles," all can be used in highpower rifle competition (some better than others), but under no circumstances should "sporting use" be used as a test to determine whether they can be sold to the American public. The respondent states that "sporting use" is a totally bogus question.

(17) The respondent's basic concern is that the scope of our survey is significantly too narrow (i.e., not responsive to the Presidential directive, too narrow to address the problem, and inadequate to the task). The respondent states, "We do not indicate that our determination will impact modifications made to skirt law. We rely on the opinions of the 'gun press.' At a minimum, the Bureau should deny importation of: any semiautomatic capable of accepting with a capacity of more than 10 rounds, and any semiautomatic rifle with a capacity to accept more rounds than permitted by the State with the lowest number of permitted rounds. Deny any semiautomatic that incorporates cosmetically altered 'rule-beating' characteristics. Deny any semiautomatic that can be converted by using parts available domestically to any of the 1994 banned guns/characteristics. Deny any semiautomatic manufactured by any entity controlled by a foreign government. OR manufactured by a foreign entity that also manufactures, assembles or exports assault-type weapons. Deny any semiautomatic that contains a part that is a material component of any assault type weapon made, assembled, or exported by the foreign entity which is the source of the firearm proposed to be imported."

"A material component of any assault type weapon, assembled or exported by the foreign entity, which is, the source of the firearms proposed to be imported. The gun press has fabricated 'sporting' events to justify these weapons. The manner in which we are proceeding is a serious disservice to the American people."

Attachments: <u>That Was Then, This is Now; Assault Weapons; Analysis, New Research, and Legislation; Assault Weapons and Accessories in America; and Cop Killers.</u> All authored by the Violence Policy Center.

(30) The respondent states, "At least for handguns, and among young adult purchasers who have a prior criminal history, the purchase of an assault-type firearm is an independent risk factor for later criminal activity on the part of the purchaser."

NOTE: The above study was for assault-type handguns used in criminal activity versus other handguns. The study involved only young adults, and caution should be used in extending these results to other adults and purchasers of rifles. However, the respondent states, it is plausible that findings for one class of firearms may pertain to another closely related class.

(31) <u>The 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation</u>. The publication outlines 1996 expenditures for guide use and percentage of hunters using guides for both big game and small game hunting.

(32) In a memo from the Center to Prevent Handgun Violence the sections are Legal Background, History of Bureau Application of the "Sporting Purposes" Test, The Modified Assault Rifles under Import Suspension Should Be Permanently Barred from Importation, [The Galils and Uzis Should Be Barred from Importation Because They Are Banned by the Federal Assault Weapon Statute, and All the Modified Assault Rifles Should Be Barred from Importation Because They Fail the Sporting Purposes Test]. The conclusion states: "The modified assault rifles currently under suspended permits should be permanently barred from importation because they do not meet the sporting purposes test for importation under the Gun Control Act of 1968 and because certain of the rifles [Galils and Uzis] also are banned by the 1994 Federal assault weapon law."

Comments Provided by Individuals

(10) The respondent does not recommend the Uzi, but he highly recommends the others for small game and varmints. He feels that the calibers of these are not the caliber of choice for medium or large game; however, he believes that the SIG and H&K are the best-built semiautomatics available.

He can not and will not defend the Uzi, referring to it as a "piece of junk."

The respondent feels that because of their expense and their being hard to find, the study rifles (excluding the Uzi) would not be weapons of choice for illegal activities.

(11) The respondent questions ATF's definition of "sporting" and "organized shooting." He feels that ATF's definition is too narrow and based on "political pressure."

The respondent feels that the firearms are especially suitable for competitive shooting and hunting and that the restrictions on caliber and number of cartridges should be left to the individual States. He has shot competitively for 25 years.

(18) The respondent specifically recommends the MAK90 for hunting because its shorter length makes for easier movement through covered areas, it allows for quicker follow-up shots, its open sights allow one to come up upon a target more quickly, and it provides a quicker determination of whether a clear shot exists through the brush than with telescopic sighting.

(21) The respondent states that the second amendment discusses "arms," not "sporting arms." The respondent further states that taxpayer money was spent on this survey and ATF has an agenda. A gun's original intent (military) has nothing to do with how it is used now. "The solution to today's crime is much the same as it always has been, proper enforcement of existing laws, not the imposition of new freedom-restricting laws on honest people."

Information on Articles Reviewed

(1) Describes limited availability of Uzi Model B sporter with thumbhole stock.

(2) Describes rifle and makes political statement concerning 1989 ban.

(3) Describes Chinese copy of Uzi with thumbhole stock.

(4) Quality sporting firearms from Russia.

(5) Short descriptions of rifles and shotguns available. Lead-in paragraph mentions hunting. Does not specifically recommend any of the listed weapons for hunting.

(6) Geared to retail gun dealers, provides list of available products. States L1A1 Sporter is pinpoint accurate and powerful enough for most North American big game hunting.

(7) Discusses the use of the rifle for hunting bear, sheep, and coyotes. Describes accuracy and ruggedness. NOTE: The rifle is a pre-1989 ban assault rifle.

(8) Deals primarily with performance of the cartridge. Makes statement that AK 47-type rifle is adequate for deer hunting at woods ranges.

(9) Discusses gun ownership in the United States. Highlighted text (not by writers) includes the National Survey of Private Ownership of Firearms that was conducted by Chilton Research Services of Drexel Hill, Pennsylvania during November and December 1994: 70 million rifles are privately held, including 28 million semiautomatics.

(10) Discusses pre-1989 ban configuration. Describes use in hunting, and makes the statement that "in the appropriate calibers, the military style autoloaders can indeed make excellent rifles, and that their ugly configuration probably gives them better handling qualities than more conventional sporters as the military discovered a long time ago."

(15) Not article - letter from Editor of Gun World magazine discussing "sport" and various competitions. Note: Attached submitted by Century Arms.

(16) Letter addressed to "To Whom It May Concern" indicating HK91 (not mentioned but illustrated in photos) is suitable for hunting and accurate enough for competition. Note: Submitted by Century Arms.

(17) Describes a competition developed to test a hunter's skill. Does not mention any of the rifles at issue.

(18) Not on point - deals with AR 15.

(19) Describes function, makes political statement.

(20) Discusses function and disassembly of rifle.

(21) Not on point - deals with AR 15 rifle.

(22) Discusses competition started to show sporting use of rifles banned for sale in California. Unknown if weapons in study were banned in California in 1990.

(23) Not on point - deals with national matches.

(24) Not on point - deals with various surplus military rifles.

(25) Deals with 7.62x39mm ammunition as suitable for deer hunting and mentions the use in SKS rifles, which is a military style semiautomatic but not a part of the study.

(26) Not on point - deals with reloading.

(27) Not on point - deals with reloading.

(28) Not on point - deals with AR15 rifles in competition.

(29) Not on point - deals with the SKS rifle.

(30) Not on point - deals with national matches.

(31) Not on point - deals with national matches.

(32) Not on point - deals with national matches.

(33) Not on point - deals with national matches at Camp Perry.

(34) Not on point - deals with national matches at Camp Perry.

(35) Not on point - deals with 1989 national matches at Camp Perry.

(36) Not on point - deals with Browning BAR sporting semiautomatic rifles.

(38) Not on point - deals with AR15, mentions rifle in caliber 7.62 x 39.

(39) Not on point - deals with bullet types.

(40) Not on point - deals with reloading.

(41) Discusses tracking in snow. Rifles mentioned do not include any rifles in study.

(42) Deals with deer hunting in general.

(43) Deals with rifles for varmint hunting. Does not mention rifles in study.

(44) Not on point - deals with hunting pronghorn antelope.

(45) Deals with various deer rifles.

(46) Not on point - deals with two Browning rifles' recoil reducing system.

(47) Not on point - deals with bolt-action rifles.

(48) Not on point - deals with ammunition.

(49) Deals with modifications to AR15 trigger for target shooting.

(50) Not on point - deals with M1 Garand as a target rifle.

(51) Not on point - deals with reloading.

(52) Deals with impact of banning semiautomatic rifles would have on competitors at Camp Perry.

(53) Deals with economic impact in areas near Camp Perry if semiautomatic rifles banned. Reprint from Akron Beacon Journal.

(54) Deals with training new competitive shooters - mentions sporting use of assault rifles, i.e., AR15.

(55) Not on point - article about Nelson Shew.

(56) Not on point - deals with reloading.

(57) Not on point - deals with shooting the AR15.

(58) Not on point - article about AR15 as target rifle.

(59) Not on point - article about well known competitive shooter.

(67) Not on point - deals with reloading.

(68) Discusses semiautomatic versions of M14.

(69) Discusses gas operation.

(70) Discusses right adjustment on M1 and M1A rifles.

(71) Discusses M1A and AR15-type rifles modified to remove them from assault weapon definition, and their use in competition.

(72) Deals with AR15 type rifle.

(73) Not on point - deals with AR15.

(74) Not on point - deals with target rifle based on AR15/M16.

(75) Not on point - deals with SKS rifle.

(76) Not on point - deals with reloading 7.62x39mm cartridge.

(77) Not on point - deals with reloading. Mentions 7.62x39mm.

(78) Not on point - deals with ammunition performance.

(79) Deals with .223 Remington caliber ammunition as a hunting cartridge.

(80) Describes M1A (semiautomatic copy of M14) as a target rifle.

(81) Not on point - deals with bullet design.

(82) Not on point - deals with ammunition performance.

Information on Advertisements Reviewed

(11) Indicates rifles are rugged, reliable and accurate.

(12) Describes rifles, lists price.

(13) Sporting versions of AK 47 and FAL.

(14) Sporting version of AK 47, reliable, accurate.

(61) Catalog of ammunition - lists uses for 7.62x39mm ammunition.

(62) Catalog of ammunition - lists uses for 7.62x39mm ammunition.

(63) Catalog of ammunition - lists uses for 7.62x39mm ammunition.

(64) Catalog of ammunition - lists uses for 9mm ammunition.

(65) Catalog of ammunition - lists uses for 9mm ammunition.

(66) Catalog of ammunition - lists recommended uses for 9mm ammunition.

Exhibit S

U.S. Department of Justice

Bureau of Alcohol, Tobacco, Firearms and Explosives

ATF

Study on the Importability of Certain Shotguns

Firearms and Explosives Industry Division

January 2011

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Study on the Importability of Certain Shotguns

Executive Summary

The purpose of this study is to establish criteria that the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) will use to determine the importability of certain shotguns under the provisions of the Gun Control Act of 1968 (GCA).

The Gun Control Act of 1968 (GCA) generally prohibits the importation of firearms into the United States. [1] However, pursuant to 18 U.S.C. § 925(d), the GCA creates four narrow categories of firearms that the Attorney General must authorize for importation. Under one such category, subsection 925(d)(3), the Attorney General shall approve applications for importation when the firearms are generally recognized as particularly suitable for or readily adaptable to sporting purposes (the "sporting purposes test").

After passage of the GCA in 1968, a panel was convened to provide input on the sporting suitability standards which resulted in factoring criteria for handgun importations. Then in 1989, and again in 1998, the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) conducted studies to determine the sporting suitability and importability of certain firearms under section 925(d)(3). However, these studies focused mainly on a type of firearm described as "semiautomatic assault weapons." The 1989 study determined that assault rifles contained a variety of physical features that distinguished them from traditional sporting rifles. The study concluded that there were three characteristics that defined semiautomatic assault rifles.[2]

The 1998 study concurred with the conclusions of the 1989 study, but included a finding that "the ability to accept a detachable large capacity magazine originally designed and produced for a military assault weapon should be added to the list of disqualifying military configuration features identified in 1989."[3] Further, both studies concluded that the scope of "sporting purposes" did not include all lawful activity, but was limited to traditional sports such as hunting, skeet shooting, and trap shooting. This effectively narrowed the universe of firearms considered by each study because a larger number of firearms are "particularly suitable for or readily adaptable to a sporting purpose" if plinking[4] and police or military-style practical shooting competitions are also included as a "sporting purpose."[5]

Although these studies provided effective guidelines for determining the sporting purposes of rifles, ATF recognized that no similar studies had been completed to determine the sporting

[1] Chapter 44, Title 18, United States Code (U.S.C.), at 18 U.S.C. § 922(l).
[2] These characteristics were: (a) a military configuration (ability to accept a detachable magazine, folding/telescoping stocks, pistol grips, ability to accept a bayonet, flash suppressors, bipods, grenade launchers, and night sights); (b) a semiautomatic version of a machinegun; and (c) chambered to accept a centerfire cartridge case having a length of 2.25 inches or less. *1989 Report and Recommendation on the Importability of Certain Semiautomatic Rifles (1989 Study)* at 6-9.
[3] *1998 Department of the Treasury Study on the Sporting Suitability of Modified Semiautomatic Rifles (1998 Study)* at 2.
[4] "Plinking" is shooting at random targets such as bottles and cans. 1989 Report at 10.
[5] *1989 Report* at 8-9; *1998 Study* at 18-19.

suitability of shotguns. A shotgun study working group (working group) was assigned to perform a shotgun study under the § 925(d)(3) sporting purposes test. The working group considered the 1989 and 1998 studies, but neither adopted nor entirely accepted findings from those studies as conclusive as to shotguns.

Sporting Purpose

Determination of whether a firearm is generally accepted for use in sporting purposes is the responsibility of the Attorney General (formerly the Secretary of the Treasury). As in the previous studies, the working group considered the historical context of "sporting purpose" and that Congress originally intended a narrow interpretation of sporting purpose under § 925(d)(3).

While the 1989 and 1998 studies considered all rifles in making their recommendations, these studies first identified firearm features and subsequently identified those activities believed to constitute a legitimate "sporting purpose." However, in reviewing the previous studies, the working group believes that it is appropriate to first consider the current meaning of "sporting purpose" as this may impact the "sporting" classification of any shotgun or shotgun features. For example, military shotguns, or shotguns with common military features that are unsuitable for traditional shooting sports, may be considered "particularly suitable for or readily adaptable to sporting purposes" if military shooting competitions are considered a generally recognized sporting purpose. Therefore, in determining the contemporary meaning of sporting purposes, the working group examined not only the traditional sports of hunting and organized competitive target shooting, but also made an effort to consider other shooting activities.

In particular, the working group examined participation in and popularity of practical shooting events as governed by formal rules, such as those of the United States Practical Shooting Association (USPSA) and International Practical Shooting Confederation (IPSC), to determine whether it was appropriate to consider these events a "sporting purpose" under § 925(d)(3). While the number of members reported for USPSA is similar to the membership for other shotgun shooting organizations,[6] the working group ultimately determined that it was not appropriate to use this shotgun study to determine whether practical shooting is "sporting" under § 925(d)(3). A change in ATF's position on practical shooting has potential implications for rifle and handgun classifications as well. Therefore, the working group believes that a more thorough and complete assessment is necessary before ATF can consider practical shooting as a generally recognized sporting purpose.

The working group agreed with the previous studies in that the activity known as "plinking" is "primarily a pastime" and could not be considered a recognized sport for the purposes of

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[6] Organization websites report these membership numbers: for the United States Practical Shooting Association, approx. 19,000; Amateur Trapshooting Association, over 35,000 active members; National Skeet Shooting Association, nearly 20,000 members; National Sporting Clays Association, over 22,000 members; Single Action Shooting Society, over 75,000 members.

importation.[7] Because almost any firearm can be used in that activity, such a broad reading of "sporting purpose" would be contrary to the congressional intent in enacting section 925(d)(3). For these reasons, the working group recommends that plinking not be considered a sporting purpose. However, consistent with past court decisions and Congressional intent, the working group recognized hunting and other more generally recognized or formalized competitive events similar to the traditional shooting sports of trap, skeet, and clays.

Firearm Features

In reviewing the shotguns used for those activities classified as sporting purposes, the working group examined State hunting laws, rules, and guidelines for shooting competitions and shooting organizations; industry advertisements and literature; scholarly and historical publications; and statistics on participation in the respective shooting sports. Following this review, the working group determined that certain shotgun features are not particularly suitable or readily adaptable for sporting purposes. These features include:

(1) Folding, telescoping, or collapsible stocks;
(2) bayonet lugs;
(3) flash suppressors;
(4) magazines over 5 rounds, or a drum magazine;
(5) grenade-launcher mounts;
(6) integrated rail systems (other than on top of the receiver or barrel);
(7) light enhancing devices;
(8) excessive weight (greater than 10 pounds for 12 gauge or smaller);
(9) excessive bulk (greater than 3 inches in width and/or greater than 4 inches in depth);
(10) forward pistol grips or other protruding parts designed or used for gripping the shotgun with the shooter's extended hand.

Although the features listed above do not represent an exhaustive list of possible shotgun features, designs or characteristics, the working group determined that shotguns with any one of these features are most appropriate for military or law enforcement use. Therefore, shotguns containing any of these features are not particularly suitable for nor readily adaptable to generally recognized sporting purposes such as hunting, trap, sporting clay, and skeet shooting. Each of these features and an analysis of each of the determinations are included within the main body of the report.

[7] 1989 Study at 10; 1998 Study at 17.

Study on the Importability of Certain Shotguns

The purpose of this study is to establish criteria that the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) will use to determine the importability of certain shotguns under the provisions of the Gun Control Act of 1968 (GCA).

Background on Shotguns

A shotgun is defined by the GCA as "a weapon designed or redesigned, made or remade, and intended to be fired from the shoulder and designed or redesigned and made or remade to use the energy of an explosive to fire through a smooth bore either a number of ball shot or a single projectile for each single pull of the trigger."[8]

Shotguns are traditional hunting firearms and, in the past, have been referred to as bird guns or "fowling" pieces. They were designed to propel multiple pellets of shot in a particular pattern that is capable of killing the game that is being hunted. This design and type of ammunition limits the maximum effective long distance range of shotguns, but increases their effectiveness for small moving targets such as birds in flight at a close range. Additionally, shotguns have been used to fire slugs. A shotgun slug is a single metal projectile that is fired from the barrel. Slugs have been utilized extensively in areas where State laws have restricted the use of rifles for hunting. Additionally, many States have specific shotgun seasons for deer hunting and, with the reintroduction of wild turkey in many States, shotguns and slugs have found additional sporting application.

Shotguns are measured by *gauge* in the United States. The gauge number refers to the "number of equal-size balls cast from one pound of lead that would pass through the bore of a specific diameter."[9] The largest commonly available gauge is 10 gauge (.0775 in. bore diameter). Therefore, a 10 gauge shotgun will have an inside diameter equal to that of a sphere made from one-tenth of a pound of lead. By far, the most common gauges are 12 (0.729 in. diameter) and 20 (0.614 in. diameter). The smallest shotgun that is readily available is known as a ".410," which is the diameter of its bore measured in inches. Technically, a .410 is a 67 gauge shotgun.

Background on Sporting Suitability

The GCA generally prohibits the importation of firearms into the United States.[10] However, the statute exempts four narrow categories of firearms that the Attorney General shall authorize for importation. Originally enacted by Title IV of the Omnibus Crime Control and Safe Streets Act of 1968,[11] and amended by Title I of the GCA[12] enacted that same year, this section provides, in pertinent part:

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[8] 18 U.S.C. § 921(a)(5).
[9] The Shotgun Encyclopedia at 106.
[10] 18 U.S.C. § 922(l).
[11] Pub. Law 90-351 (June 19, 1968).
[12] Pub. Law 90-618 (October 22, 1968).

> the Attorney General shall authorize a firearm . . . to be imported or brought into the United States . . . if the firearm . . . (3) is of a **type** that does not fall within the definition of a firearm as defined in section 5845(a) of the Internal Revenue Code of 1954 and **is generally recognized as particularly suitable for or readily adaptable to sporting purposes**, excluding surplus military firearms, except in any case where the Secretary has not authorized the importation of the firearm pursuant to this paragraph, it shall be unlawful to import any frame, receiver, or barrel of such firearm which would be prohibited if assembled.[13] (Emphasis added)

This section addresses Congress' concern that the United States had become a "dumping ground of the castoff surplus military weapons of other nations,"[14] in that it exempted only firearms with a generally recognized sporting purpose. In recognizing the difficulty in implementing this section, Congress gave the Secretary of the Treasury (now the Attorney General) the discretion to determine a weapon's suitability for sporting purposes. This authority was ultimately delegated to what is now ATF. Immediately after discussing the large role cheap imported .22 caliber revolvers were playing in crime, the Senate Report stated:

> [t]he difficulty of defining weapons characteristics to meet this target without discriminating against sporting quality firearms, was a major reason why the Secretary of the Treasury has been given fairly broad discretion in defining and administering the import prohibition.[15]

Indeed, Congress granted this discretion to the Secretary even though some expressed concern with its breadth:

> [t]he proposed import restrictions of Title IV would give the Secretary of the Treasury unusually broad discretion to decide whether a particular type of firearm is generally recognized as particularly suitable for, or readily adaptable to, sporting purposes. If this authority means anything, it permits Federal officials to differ with the judgment of sportsmen expressed through consumer preference in the marketplace….[16]

Since that time, ATF has been responsible for determining whether firearms are generally recognized as particularly suitable for or readily adaptable to sporting purposes under the statute.

[13] 18 U.S.C. § 925(d)(3). In pertinent part, 26 U.S.C. § 5845(a) includes "a shotgun having a barrel or barrels of less than 18 inches in length."
[14] 90 P.L. 351 (1968).
[15] S. Rep. No. 1501, 90th Cong. 2d Sess. 38 (1968).
[16] S. Rep. No. 1097, 90th Cong. 2d. Sess. 2155 (1968) (views of Senators Dirksen, Hruska, Thurmond, and Burdick). In Gun South, Inc. v. Brady, 877 F.2d 858, 863 (11th Cir. 1989), the court, based on legislative history, found that the GCA gives the Secretary "unusually broad discretion in applying section 925(d)(3)."

On December 10, 1968, the Alcohol and Tobacco Tax Division of the Internal Revenue Service (predecessor to ATF) convened a "Firearm Advisory Panel" to assist with defining "sporting purposes" as utilized in the GCA. This panel was composed of representatives from the military, law enforcement, and the firearms industry. The panel generally agreed that firearms designed and intended for hunting and organized competitive target shooting would fall into the sporting purpose criteria. It was also the consensus that the activity of "plinking" was primarily a pastime and therefore would not qualify. Additionally, the panel looked at criteria for handguns and briefly discussed rifles. However, no discussion took place on shotguns given that, at the time, all shotguns were considered inherently sporting because they were utilized for hunting or organized competitive target competitions.

Then, in 1984, ATF organized the first large scale study aimed at analyzing the sporting suitability of certain firearms. Specifically, ATF addressed the sporting purposes of the Striker-12 and Streetsweeper shotguns. These particular shotguns were developed in South Africa as law enforcement, security and anti-terrorist weapons. These firearms are nearly identical 12-gauge shotguns, each with 12-round capacity and spring-driven revolving magazines. All 12 rounds can be fired from the shotguns within 3 seconds.

In the 1984 study, ATF ruled that the Striker-12 and the Streetsweeper were not eligible for importation under 925(d)(3) because they were not "particularly suitable for sporting purposes." In doing this, ATF reversed an earlier opinion and specifically rejected the proposition that police or combat competitive shooting events were a generally accepted "sporting purpose." This 1984 study adopted a narrow interpretation of organized competitive target shooting competitions to include the traditional target events such as trap and skeet. ATF ultimately concluded that the size, weight and bulk of the shotguns made them difficult to maneuver in traditional shooting sports and, therefore, these shotguns were not particularly suitable for or readily adaptable to these sporting purposes. At the same time, however, ATF allowed importation of a SPAS-12 variant shotgun because its size, weight, bulk and *modified* configuration were such that it was particularly suitable for traditional shooting sports.[17] The Striker-12 and Streetsweeper were later classified as "destructive devices" pursuant to the National Firearms Act.[18]

In 1989, and again in 1998, ATF conducted studies to determine whether certain rifles could be imported under section 925(d)(3). The respective studies focused primarily on the application of the sporting purposes test to a type of firearm described as a "semiautomatic assault weapon." In both 1989 and 1998, ATF was concerned that certain semiautomatic assault weapons had been approved for importation even though they did not satisfy the sporting purposes test.

[17] Private letter Ruling of August 9, 1989 from Bruce L. Weininger, Chief, Firearms and Explosives Division.
[18] *See* ATF Rulings 94-1 *and* 94-2.

1989 Study

In 1989, ATF announced that it was suspending the importation of several semiautomatic assault rifles pending a decision on whether they satisfied the sporting criteria under section 925(d)(3). The 1989 study determined that assault rifles were a "type" of rifle that contained a variety of physical features that distinguished them from traditional sporting rifles. The study concluded that there were three characteristics that defined semiautomatic assault rifles:

(1) a military configuration (ability to accept a detachable magazine, folding/telescoping stocks, pistol grips, ability to accept a bayonet, flash suppressors, bipods, grenade launchers, and night sights);
(2) semiautomatic version of a machinegun;
(3) chambered to accept a centerfire cartridge case having a length of 2.25 inches or less.[19]

The 1989 study then examined the scope of "sporting purposes" as used in the statute.[20] The study noted that "[t]he broadest interpretation could take in virtually any lawful activity or competition which any person or groups of persons might undertake. Under this interpretation, any rifle could meet the "sporting purposes" test.[21] The 1989 study concluded that a broad interpretation would render the statute useless. The study therefore concluded that neither plinking nor "police/combat-type" competitions would be considered sporting activities under the statute.[22]

The 1989 study concluded that semiautomatic assault rifles were "designed and intended to be particularly suitable for combat rather than sporting applications."[23] With this, the study determined that they were not suitable for sporting purposes and should not be authorized for importation under section 925(d)(3).

1998 Study

The 1998 study was conducted after "members of Congress and others expressed concern that rifles being imported were essentially the same as semiautomatic assault rifles previously determined to be nonimportable" under the 1989 study.[24] Specifically, many firearms found to be nonimportable under the 1989 study were later modified to meet the standards outlined in the study. These firearms were then legally imported into the country under section 925(d)(3). ATF commissioned the 1998 study on the sporting suitability of semiautomatic rifles to address concerns regarding these modified firearms.

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[19] 1989 Report and Recommendation on the ATF Working Group on the Importability of Certain Semiautomatic Rifles (1989 Study).
[20] Id. at 8.
[21] Id.
[22] *Id.* At 9.
[23] *Id.* At 12.
[24] 1998 Study at 1.

The 1998 study identified the firearms in question and determined that the rifles shared an important feature—the ability to accept a large capacity magazine that was originally designed for military firearms. The report then referred to such rifles as Large Capacity Military Magazine rifles or "LCMM rifles."[25]

The study noted that after 1989, ATF refused to allow importation of firearms that had any of the identified non-sporting features, but made an exception for firearms that possessed only a detachable magazine. Relying on the 1994 Assault Weapons Ban, the 1998 study noted that Congress "sent a strong signal that firearms with the ability to expel large amounts of ammunition quickly are not sporting."[26] The study concluded by adopting the standards set forth in the 1989 study and by reiterating the previous determination that large capacity magazines are a military feature that bar firearms from importation under section 925(d)(3).[27]

Present Study

While ATF conducted the above mentioned studies on the sporting suitability of rifles, to date, no study has been conducted to address the sporting purposes and importability of shotguns. This study was commissioned for that purpose and to ensure that ATF complies with it statutory mandate under section 925(d)(3).

Methodology

To conduct this study, the working group reviewed current shooting sports and the sporting suitability of common shotguns and shotgun features. At the outset, the working group recognized the importance of acknowledging the inherent differences between rifles, handguns and shotguns. These firearms have distinct characteristics that result in specific applications of each weapon. Therefore, in conducting the study, the working group generally considered shotguns without regard to technical similarities or differences that exist in rifles or handguns.

The 1989 and 1998 studies examined particular features and made sporting suitability determinations based on the generally accepted sporting purposes of *rifles*. These studies served as useful references because, in recent years, manufacturers have produced shotguns with features traditionally found only on rifles. These features are typically used by military or law enforcement personnel and provide little or no advantage to sportsmen.

Following a review of the 1989 and 1998 studies, the working group believed that it was necessary to first identify those activities that are considered legitimate "sporting purposes" in the modern era. While the previous studies determined that only "the traditional sports of hunting and organized competitive target shooting" would be considered "sporting,"[28] the working group recognized that sporting purposes may evolve over time. The working group felt

[25] 1998 Study at 16.
[26] 1998 Study at 3.
[27] The 1994 Assault Weapons Ban expired Sept. 13, 2004, as part of the law's sunset provision.
[28] 1998 Study at 16

that the statutory language supported this because the term "generally recognized" modifies, not only firearms used for shooting activities, but also the shooting activities themselves. This is to say that an activity is considered "sporting" under section 925(d)(3) if it is generally recognized as such.[29] Therefore, activities that were "generally recognized" as legitimate "sporting purposes" in previous studies are not necessarily the same as those activities that are "generally recognized" as sporting purposes in the modern era. As stated above, Congress recognized the difficulty in legislating a fixed meaning and therefore gave the Attorney General the responsibility to make such determinations. As a result, the working group did not simply accept the proposition that sporting events were limited to hunting and traditional trap and skeet target shooting. In determining whether an activity is now generally accepted as a sporting purpose, the working group considered a broad range of shooting activities.

Once the working group determined those activities that are generally recognized as a "sporting purpose" under section 925(d)(3), it examined numerous shotguns with diverse features in an effort to determine whether any particular firearm was particularly suitable for or readily adaptable to those sports. In coming to a determination, the working group recognized that a shotgun cannot be classified as sporting merely because it may be used for a sporting purpose. During debate on the original bill, there was discussion about the meaning of the term "sporting purposes." Senator Dodd stated:

> Here again I would have to say that if a military weapon is used in a special sporting event, it does not become a sporting weapon. It is a military weapon used in a special sporting event . . . . As I said previously the language says no firearms will be admitted into this country unless they are genuine sporting weapons.[30]

In making a determination on any particular feature, the working group considered State hunting laws, currently available products, scholarly and historical publications, industry marketing, and rules and regulations of organization such as the National Skeet Shooting Association, Amateur Trapshooting Association, National Sporting Clays Association, Single Action Shooting Society, International Practical Shooting Confederation (IPSC), and the United States Practical Shooting Association (USPSA). Analysis of these sources as well as a variety of shotguns led the working group to conclude that certain shotguns were of a type that did not meet the requirements of section 925(d)(3), and therefore, could not lawfully be imported.

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[29] ATF previously argued this very point in Gilbert Equipment Company , Inc. v. Higgins, 709 F.Supp. 1071, 1075 (S.D. Ala. 1989). The court agreed, noting, "according to Mr. Drake, the bureau takes the position…that an event has attained general recognition as being a sport before those uses and/or events can be 'sporting purposes' or 'sports' under section 925(d)(3). *See also* Declaration of William T. Drake, Deputy Director, Bureau of Alcohol, Tobacco and Firearms.

[30] 114 Cong. Rec. 27461-462 (1968).

Analysis

A. Scope of Sporting Purposes

In conducting the sporting purposes test on behalf of the Attorney General, ATF examines the physical and technical characteristics of a shotgun and determines whether those characteristics meet this statutory requirement. A shotgun's suitability for a particular sport depends upon the nature and requirements inherent to that sport. Therefore, determining a "sporting purpose" was the first step in this analysis under section 925(d)(3) and is a critical step of the process.

A broad interpretation of "sporting purposes" may include any lawful activity in which a shooter might participate and could include any organized or individual shooting event or pastime. A narrow interpretation of "sporting purposes" would clearly result in a more selective standard governing the importation of shotguns.

Consistent with previous ATF decisions and case law, the working group recognized that a sport or event must "have attained general recognition as being a 'sport,' before those uses and/or events can be 'sporting purposes' or 'sports' under Section 925(d)(3)."[31] The statutory language limits ATF's authority to recognize a particular shooting activity as a "sporting purpose," and therefore requires a narrow interpretation of this term. As stated however, the working group recognized that sporting purposes may change over time, and that certain shooting activities may become "generally recognized" as such.

At the present time, the working group continues to believe that the activity known as "plinking" is not a generally recognized sporting purpose. There is nothing in the legislative history of the GCA to indicate that section 925(d)(3) was meant to recognize every conceivable type of activity or competition that might employ a firearm. Recognition of plinking as a sporting purpose would effectively nullify section 925(d)(3) because it may be argued that *any* shotgun is particularly suitable for or readily adaptable to this activity.

The working group also considered "practical shooting" competitions. Practical shooting events generally measure a shooter's accuracy and speed in identifying and hitting targets while negotiating obstacle-laden shooting courses. In these competitions, the targets are generally stationary and the shooter is mobile, as opposed to clay target shooting where the targets are moving at high speeds mimicking birds in flight. Practical shooting consist of rifle, shotgun and handgun competitions, as well as "3-Gun" competitions utilizing all three types of firearm on one course. The events are often organized by local or national shooting organizations and attempt to categorize shooters by skill level in order to ensure competitiveness within the respective divisions. The working group examined participation in and popularity of practical shooting events as governed under formal rules such as those of the United States Practical Shooting Association (USPSA) and International Practical Shooting Confederation (IPSC) to see

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[31] Gilbert *at 1085.*

if it is appropriate to consider these events a legitimate "sporting purpose" under section 925(d)(3).

The USPSA currently reports approximately 19,000 members that participate in shooting events throughout the United States.[32] While USPSA's reported membership is within the range of members for some other shotgun shooting organizations,[33] organizations involved in shotgun hunting of particular game such as ducks, pheasants and quail indicate significantly more members than any of the target shooting organizations.[34] Because a determination on the sporting purpose of practical shooting events should be made only after an in-depth study of those events, the working group determined that it was not appropriate to use this shotgun study to make a definitive conclusion as to whether practical shooting events are "sporting" for purposes of section 925(d)(3). Any such study must include rifles, shotguns and handguns because practical shooting events use all of these firearms, and a change in position by ATF on practical shooting or "police/combat-type" competitions may have an impact on the sporting suitability of rifles and handguns. Further, while it is clear that shotguns are used at certain practical shooting events, it is unclear whether shotgun use is so prevalent that it is "generally recognized" as a sporting purpose. If shotgun use is not sufficiently popular at such events, practical shooting would have no effect on any sporting suitability determination of shotguns. Therefore, it would be impractical to make a determination based upon one component or aspect of the practical shooting competitions.

As a result, the working group based the following sporting suitability criteria on the traditional sports of hunting, trap and skeet target shooting.

B. Suitability for Sporting Purposes

The final step in our review involved an evaluation of shotguns to determine a "type" of firearm that is "generally recognized as particularly suitable or readily adaptable to sporting purposes." Whereas the 1989 and 1998 studies were conducted in response to Congressional interest pertaining to a certain "type" of firearm, the current study did not benefit from a mandate to focus upon and review a particular type of firearm. Therefore, the current working group determined that it was necessary to consider a broad sampling of shotguns and shotgun features that may constitute a "type."

Whereas rifles vary greatly in size, function, caliber and design, historically, there is less variation in shotgun design. However, in the past several years, ATF has witnessed increasingly diverse shotgun design. Much of this is due to the fact that some manufacturers are now applying rifle designs and features to shotguns. This has resulted in a type of shotgun that has

[32] *See* www.uspsa.org.

[33] Organization websites report these membership numbers: for the United States Practical Shooting Association, approx. 19,000; Amateur Trapshooting Association, over 35,000 active members; National Skeet Shooting Association, nearly 20,000 members; National Sporting Clays Association, over 22,000 members; Single Action Shooting Society, over 75,000 members.

[34] Organization websites report these membership numbers: Ducks Unlimited, U.S adult 604,902 (Jan. 1, 2010); Pheasants/Quail Forever, over 130,000 North American members (2010) http://www.pheasantfest.org/page/1/PressReleaseViewer.jsp?pressReleaseId=12406.

features or characteristics that are based on tactical and military firearms. Following a review of numerous shotguns, literature, and industry advertisements, the working group determined that the following shotgun features and design characteristics are particularly suitable for the military or law enforcement, and therefore, offer little or no advantage to the sportsman. Therefore, we recognized that any shotgun with one or more of these features represent a "type" of firearm that is not "generally recognized as particularly suitable or readily adaptable to sporting purposes" and may not be imported under section 925(d)(3).

(1) Folding, telescoping or collapsible stock.

Shotgun stocks vary in style, but sporting stocks have largely resembled the traditional design.[35] Many military firearms incorporate folding or telescoping stocks. The main advantage of this feature is portability, especially for airborne troops. These stocks allow the firearm to be fired from the folded or retracted position, yet it is difficult to fire as accurately as can be done with an open or fully extended stock. While a folding stock or telescoping stock makes it easier to carry the firearm, its predominant advantage is for military and tactical purposes. A folding or telescoping stock is therefore not found on the traditional sporting shotgun. Note that certain shotguns may utilize adjustable butt plates, adjustable combs, or other designs intended only to allow a shooter to make small custom modifications to a shotgun. These are not intended to make a shotgun more portable, but are instead meant to improve the overall "fit" of the shotgun to a particular shooter. These types of adjustable stocks are sporting and are, therefore, acceptable for importation.

(2) Bayonet Lug.

A bayonet lug is generally a metal mount that allows the installation of a bayonet onto the end of a firearm. While commonly found on rifles, bayonets have a distinct military purpose. Publications have indicated that this may be a feature on military shotguns as well.[36] It enables soldiers to fight in close quarters with a knife attached to their firearm. The working group discovered no generally recognized sporting application for a bayonet on a shotgun.

(3) Flash Suppressor.

Flash suppressors are generally used on military firearms to disperse the muzzle flash in order to help conceal the shooter's position, especially at night. Compensators are used on military and commercial firearms to assist in controlling recoil and the "muzzle climb" of the shotgun. Traditional sporting shotguns do not have flash suppressors or compensators. However, while compensators have a limited benefit for shooting sports because they allow the shooter to quickly reacquire the target for a second shot, there is no particular benefit in suppressing muzzle flash in

[35] Exhibit 1.
[36] *A Collector's Guide to United States Combat Shotguns* at 156.

sporting shotguns. Therefore, the working group finds that flash suppressors are not a sporting characteristic, while compensators are a sporting feature. However, compensators that, in the opinion of ATF, actually function as flash suppressors are neither particularly suitable nor readily adaptable to sporting purposes.

(4) Magazine over 5 rounds, or a Drum Magazine.

A magazine is an ammunition storage and feeding device that delivers a round into the chamber of the firearm during automatic or semiautomatic firing.[37] A magazine is either integral (tube magazine) to the firearm or is removable (box magazine). A drum magazine is a large circular magazine that is generally detachable and is designed to hold a large amount of ammunition.

The 1989 Study recognized that virtually all modern military firearms are designed to accept large, detachable magazines. The 1989 Study noted that this feature provides soldiers with a large ammunition supply and the ability to reload rapidly. The 1998 Study concurred with this and found that, for rifles, the ability to accept a detachable large capacity magazine was not a sporting feature. The majority of shotguns on the market today contain an integral “tube” magazine. However, certain shotguns utilize removable box magazine like those commonly used for rifles.[38]

In regard to sporting purposes, the working group found no appreciable difference between integral tube magazines and removable box magazines. Each type allowed for rapid loading, reloading, and firing of ammunition. For example, “speed loaders” are available for shotguns with tube-type magazines. These speed loaders are designed to be preloaded with shotgun shells and can reload a shotgun with a tube-type magazine in less time than it takes to change a detachable magazine.

However, the working group determined that magazines capable of holding large amounts of ammunition, regardless of type, are particularly designed and most suitable for military and law enforcement applications. The majority of state hunting laws restrict shotguns to no more than 5 rounds.[39] This is justifiable because those engaged in sports shooting events are not engaging in potentially hostile or confrontational situations, and therefore do not require the large amount of immediately available ammunition, as do military service members and police officers.

Finally, drum magazines are substantially wider and have considerably more bulk than standard clip-type magazines. They are cumbersome and, when attached to the shotgun, make it more difficult for a hunter to engage multiple small moving targets. Further, drum magazines are generally designed to contain more than 5 rounds. Some contain as many as 20 or more

[37] Steindler’s New Firearms Dictionary at 164.
[38] See Collector’s Guide to United States Combat Shotguns at 156-7, noting that early combat shotguns were criticized because of their limited magazine capacity and time consuming loading methods.
[39] Exhibit 2.

rounds.[40] While such magazines may have a military or law enforcement application, the working group determined that they are not useful for any generally recognized sporting purpose. These types of magazines are unlawful to use for hunting in most states, and their possession and manufacture are even prohibited or restricted in some states.[41]

(5) Grenade Launcher Mount.

Grenade launchers are incorporated into military firearms to facilitate the launching of explosive grenades. Such launchers are generally of two types. The first type is a flash suppressor designed to function as a grenade launcher. The second type attaches to the barrel of the firearm either by screws or clamps. Grenade launchers have a particular military application and are not currently used for sporting purposes.

(6) Integrated Rail Systems.[42]

This refers to a mounting rail system for small arms upon which firearm accessories and features may be attached. This includes scopes, sights, and other features, but may also include accessories or features with no sporting purpose, including flashlights, foregrips, and bipods. Rails on the sides and underside of shotguns—including any accessory mount—facilitate installation of certain features lacking any sporting purpose. However, receiver rails that are installed on the top of the receiver and barrel are readily adaptable to sporting purposes because this facilitates installation of optical or other sights.

(7) Light Enhancing Devices.

Shotguns are generally configured with either bead sights, iron sights or optical sights, depending on whether a particular sporting purpose requires the shotgun to be pointed or aimed.[43] Bead sights allow a shooter to "point" at and engage moving targets at a short distance with numerous small projectiles, including birds, trap, skeet and sporting clays. Iron and optical sights are used when a shooter, firing a slug, must "aim" a shotgun at a target, including deer, bear and turkeys.[44] Conversely, many military firearms are equipped with sighting devices that utilize available light to facilitate night vision capabilities. Devices or optics that allow illumination of a target in low-light conditions are generally for military and law enforcement purposes and are not typically found on sporting shotguns because it is generally illegal to hunt at night.

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[40] Exhibit 3.
[41] *See, e.g.,* Cal Pen Code § 12020; N.J. Stat. § 2C:39-9.
[42] Exhibit 4.
[43] NRA Firearms Sourcebook at 178.
[44] Id.

(8) Excessive Weight.[45]

Sporting shotguns, 12 gauge and smaller, are lightweight (generally less than 10 pounds fully assembled),[46] and are balanced and maneuverable. This aids sportsmen by allowing them to carry the firearm over long distances and rapidly engage a target. Unlike sporting shotguns, military firearms are larger, heavier, and generally more rugged. This design allows the shotguns to withstand more abuse in combat situations.

(9) Excessive Bulk.[47]

Sporting shotguns are generally no more than 3 inches in width or more than 4 inches in depth. This size allows sporting shotguns to be sufficiently maneuverable in allowing hunters to rapidly engage targets. Certain combat shotguns may be larger for increased durability or to withstand the stress of automatic fire. The bulk refers to the fully assembled shotgun, but does not include magazines or accessories such as scopes or sights that are used on the shotgun. For both width and depth, shotguns are measured at the widest points of the action or housing on a line that is perpendicular to the center line of the bore. Depth refers to the distance from the top plane of the shotgun to the bottom plane of the shotgun. Width refers to the length of the top or bottom plane of the firearm and measures the distance between the sides of the shotgun. Neither measurement includes the shoulder stock on traditional sporting shotgun designs.

(10) Forward Pistol Grip or Other Protruding Part Designed or Used for Gripping the Shotgun with the Shooter's Extended Hand.[48]

While sporting shotguns differ in the style of shoulder stock, they are remarkably similar in fore-end design.[49] Generally, sporting shotguns have a foregrip with which the shooter's forward hand steadies and aims the shotgun. Recently, however, some shooters have started attaching forward pistol grips to shotguns. These forward pistol grips are often used on tactical firearms and are attached to those firearms using the integrated rail system. The ergonomic design allows for continued accuracy during sustained shooting over long periods of time. This feature offers little advantage to the sportsman. Note, however, that the working group believes that pistol grips for the trigger hand are prevalent on shotguns and are therefore generally recognized as particularly suitable for sporting purposes.[50]

While the features listed above are the most common non-sporting shotgun features, the working group recognizes that other features, designs, or characteristics may exist. Prior to importation, ATF will classify these shotguns based upon the requirements of section 925(d)(3). The working

[45] *See generally* Gilbert.
[46] Shotgun Encyclopedia 2001 at 264.
[47] Exhibit 5.
[48] Exhibit 6.
[49] *See* Exhibit 1. *See generally* NRA Firearms Sourcebook at 121-2.
[50] See Exhibit 1.

group expects the continued application of unique features and designs to shotguns that may include features or designs based upon traditional police or military tactical rifles. However, even if a shotgun does not have one of the features listed above, it may be considered "sporting" only if it meets the statutory requirements under section 925(d)(3). Further, the simple fact that a military firearm or feature *may* be used for a generally recognized sporting purposes is not sufficient to support a determination that it is sporting under 925(d)(3). Therefore, as required by section 925(d)(3), in future sporting classifications for shotguns, ATF will classify the shotgun as sporting only if there is evidence that its features or design characteristics are generally recognized as particularly suitable for or readily adaptable to generally recognized sporting purposes.

The fact that a firearm or feature was initially designed for military or tactical applications, including offensive or defensive combat, may indicate that it is not a sporting firearm. This may be overcome by evidence that the particular shotgun or feature has been so regularly used by sportsmen that it is generally recognized as particularly suitable for or readily adaptable to sporting purposes. Such evidence may include marketing, industry literature and consumer articles, scholarly and historical publications, military publications, the existence of State and local statutes and regulations limiting use of the shotgun or features for sporting purposes, and the overall use and the popularity of such features or designs for sporting purposes according to hunting guides, shooting magazines, State game commissioners, organized competitive hunting and shooting groups, law enforcement agencies or organizations, industry members and trade associations, and interest and information groups. Conversely, a determination that the shotgun or feature was originally designed as an improvement or innovation to an existing sporting shotgun design or feature will serve as evidence that the shotgun is sporting under section 925(d)(3). However, any new design or feature must still satisfy the sporting suitability test under section 925(d)(3) as outlined above.

The Attorney General and ATF are not limited to these factors and therefore may consider any other factor determined to be relevant in making this determination. The working group recognizes the difficulty in applying this standard but acknowledges that Congress specifically intended that the Attorney General perform this function. Therefore, the working group recommends that sporting determinations for shotguns not specifically addressed by this study be reviewed by a panel pursuant to ATF orders, policies and procedures, as appropriate.

Conclusion

The purpose of section 925(d)(3) is to provide a limited exception to the general prohibition on the importation of firearms without placing "any undue or unnecessary Federal restrictions or burdens on law-abiding citizens with respect to the acquisition, possession, or use of firearms…."[51] Our determinations will in no way preclude the importation of true sporting shotguns. While it will certainly prevent the importation of certain shotguns, we believe that

[51] 90 P.L. 351 (1968).

those shotguns containing the enumerated features cannot be fairly characterized as “sporting” shotguns under the statute. Therefore, it is the recommendation of the working group that shotguns with any of the characteristics or features listed above not be authorized for importation.

Shotgun Stock Style Comparison

Exhibit 1

"Straight" or "English" style stock (Ruger Red Label):

"Pistol grip" style stock (Browning Citori):

"Pistol grip" style stock (Mossberg 935 Magnum Turkey):

"Thumbhole" style stock (Remington SP-10):

Stock with Separate Pistol Grip

Hunting Statutes by State

Exhibit 2

State	Gauge	Mag Restriction / plugged with one piece filler requiring disassembly of gun for removal	Attachments	Semi-Auto	Other
Alabama	10 gauge or smaller;	(Species specific) 3 shells			1
Alaska	10 gauge or smaller				
Arizona	10 gauge or smaller	5 shells			
Arkansas	≤ 10 gauge; some zones ≥ .410; ≥ 20 gauge for bear	(Species specific) 3 shells			
California	≤ 10 gauge; Up to 12 gauge in some areas	(Species specific) 3 shells			
Colorado	≥ 20 gauge; Game Mammals ≤ 10 gauge	3 shells			
Connecticut	≤ 10-gauge	(Species specific) 3 shells	telescopic sights		
Delaware	20, 16, 12, 10 gauge	3 shells	Muzzleloaders may be equipped with scopes		2
Florida	Muzzleloading firing ≥ 2 balls ≥ 20-gauge; Migratory birds ≤ 10-gauge; opossums - single-shot .41 -gauge shotguns	(Species specific) 3 shells			
Georgia	≥ 20-gauge; Waterfowl ≤ 10-gauge	5 shells	Scopes are legal		
Hawaii	≤ 10 gauge	(Species specific) 3 shells			
Idaho			some scopes allowed		3
Illinois	20 - 10 gauge; no .410 or 28 gauge allowed	3 shells			
Indiana		(Species specific) 3 shells	Laser sights are legal		

Hunting Statutes by State

Exhibit 2

Iowa	10-, 12-, 16-, and 20-gauge			
Kansas	≥ 20 gauge; ≤ 10 gauge,	(Species specific) 3 shells		
Kentucky	up to and including 10-gauge, includes .410-	(Species specific) 3 shells	Telescopic sights (scopes)	
Louisiana	≤ 10 gauge	3 shells	Nuisance Animals; infrared, laser sighting devices, or night vision devices	
Maine	10 - 20 gauge	(Species specific) 3 shells	may have any type of sights, including scopes	Auto-loading illegal if hold more than 6 cartridges
Maryland	Muzzle loading ≥ 10 gauge ; Shotgun ≤ 10-gauge	(Species specific) 3 shells	may use a telescopic sight on muzzle loading firearm	
Massachusetts	≤ 10 gauge	(Species specific) 3 shells		
Michigan	any gauge	(Species specific) 3 shells		Illegal: semi-automatic holding > 6 shells in barrel and magazine combined
Minnesota	≤ 10 gauge	(Species specific) 3 shells		
Mississippi	any gauge	(Species specific) 3 shells	Scopes allowed on primitive weapons	
Missouri	≤ 10 gauge	(Species specific) 3 shells		
Montana	≤ 10 gauge	(Species specific) 3 shells		
Nebraska	≥ 20 gauge	(Species specific) 3 shells		Illegal: semi-automatic holding > 6 shells in barrel and magazine combined
Nevada	≤ 10 gauge; ≥ 20 gauge	(Species specific) 3 shells		
New Hampshire	10 - 20 gauge	(Species specific) 3 shells		
New Jersey	≤ 10 gauge; ≥ 20 gauge; or .410 caliber	(Species specific) 3 shells	Require adjustable open iron, peep sight or scope affixed if hunting with slugs. Telescopic sights Permitted	
New Mexico	≥ 28 gauge, ≤ 10 gauge	(Species specific) 3 shells		
New York	Big game ≥ 20 gauge		scopes allowed	No semi-automatic firearm with a capacity to hold more than 6 rounds

North Carolina	≤ 10 gauge	(Species specific) 3 shells			
North Dakota	≥ 410 gauge; no ≤ 10 gauge	3 shells (repealed for migratory birds)			
Ohio	≤ 10 gauge	(Species specific) 3 shells			
Oklahoma	≤ 10 gauge	(Species specific) 3 shells			
Oregon	≤ 10 gauge; ≥ 20 gauge	(Species specific) 3 shells	Scopes (permanent and detachable), and sights allowed for visually impaired		
Pennsylvania	≤ 10 gauge; ≥ 12 gauge	(Species specific) 3 shells			
Rhode Island	10, 12, 16, or 20-gauge	5 shells			
South Carolina		(Species specific) 3 shells			
South Dakota	(Species specific) ≤ 10 gauge	5 shells		No auto-loading firearm holding > 6 cartridges	
Tennessee	Turkey: ≥ 28 gauge	(Species specific) 3 shells	May be equipped with sighting devices		
Texas	≤ 10 gauge	(Species specific) 3 shells	scoping or laser sighting devices used by disabled hunters		
Utah	≤ 10 gauge; ≥ 20 gauge	(Species specific) 3 shells			
Vermont	≥ 12 gauge	(Species specific) 3 shells			
Virginia	≤ 10 gauge	(Species specific) 3 shells			
Washington	≤ 10 gauge	(Species specific) 3 shells			
West Virginia					
Wisconsin	10, 12, 16, 20 and 28 gauge; no .410 shotgun for deer/bear	(Species specific) 3 shells			
Wyoming					4
1	Shotgun/rifle combinations (drilling) permitted				
2	large game training course - Students in optional proficiency qualification bring their own pre-zeroed, ≥ .243 , scoped shotgun				
3	no firearm that, in combination with a scope, sling and/or any attachments, weighs more than 16 pounds				
4	no relevant restrictive laws concerning shotguns				

General Firearm Statutes by State

Exhibit 2

State	Source	Semi-Auto Restrictions	Attachments	Prohibited* (in addition to possession of short-barrel or sawed-off shotguns by non-authorized persons, e.g., law enforcment officers for official duty purposes)
Alabama	Alabama Code, title 13:			
Alaska	Alaska Statutes 11.61.200.(h)			
Arizona	Arizona Rev. Statutes 13-3101.8.	single shot	silencer prohibited	
Arkansas	Arkansas Code Title 5, Chapter 73.			
California	California Penal Code, Part 4.12276. and San Diego Municipal Code 53.31.	San Diego includes under "assault weapon," any shotgun with a magazine capacity of more than 6 rounds		"Assault weapons": Franchi SPAS 12 and LAW 12; Striker 12; Streetsweeper type S/S Inc. ; semiautomatic shotguns having both a folding or telescoping stock and a pistol grip protruding conspicuously beneath the action of the weapon, thumbhole stock, or vertical handgrip; semiautomatic shotguns capable of accepting a detachable magazine; or shotguns with a revolving cylinder.
Colorado	2 CCR 406-203			
Connecticut	Connecticut Gen. Statutes 53-202a.			"Assault weapons": Steyr AUG; Street Sweeper and Striker 12 revolving cylinder shotguns
D.C	7-2501.01.			

Delaware	7.I.§ 711.			7.I.§ 711. Hunting with automatic-loading gun prohibited; penalty (a) No person shall hunt for game birds or game animals in this State, except as authorized by state-sanctioned federal depredation/conservation orders for selected waterfowl species, with or by means of any automatic-loading or hand-operated repeating shotgun capable of holding more than 3 shells, the magazine of which has not been cut off or plugged with a filler incapable of removal through the loading end thereof, so as to reduce the capacity of said gun to not more than 3 shells at 1 time, in the magazine and chamber combined. (b) Whoever violates this section shall be guilty of a class C environmental misdemeanor. (c) Having in one's possession, while in the act of hunting game birds or game animals, a gun that will hold more than 3 shells at one time in the magazine and chamber combined, except as authorized in subsection (a) of this section, shall be prima facie evidence of violation of this section.
Florida	Florida statutes, Title XLVI.790.001.			
Georgia				
Hawaii	Hawaii Rev. Statutes, Title 10., 134-8.		silencer prohibited	
Idaho	Idaho Code, 18-3318.			
Illinois	Code of Ordinances, City of Aurora 29-43.	Aurora includes under "assault weapon," any shotgun with a magazine capacity of more than 5 rounds		"Assault weapons": Street Sweeper and Striker 12 revolving cylinder shotguns or semiautomatic shotguns with either a fixed magazine with a capacity over 5 rounds or an ability to accept a detachable magazine and has at least a folding / telescoping stock or a pistol grip that protrudes beneath the action of firearm and which is separate and apart from stock

Indiana	Indiana Code 35-47-1-10. and Municipal Code of the City of South Bend 13-95.	South Bend under "assault weapon" firearms which have threads, lugs, or other characteristics designed for direct attachment of a silencer, bayonet, flash suppressor, or folding stock; as well as any detachable magazine, drum, belt, feed strip, or similar device which can be readily made to accept more than 15. rounds	South Bend includes under "assault weapon," any shotgun with a magazine capacity of more than 9 rounds
Iowa	Iowa Code, Title XVI. 724.1.		Includes as an offensive weapon, "a firearm which shoots or is designed to shoot more than one shot, without manual reloading, by a single function of the trigger"
Kansas			
Kentucky	Kentucky Revised Statutes- 150.360		
Louisiana	Louisiana RS 56:116.1		
Maine	Maine Revised Statutes 12.13.4.915.4.§11214. F.		
Maryland	Maryland Code 5-101.		"Assault weapons": F.I.E./Franchi LAW 12 and SPAS 12 assault shotgun; Steyr-AUG-SA semi-auto; Holmes model 88 shotgun; Mossberg model 500 Bullpup assault shotgun; Street sweeper assault type shotgun; Striker 12 assault shotgun in all formats; Daewoo USAS 12 semi-auto shotgun

Massachusetts	Massachusetts Gen L. 140.121.	under "assault weapon": any shotgun with (fixed or detachable) magazine capacity of more than 5 rounds		"Assault weapons": revolving cylinder shotguns, e.g., Street Sweeper and Striker 12; also "Large capacity weapon" includes any semiautomatic shotgun fixed with large capacity feeding device (or capable of accepting such), that uses a rotating cylinder capable of accepting more than 5 shells
Michigan	II.2.1. (2)			
Minnesota	Minnesota Statutes 624.711			"Assault weapons": Street Sweeper and Striker-12 revolving cylinder shotgun types as well as USAS-12 semiautomatic shotgun type
Mississippi	Mississippi Code 97-37-1.		silencer prohibited	
Missouri	Code of State Regulations 10-7.410(1)(G)			
Montana				
Nebraska	Nebraska Administrative Code Title 163 Chapter 4 001.			
Nevada	Nevada Revised Statutes 503.150 1.			
New Hampshire				
New Jersey	New Jersey Statutes 23:4-13. and 23:4-44. and New Jersey Rev. Statutes 2C39-1.w.	magazine capacity of no more than 5 rounds		"Assault weapons": any shotgun with a revolving cylinder, e.g. "Street Sweeper" or "Striker 12" Franchi SPAS 12 and LAW 12 shotguns or USAS 12 semi-automatic type shotgun; also any semi-automatic shotgun with either a magazine capacity exceeding 6 rounds, a pistol grip, or a folding stock
New Mexico	New Mexico Administrative Code 19.31.6.7H., 19.31.11.10N. , 19.31.13.10M. and 19.31.17.10N.			

General Firearm Statutes by State

Exhibit 2

New York	New York Consolidated Laws 265.00. 22. and Code of the City of Buffalo 1801B.	magazine capacity of no more than 5 rounds	sighting device making a target visible at night may classify a shotgun as an assault weapon	"Assault weapons": Any semiautomatic shotgun with at least two of the following:folding or telescoping stock;pistol grip that protrudes conspicuously beneath the action of the weapon;fixed magazine capacity in excess of five rounds;an ability to accept a detachable magazine; or any revolving cylinder shotguns, e.g., Street Sweeper and Striker 12; Buffalo 1801B. Assault Weapon:(2) A center-fire rifle or shotgun which employs the force of expanding gases from a discharging cartridge to chamber a fresh round after each single pull of the trigger, and which has:(a) A flash suppressor attached to the weapon reducing muzzle flash;(c) A sighting device making a target visible at night;(d) A barrel jacket surrounding all or a portion of the barrel, to dissipate heat therefrom; or(e) A multi-burst trigger activator.(3) Any stockless pistol grip shotgun.
North Carolina	North Carolina Gen. Statutes 14-288.8		silencer prohibited	
North Dakota	North Dakota Century Code 20.1-01-09. Section 20.1-04-10, SHOTGUN SHELL-HOLDING CAPACITY RESTRICTION, repealed/eliminated			
Ohio	Ohio Rev. Code 2923.11. and Columbus City Codes 2323.11.	magazine capacity of no more than 5 rounds		semiautomatic shotgun that was originally designed with or has a fixed magazine or detachable magazine with a capacity of more than five rounds. Columbus includes under "Assault weapon" any semi-automatic shotgun with two or more of the following: pistol grip that protrudes conspicuously beneath the receiver of the weapon; folding, telescoping or thumbhole stock; fixed magazine capacity in excess of 5 standard 2-3/4, or longer, rounds; or ability to accept a detachable magazine; also any shotgun with revolving cylinder
Oklahoma				
Oregon	Oregon Rev. Statutes 166.272.		silencer prohibited	
Pennsylvania	Title 34 Sec. 2308. (a)(4) and (b)(1)			
Rhode Island	Rule 7, Part III, 3.3 and 3.4			
South Carolina	SECTION 50-11-310. (E) and ARTICLE 3. SUBARTICLE 1. 123 40			

South Dakota	South Dakota Codified Laws 22,1,2, (8)		silencer prohibited	
Tennessee				
Texas				
Utah	Utah Administrative Code R657-5-9. (1), R657-6-6. (1) and R657-9-7.			
Vermont				
Virginia	Virginia Code 18.2-308.	magazine capacity no more than 7 rounds (not applicable for hunting or sport shooting)		"Assault weapons": Striker 12's commonly called a "streetsweeper," or any semi-automatic folding stock shotgun of like kind with a spring tension drum magazine capable of holding twelve shotgun shells prohibited
Washington	Washington Administrative Code 232-12-047			
West Virginia	West Virginia statute 8-12-5a.			
Wisconsin	Wisconsin Administrative Code – NR 10.11 and NR 10.12			
Wyoming	Wyoming Statutes, Article 3. Rifles and Shotguns [Repealed] and 23-3-112.		silencer prohibited	

<u>Drum Magazine</u> Exhibit 3

Integrated Rail System

Exhibit 4

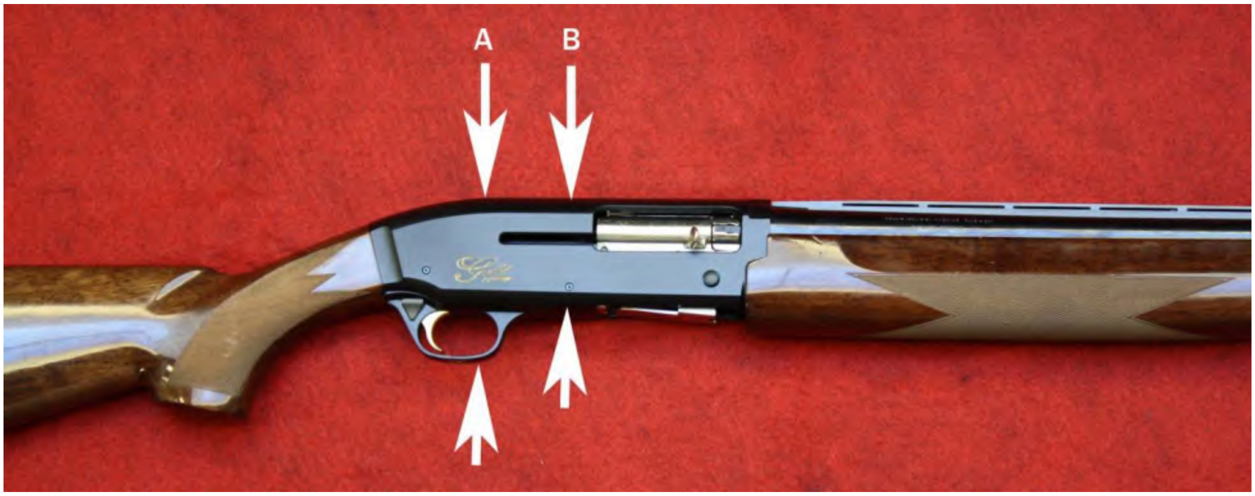
Sporting

Sporting

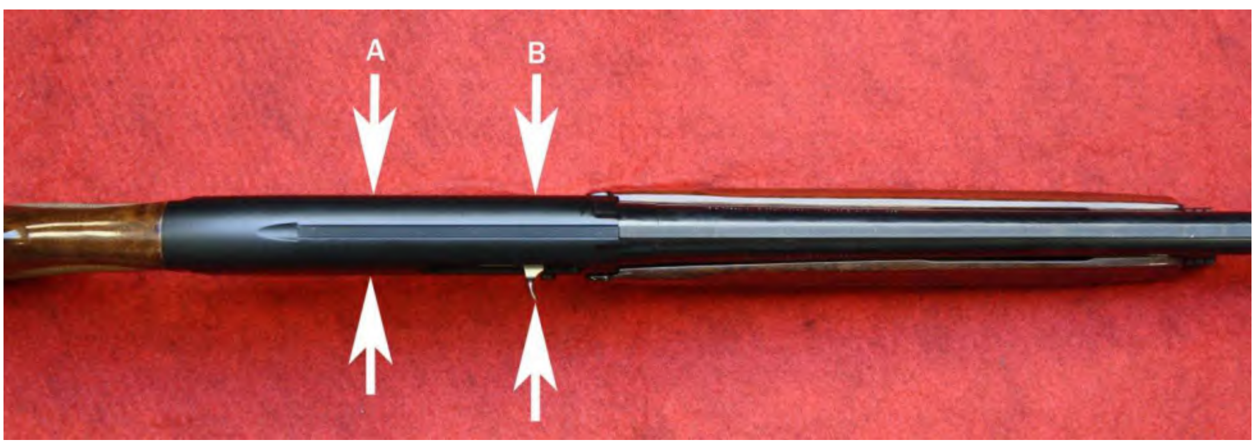
Non-Sporting

Non-Sporting

Depth refers to the distance from the top plane of the shotgun to the bottom plane of the shotgun. Depth measurement "A" below is INCORRECT; it includes the trigger guard which is not part of the frame or receiver. Depth measurement "B" below is CORRECT; it measures only the depth of the frame or receiver:



Width refers to the length of the top or bottom pane of the firearm and measures the distance between the sides of the shotgun. Width measurement "A" below is CORRECT; it measures only the width of the frame or receiver. Width measurement "B" below is INCORRECT; it includes the charging handle which is not part of the frame or receiver:



Forward Pistol Grip

Exhibit 6

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Exhibit T

FM 3-22.9(FM23-9)

RIFLE MARKSMANSHIP M16A1, M16A2/3, M16A4, AND M4 CARBINE

APRIL 2003

HEADQUARTERS
DEPARTMENT OF THE ARMY

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Change 4

Headquarters
Department of the Army
Washington, DC, 13 September 2006

RIFLE MARKSMANSHIP M16A1, M16A2/3, M16A4, AND M4 CARBINE

1. Change FM 3-22.9(FM 23-9), 24 April 2003, as follows:

Remove old pages:	**Insert new pages:**
Contents	Contents
Preface	Preface
2-23 through 2-30	2-23 through 2-31
4-19 through 4-21	4-19 through 4-25
6-9 through 6-15	6-9 through 6-16
7-1 through 7-2	7-1 through 7-2
7-17 through 7-24	7-17 through 7-24
8-13 through 8-23	8-13 through 8-24
A-21 through A-42	A-21 through A-43
B-5 through B-6	B-5 through B-6
Glossary	Glossary
Index	Index
DA Form 3595-R	DA Form 3595-R
DA Form 5790-R	DA Form 5790-R

2. A star (*) marks new or changed material.

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Change 3

Headquarters
Department of the Army
Washington, DC, 28 April 2005

RIFLE MARKSMANSHIP
M16A1, M16A2/3, M16A4
AND M4 CARBINE

1. Change FM 3-22.9(FM 23-9), 24 April 2003, as follows:

Remove old pages:	**Insert new pages:**
4-1 through 4-4	4-1 through 4-4
5-31 through 5-39	5-31 through 5-40
7-1 through 7-57	7-1 through 7-59
A-1 through A-2	A-1 through A-2
C-1 through C-2	C-1 through C-2
C-9 through C-10	C-9 through C-10

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FM 3-22.9(FM 23-9)
C2

Change 2

Headquarters
Department of the Army
Washington, DC, 14 April 2004

RIFLE MARKSHMASHIP
M16A1, M16A2/3, M16/4
AND M4 CARBINE

1. Change FM 3-22.9(FM 23-9), 24 April 2003, as follows:

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8-11 through 8-14	8-11 through 8-14
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Change 1

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Washington, DC, 22 January 2004

RIFLE MARKSMANSHIP
M16A1, M16A2/3, M1614, AND M4 CARBINE

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FIELD MANUAL
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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 13 September 2006

RIFLE MARKSMANSHIP
M16A1, M16A2/3, M16A4, and M4 CARBINE

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*This publication supersedes FM 23-9, July 1989.

Page

CHAPTER 7. ADVANCED RIFLE MARKSMANSHIP (PHASE IV of Basic Rifle Marksmanship)

PREFACE

This manual provides guidance for planning and executing training on the 5.56-mm M16-series rifle (M16A1/A2/A3/A4) and M4 carbine. It is a guide for commanders, leaders, and instructors to develop training programs, plans, and lessons that meet the objectives or intent of the United States Army rifle marksmanship program and FM 7-0 (Training the Force).

This manual is organized to lead the trainer through the material needed to conduct training during initial entry training (IET) and unit sustainment training. Preliminary subjects include discussion on the weapons' capabilities, mechanical training, and the fundamentals and principles of rifle marksmanship. Live-fire applications are scheduled after the soldier has demonstrated preliminary skills.

*This publication applies to the Active Army, the Army National Guard/Army National Guard of the United States, and the United States Reserve unless otherwise stated. The proponent for this publication is the U.S. Army Training and Doctrine Command. The preparing agency is the U.S. Army Infantry School. You may send comments and recommendations by any means, U.S. mail, e-mail, FAX, or telephone, as long as you use or follow the format of DA Form 2028, Recommend change to Publications and Blank Forms. You may also phone for more information:

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*Chemical, biological, radiological, and nuclear (CBRN) now replaces, nuclear, biological, chemical (NBC), throughout this manual.

Unless this publication states otherwise, masculine nouns and pronouns may refer to either men or women.

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CHAPTER 1

INTRODUCTION AND TRAINING STRATEGY

An effective unit marksmanship program reflects the priority, emphasis, and interest of commanders and trainers. This chapter provides a proven rifle marksmanship training strategy as guidance in establishing and conducting an effective training program. The strategy consists of the progressive individual training periods taught during initial entry training (IET). It progresses into advanced skills and concludes with advanced reading material. Refresher training need only be conducted on periods that are deemed necessary.

The proficiency attained by a soldier depends on proper training and application of the basic marksmanship fundamentals. During initial marksmanship training, emphasis is on learning the firing fundamentals, which are taught in four phases-preliminary rifle instruction, downrange feedback, field firing, and advanced firing exercises. This prepares soldiers for advanced optic and laser training for combat-type collective exercises and real world deployments.

Section I. TRAINING OVERVIEW

This section details the effective and proven method of training the soldier in preliminary rifle marksmanship. The following marksmanship training guide contains the current tasks that are trained in basic rifle marksmanship programs, during basic combat training at Army training centers (ATCs), and during infantry one-station unit training (OSUT). It provides a basis for structuring unit sustainment programs. The unit normally performs a diagnostic test of the tasks and only conducts training on specific periods for soldiers who must improve their basic firing skills. Training is usually conducted in a shorter time frame than at IET.

1-1. OBJECTIVES

The procedures and methods used in the Army basic rifle marksmanship program are based on the concept that soldiers must become skilled marksmen. FM 25-100 stresses marksmanship as a paramount soldier skill. The basic firing skills and exercises outlined in this manual must be part of every unit's marksmanship training program. Unit commanders must focus their basic and advanced marksmanship training programs to support their respective mission-essential task list (METL).

1-2. TRAINING STRATEGY

Training strategy is the overall concept for integrating resources into a program to train the individual and collective skills needed to perform a unit's wartime mission. Training strategies for basic rifle marksmanship are implemented in TRADOC institutions (IET, Noncommissioned Officers Education System [NCOES], Infantry Officer Basic Course [IOBC]) and in units. The overall training strategy is multifaceted and includes supporting strategies that use resources such as publications, ranges, ammunition, training aids and devices, simulators, and simulations. These strategies focus on developing the critical soldier and leader skills required for success in combat.

Two primary components form the training strategy: initial training and sustainment training. Both may include individual and collective skills. Initial training must be taught correctly the first time. A task taught correctly and learned well is retained longer and skills can be sustained. However, an individual or unit eventually loses skill proficiency. This learning decay depends on many factors such as the difficulty and complexity of the task. Personnel turnover is a main factor in decay of collective skills, since the loss of critical team members requires retraining to regain proficiency. If a long period elapses between initial and sustainment sessions or training doctrine is altered retraining may be required.

a. **Initial Training.** The training strategy for basic rifle marksmanship begins in IET and continues in the unit. (An example of this overall process is illustrated in Figure 1-1 and provides a concept of the flow of unit sustainment training.) IET provides field units soldiers who have been trained and who have demonstrated proficiency to standard in basic rifle marksmanship. The soldier graduating from these courses has been trained to maintain the rifle and hit a point target. He has learned to apply the four marksmanship fundamentals, and other skills needed to engage a target.

(1) Once the soldier understands the weapon and has demonstrated skill in zeroing, additional live-fire training exercises are conducted before qualification. Target types and scenarios of increasing difficulty must be mastered to develop proficiency.

(2) IET culminates in the soldier's proficiency assessment, which is conducted on the standard record fire range or approved alternates, followed by instruction on advanced firing techniques to include a night fire with either iron sights (unassisted) or night vision goggles (assisted). This evaluation also provides an overview of training effectiveness.

b. **Sustainment Training.** Training continues in units using the basic skills taught in IET. Additional skills, such as area fire, are trained and integrated into collective training exercises, which include platoon and squad live-fire situation training exercises (STXs).

(1) The strategy for sustaining the basic marksmanship skills taught in IET is periodic preliminary rifle instruction, followed by instructional and qualification range firing. A unit must set up a year-round program to sustain skills. Key elements include training of trainers, refresher training of nonfiring skills, and use of the Weaponeer, Engagement Skills Trainer (EST), location of misses and hits (LOMAH), or other devices for remedial training. Additional skills trained in the unit include semiautomatic and automatic area fires, night fire, MOPP firing, firing using aiming devices, and moving target training techniques.

(2) General marksmanship knowledge and weapon proficiency are perishable skills. Marksmanship training should be conducted for short periods throughout the year. Most units have a readiness requirement that all soldiers must zero their rifles within a certain time after unit assignment. Soldiers must confirm the battle sight zeros of their assigned rifles before conducting a qualification firing. Units should conduct preliminary training and practice firing throughout the year due to personnel turnover. A year-round marksmanship sustainment program is needed for the unit to maintain the individual and collective firing proficiency requirements to accomplish its mission.

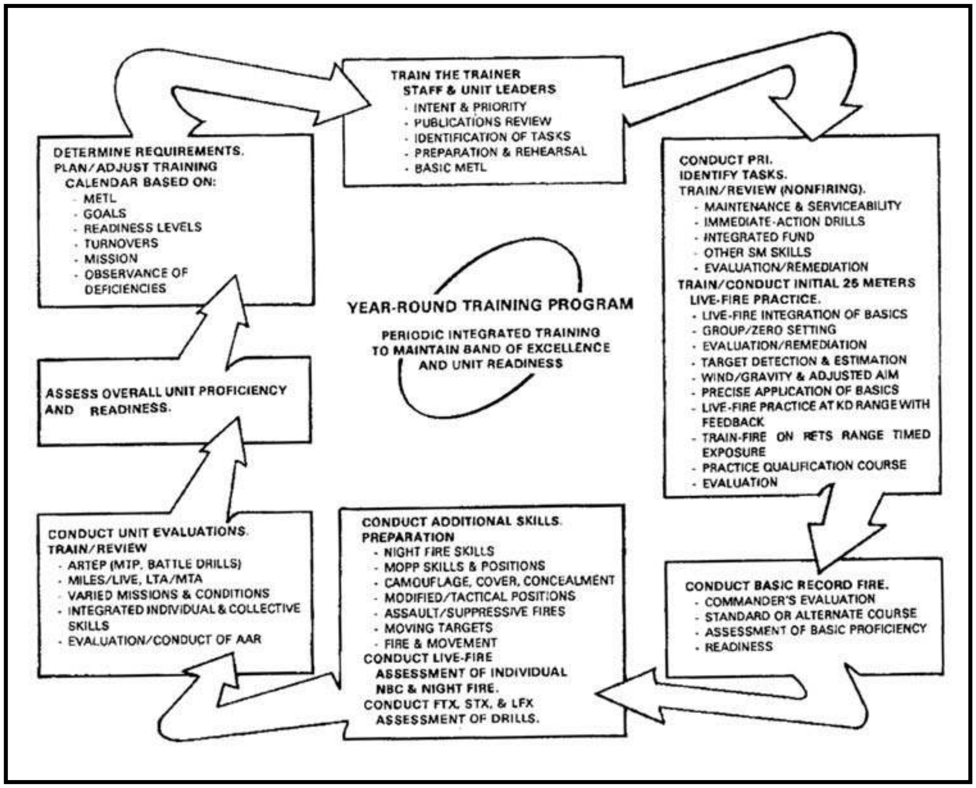

Figure 1-1. Unit marksmanship sustainment strategy.

1-3. TRAINING PHASES

The procedures and techniques for implementing the Army rifle marksmanship training program are based on all soldiers understanding common firing principles, being proficient marksmen, and being confident in applying their firing skills in combat. This depends on understanding the rifle and applying marksmanship fundamentals. Unit leaders accomplish proficiency through supervised practice by qualified instructors/trainers and thorough objective performance assessments. During preliminary rifle instruction (PRI), instructors/trainers emphasize initial learning by reviewing, reinforcing, and practicing the basics. Soldiers must master weapon maintenance, function checks, and firing fundamentals before progressing to advanced skills and firing exercises under tactical conditions. Soldier skills are developed in five phases:

- **PHASE I. Basic Rifle Marksmanship (BRM) Preliminary Rifle Instruction (PRI).**

  Introduction to BRM and mechanical training (4 hours)

  Disassembly and assembly
  Identify parts
  Function check
  Load/unload magazine
  Ammunition types and care
  Load/unload weapon
  Correct malfunctions (SPORTS)
  Adjust front and rear sights

Peer coaching
Eight cycles of function and trouble shooting
Marksmanship Fundamentals I (6 hours)
The four fundamentals
Basic firing positions
Range and safety procedures
Dominant eye training
Demonstrate the integrated act of shooting during dry fire exercises
Marksmanship Fundamentals II (6 hours)
Demonstrate the integrated act of shooting using the Weaponeer.

- **PHASE II. BRM Downrange Feedback Range Firing.**
  Grouping procedures (6 hours)
  Zeroing procedures (8 hours)
  Downrange feedback (6 hours)
- **PHASE III. BRM Field Firing on Train-Fire Ranges.**
  Field Fire I (single timed targets at 75, 175 and 300 meters) (3 hours)
  Field Fire II (single and multiple timed targets at 75, 175 and 300 meters) (3 hours)
  Practice Record Fire (4 hours)
  Practice Record Fire II (4 hours)
  Record Fire (3 hours)
- **PHASE IV. Advanced Rifle Marksmanship.**
  Alternate firing positions
  Burst fire
  Quick fire
  Nuclear, biological, chemical (NBC) fire
  Moving targets
  Squad designated marksman
  Unassisted night record fire
  Assisted night record fire infrared (IR)
  Assisted night record fire (thermal)
  Short range marksmanship
- **PHASE V. Advanced Optics, Lasers, and Iron Sights.**
  Backup iron sight (BIS)
  M68 close combat optic (CCO)
  AN/PAQ-4C IR aiming laser
  AN/PEQ-2A target pointer illuminator/aiming light (TPIAL)
  Thermal weapon sight (TWS)
  AN/PVS-4 night vision sight

Soldiers progress through these phases of rifle marksmanship training and sustainment. These phases start with basic rifle marksmanship and progress into advanced rifle marksmanship. Once these phases are mastered the soldier progresses into advanced optics, and lasers. After all phases of rifle marksmanship are accomplished the final stage is to conduct collective training during unit live-fire training exercises. An effective marksmanship program can be measured by the unit's ability to put effective fire on target. When the soldier is trained in all phases of rifle marksmanship a solid sustainment program is the key to mission readiness.

Section II. MARKSMANSHIP TRAINING STRATEGY

An effective unit marksmanship program reflects the priority, emphasis, and interest of commanders and trainers. This section proposes a rifle marksmanship training strategy as guidance in establishing and conducting an effective training program. The strategy consists of the individual and leader refresher training for maintaining the basic skills learned during IET. It progresses to training advanced and collective skills under near-combat conditions during live-fire STXs.

1-4. MISSION-ESSENTIAL TASKS

Marksmanship proficiency is critical and basic to soldiering and is required for any unit deployed to a wartime theater. All commanders should develop a mission-essential task list (METL) and organize a training program that devotes adequate time to marksmanship. The unit's combat mission must be considered when establishing training priorities. This not only applies to the tasks selected for the unit's METL but also the conditions under which the tasks are to be performed. If a unit may be employed in an urban environment, the effects of range, gravity, and wind may not be too important, but automatic or burst fire, quick fire, and assault fire would be. The reverse may be true of a unit that expects to engage the enemy at long ranges with rifle fire.

1-5. TRAINING ASSESSMENT

To conduct an effective marksmanship program, the unit commander must determine the current marksmanship proficiency of all assigned personnel. To check the effectiveness of a unit's marksmanship program, constant evaluation is required. Observing and accurately recording performance reveals the status of rifle and magazine maintenance, the quality of the rifle's zero, and the ability of each soldier to hit targets. This also allows the commander to identify soldiers who need special assistance in order to reach required standards, and to recognize soldiers who exceed these standards. Based on this evaluation, marksmanship training programs can be developed and executed.

a. This assessment is continuous, and the program is modified as required. Spot checks of individual marksmanship performance, such as interviews and evaluations of soldiers, provide valuable information as to whether the soldier knows how to zero, to use NVDs, and to perform other marksmanship tasks.

b. In addition to spot checks and direct observation of training, assessment includes a review of past training, which provides valuable information for developing a training plan. The assessment should include how record fire was conducted, what course of fire was used, how often the unit conducted collective NBC or night fire, and so on. The results are reviewed to determine unit weaknesses and which individuals require special attention.

c. Based on the commander's evaluation, goals, and missions, training events are identified that should be conducted quarterly, semiannually, or annually. Rifle marksmanship programs must be continuous. While the unit may only qualify its soldiers annually or semiannually, test results show that sustainment training is required at least quarterly to maintain marksmanship skills.

1-6. BASIC PROGRAM IMPLEMENTATION

Knowledgeable instructors or cadre are the key to marksmanship performance. All commanders must be aware of maintaining expertise in marksmanship instruction/training.

a. **Instructor-Trainer Selection.** Institutional and unit instructor-trainers are selected and assigned from the most highly qualified soldiers. These soldiers must have an impressive background in rifle marksmanship; be proficient in applying these fundamentals; know the importance of marksmanship training; and have a competent and professional attitude. The commander must ensure that selected instructor-trainers can effectively train other soldiers. Local instructor-trainer training courses and marksmanship certification programs must be established to ensure that instructor-trainer skills are developed.

b. **Cadre-Trainer.** Cadre-trainer refers to a marksmanship instructor-trainer that has more experience and expertise than the firer does. He trains soldiers in the effective use of the rifle by maintaining strict discipline on the firing line, insisting on compliance with range procedures and program objectives, and enforcing safety regulations. A good instructor-trainer must understand the training phases and techniques for developing marksmanship skills, and he must possess the following qualifications.

(1) ***Knowledge.*** The main qualifications for an effective instructor-trainer are thorough knowledge of the rifle, proficiency in firing, and a thorough understanding of this manual and supporting manuals.

(2) ***Patience.*** The instructor-trainer must relate to the soldier calmly, persistently, and patiently.

(3) ***Understanding***. The instructor-trainer can enhance success and understanding by emphasizing close observance of rules and instructions.

(4) ***Consideration***. Most soldiers enjoy firing regardless of their performance and begin with great enthusiasm. The instructor-trainer can enhance this enthusiasm by being considerate of his soldiers' feelings and by encouraging firing abilities throughout training, which can also make teaching a rewarding experience.

(5) ***Respect.*** An experienced cadre is assigned the duties of instructor-trainer, which classifies him as a technical expert and authority. A good instructor-trainer is alert for mistakes and patiently makes needed corrections.

(6) ***Encouragement***. The instructor-trainer can encourage his soldiers by convincing them to achieve good firing performance through practice. His job is to impart knowledge and to assist the soldier so he can gain the practical experience needed to become a good firer.

1-7. TRAINING THE TRAINER

Knowledgeable small-unit leaders are the key to marksmanship training. This manual and other training publications provide the unit instructor with the required information for developing a good train-the-trainer program.

(1) The commander should identify unit personnel who have had assignments as marksmanship instructors. These individuals should be used to train other unit cadre by conducting preliminary rifle instruction and live-fire exercises for their soldiers.

(2) Assistance and expertise from outside the unit may also be available such as the Army Marksmanship Unit at Fort Benning, Georgia. A suggested train-the-trainer program is outlined below:

- Conduct marksmanship diagnostic test.
- Review operation and function, immediate action, and safety of rifle and ammunition.
- Conduct PRI; review four fundamentals.
- Review coaching techniques and device usage.
- Establish grouping and zeroing procedures.
- Review effects of wind and gravity when firing out to 300 meters (out to 600 meters for advanced rifle marksmanship).
- Conduct range operations.
- Conduct qualification/record firing.
- Diagnose firing problems.

1-8. DUTIES OF THE INSTRUCTOR-TRAINER

The instructor-trainer helps the firer master the fundamentals of rifle marksmanship. He ensures that the firer consistently applies what he has learned. Then, with practice, the firer soon acquires good firing skills. When training the beginner, the instructor-trainer could confront problems such as fear, nervousness, forgetfulness, failure to understand, and a lack of coordination or determination. An expert firer is often unaware that arrogance and carelessness complicate problems. With all types of firers, the instructor-trainer must ensure that firers are aware of their firing errors, understand the causes, and apply remedies. Sometimes errors are not evident. The instructor-trainer must isolate errors, explain them, and help the firer concentrate on correcting them.

a. **Observing the Firer.** The instructor-trainer observes the firer during drills and in the act of firing to pinpoint errors. If there is no indication of probable error, then the firer's position, breath control, shot anticipation, and trigger squeeze are closely observed.

b. **Questioning the Firer.** The firer is asked to detect his errors and to explain his firing procedure to include position, aiming, breath control, and trigger squeeze.

c. **Analyzing the Shot Group.** This is an important step in detecting and correcting errors. When analyzing a target, the instructor-trainer critiques and correlates observations of the firer to probable errors in performance, according to the shape and size of shot groups. A poor shot group is usually caused by more than one observable error.

1-9. TRAINER CERTIFICATION PROGRAM

The certification program sustains the trainers' expertise and develops methods of training. The program standardizes procedures for certifying marksmanship trainers. Trainers' technical expertise must be continuously refreshed, updated, and closely managed.

a. **Training Base.** The training base can expect the same personnel changes as any other organization. Soldiers assigned as marksmanship trainers will have varying experience and knowledge of training procedures and methods. Therefore, the trainer certification program must be an ongoing process that is tailored to address these variables. As a minimum, formal records should document program progression for each trainer. All marksmanship trainers must complete the three phases of training using the progression steps, and they must be updated on a quarterly basis. One of the goals of the program is for the trainer to know the training mission.

b. **Certification Program Outline.** All trainers must attend, then conduct, all phases of the train-the-trainer program. Demonstrating the ability to train soldiers, to diagnose and correct problems, and to achieve standards certifies trainers. Those trainers who fail to attend or fail any phase of the diagnostic examination will be assigned to subsequent training. The personnel designated to present instruction must complete the phases of the program in the sequence described.

(1) ***Phase I, Program Orientation***. During this phase, the trainer must accomplish the following tasks and be certified by the chain of command.

- Be briefed on the concept of the certification program.
- Be briefed on the unit's marksmanship training strategy.
- Review the unit's marksmanship training outlines.
- Review issued reference material.
- Visit training sites and firing ranges.

(2) ***Phase II, Preliminary Marksmanship Training***. During Phase II, the trainer must demonstrate his ability to master the fundamentals of marksmanship. Phase II should be completed within two weeks after Phase I. The following fundamentals must be reviewed by the chain of command. The results of this review are recorded and maintained on a trainer's progression sheet, which is designed in accordance with the unit's SOP.

- Characteristics.
- Capabilities.
- Disassembly.
- Clean, lubricate, and inspect.
- Assembly.
- Range determination and estimation.
- Classes of fire.
- Application of fire.
- Fire commands.
- Loading.
- Unloading.
- Immediate actions and remedial actions.
- Sight manipulations.
- Scanning techniques.

(3) ***Phase III, Basic Marksmanship Training***. During this phase, the trainer must set up and conduct firing on the various ranges. He must explain the targets and the zeroing and scoring procedures. The trainer must explain the purpose of transition firing, field zero procedures, range layout, and the conduct of training on the transition range. This

briefing to the chain of command validates the trainer's knowledge necessary to conduct training. The results of this interview are recorded on the trainer's progression sheet.

(4) ***Phase IV, Advanced Marksmanship Training***. This is the final phase of the train-the-trainer program and tests the trainer. The trainer must set up a range and conduct training of at least one person. If ammunition is available, the trainer conducts a firing exercise. If ammunition is not available, the testing is based on the quality of training given.

1-10. QUALIFICATION TRAINING

Although marksmanship is a continuous training requirement, units normally conduct a refresher program before qualification. Soldiers must be well rounded in marksmanship fundamentals and have preparatory marksmanship training before qualification. This applies to qualification for the entire unit or for newly assigned personnel. All trainers must understand that rifle marksmanship is not a series of exercises to be trained in a planned sequence. The unit must prepare for training by

- Issuing soldiers a serviceable weapon.
- Maintaining and replacing bad magazines.
- Issuing and assigning each soldier his own rifle that only he zeros and fires.
- Considering available or required resources early such as targets, ranges, ammunition, training aids, devices, and publications.

a. Before the soldier can fire, he must know how to adjust rifle sights and should understand ballistics to include the effects of wind and gravity on a bullet strike. A refresher training program can prevent frustration and loss of confidence in the soldier, and also prevent wasting ammunition and training time. This program is conducted for all soldiers so they can meet the standards outlined in this manual and supporting manuals.

NOTE: Many individual marksmanship tasks, such as operation and function checks, immediate action, target detection, and dry fire, do not require live firing.

b. Feedback (precise knowledge of bullet strike) must be included in all live-fire training. The feedback is not adequate when bullets from previous firings cannot be identified such as previous shot groups on a zero target that are not triangulated and clearly marked.

c. The initial live fire should be a grouping exercise, which allows soldiers to apply marksmanship fundamentals to obtain tight, consistent shot groups. Following a successful grouping exercise, zeroing is quick and simple using only a few rounds.

d. After zeroing, downrange feedback should be conducted. A series of scaled-silhouette targets provide unlimited situations for training on the 25-meter range if modified field-fire or KD ranges are not available. The timed-fire scaled-silhouette target can add to successful record fire performance since it represents targets at six different ranges, requires quick response, and allows precise feedback. It is another way to confirm zero and requires the application of the four fundamentals. This exercise can benefit units that have access only to 25-meter ranges.

e. Field-fire training is a transitional phase that stresses focusing on a certain area. Soldiers must detect the target as soon as it comes up and quickly fire with only hit-or-miss feedback; this is an important combat skill. Soldiers who are exposed to the field-fire range before they have refined their basic firing skills cannot benefit from the exercise. For example, if most 175- and 300-meter targets are missed, additional feedback or PRI training should be conducted.

f. The Army standard record fire course involves an element of surprise in that the soldier should not be familiar with the lane in which he qualifies. He must scan the sector and apply detection skills and range estimation skills. However, practice can be repeated on the record fire course when available. This course provides the best opportunity for practicing target detection skills and for engaging targets at ranges from 50 to 300 meters.

g. For inadequate firers, remedial training is conducted to include the use of the Weaponeer device. Soldiers proficient in marksmanship skills can assist in the remedial training effort.

1-11. UNIT LIVE-FIRE EXERCISES

Unit live-fire exercises are planned, prepared, and performed as outlined in the mission training plan for the infantry platoon and squad. The soldier performs marksmanship tasks under realistic combat conditions within the framework of these exercises.

NOTE: Table 1-1 shows training devices a commander may use to sustain weapons proficiency. (See Appendix A for details on these training devices.) The devices replicate, but are not intended to replace, live-fire exercises or qualifications. Active and Reserve Component units should consult DA Pam 350-38, Standards in Weapons Training, for regulatory guidance on mandatory live-fire training and qualification events. This DA Pam can best be accessed online at http://www.atsc.army.mil/atmd/strac/index.htm for the latest approved version.

EXERCISE	TRAINING DEVICE				
	Short Range Training Ammunition and M2 Bolt	Weaponeer	Engagement Skills Trainer	Military Arcade Computer System (MACS)	Location of Misses and Hits (LOMAH)
Zero	X	X	X		X
Practice Fire		X	X	X	X
Record Fire		X	X		X
NBC Practice		X	X	X	X
NBC Record		X	X		X
Unassisted Night Practice			X		X
Unassisted Night Record			X		X
NVD Zero			X		X
NVD Practice			X		X
NVD Record			X		X
Advanced Skills	X		X		X

Table 1-1. Training devices and exercises.

a. During training, the fundamentals must apply to combat as well as to the range. Too often soldiers disregard the fundamentals while under the pressure of combat. Therefore, it is imperative the soldier receives feedback regarding his firing results and his use of the fundamentals during collective live-fire exercises. This training should also discuss target acquisition, area fire, quick fire, assuming firing positions, responding to oral fire commands, and safety. Dry fire or MILES rehearsals at crawl, walk, and run paces are required to learn SOPs and proper procedures.

b. Enough evaluators must be present during training to observe each soldier to provide performance feedback. The evaluator must know the scenario, the location of targets, the friendly plan, and SOPs. He must watch to determine if the soldier identifies targets in his sector and successfully engages them. The evaluator must also know the fundamentals of marksmanship to detect soldiers' mistakes and review them during the after-action review (AAR).

1-12. COMMANDER'S EVALUATION GUIDE

Through the active and aggressive leadership of the chain of command, a perpetual base of expertise is established and maintained. The unit's esprit de corps is significantly raised through the trainers' desire to improve and demonstrate they are the best. The goal of a progressive train-the-trainer program is to achieve a high state of combat readiness. The following is an example of a commander's evaluation guide. Commanders can use this guide not only to assess their unit's marksmanship proficiency, but to assess the leaders of their units and their ability to effectively implement a marksmanship program. They can also use it to develop the NCOs into subject matter experts within the unit.

1. Have you clearly stated the priority of rifle (small-arms) proficiency in your unit? What is it? Do the staff and subordinates support this priority? Is it based on your METL and an understanding of FM 25-100?
2. Have you clearly stated the intent of record fire? Are leaders accurately evaluating firing performance, based on accurately recorded data and results?
3. Have you clearly stated that weapons qualification or record fire is one of the commander's opportunities to assess several skills relating to small-arms readiness?
4. What qualification course will be used to evaluate your unit's marksmanship readiness (small arms)?
   a. Is the standard combat course, 300 yard KD; 25-meter scaled target or 300-meter qualification course used?
   b. How will it be conducted? Will the prescribed procedures be followed?
   c. Who will collect the data?
5. Have you clearly stated the purpose and intent of PRI?
   a. What skills will PRI address?
   b. Will PRI be performance-oriented? Are tasks integrated?
6. Do soldiers maintain their assigned weapons and magazines IAW the technical manual? Do they have a manual?
7. Do soldiers conduct serviceability checks of weapons and magazines before training? Were maintenance deficiencies corrected?
8. Do soldiers demonstrate an understanding of the weapon's operation, functioning, and capabilities?

9. Can your soldiers correctly apply immediate-action procedures to reduce weapon stoppages and then quickly continue to fire? Have they demonstrated this during dry fire?
10. Are your soldiers firing their assigned weapons?
    a. How often are weapons reassigned between individuals?
    b. What is the value of a recorded zero?
11. Can your soldiers precisely and consistently apply the four fundamentals of rifle marksmanship? To what standard have they demonstrated their mastery?
    - During dry fire?
    - During live fire?
    - During firing on the 25-meter course?
    - During KD firing?
12. Can your soldiers accurately battle sight zero their assigned rifle to standards?
    a. Do they understand sight adjustment procedures?
    b. Do they record their rifle's zero? How is it done? Why?
    c. Do they record the date the specific soldier last zeroed his specific rifle? What is the specific sight setting? Are these linked? How do you check this?
13. Do your soldiers demonstrate their knowledge of the effects of wind and gravity while firing out to 300 meters? What feedback was provided? How?
14. Can your soldiers scan a designated area or sector of fire and detect all targets out to 300 meters? If not, why?
15. Can your soldiers quickly engage timed single and multiple targets from both supported and unsupported firing positions out to 300 meters? If not, which targets were not engaged? Which were missed? Why?
16. During individual and collective training, do soldiers demonstrate their ability to manage allocated ammunition and to engage all targets? Do they fire several rounds at one target? Which targets? Why?
17. Based on an analysis of individual qualification scores, what is the distribution?
    a. Are most soldiers just meeting the minimum acceptable performance (marksman)?
    b. Are most soldiers distributed in the upper half of the performance spectrum (sharpshooter, expert)?
    c. What is the hit distribution during collective LFXs?
18. Do your soldiers demonstrate proficiency during night-fire, target detection and acquisition, and night fire engagement techniques? Use of night vision devices?
19. Do your soldiers demonstrate individual marksmanship proficiency during MOPP firing conditions? During collective exercises?
20. Do your soldiers demonstrate proficiency in moving target engagements? Do they demonstrate proficiency collectively at the multipurpose range complex by hitting moving targets? If not, do you conduct moving target training?
21. Do you integrate marksmanship skills into tactical exercises and unit live-fire exercises? If so, do you conduct suppressive fire, rapid-semiautomatic fire, and automatic or burst fire. What tasks in the mission training plan are evaluated?

22. Based on your on-site observations and analysis of training and firing performance, what skills or tasks show a readiness deficiency?
    a. What skills need training emphasis? Individual emphasis? Leader emphasis?
    b. What are your performance goals?
23. Who has trained or will train the trainers?
    a. What is the subject matter expertise of the cadre?
    b. Are they actually training the critical skills?
    c. Have they addressed the non-firing skills first?
    d. What aids and devices are being used?
24. What administrative constraints or training distracters can you overcome for the junior officer and NCO? At what level are the resources necessary to train marksmanship controlled (time, aids, weapons, ammunition, ranges)? Do the sergeants do the job they are charged with?

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CHAPTER 2

CHARACTERISTICS, AMMUNITION, AND ACCESSORIES

This chapter describes the general components, characteristics, ammunition, and accessories for the M16- and M4-series weapons to include a brief explanation of how to mount the various accessories.

2-1. CHARACTERISTICS

The M16-/M4-series weapons are 5.56-mm, magazine-fed, gas-operated, air-cooled, shoulder-fired weapons. This section describes the general characteristics (Table 2-1) and the components of the M16-/M4-series weapons. Table 2-2 (page 2-2) shows the characteristics of various accessories.

CHARACTERISTIC	M16A1	M16A2/A3	M16A4	M4
WEIGHT (pounds):				
Without magazine and sling	6.35	7.78	9.08	6.49
With sling and loaded:				
20-round magazine	6.75	8.48	9.78	7.19
30-round magazine	7.06	8.79	10.09	7.50
Bayonet knife, M9	1.50	1.50	1.50	1.50
Scabbard	0.30	0.30	0.30	0.30
Sling, M1	0.40	0.40	0.40	0.40
LENGTH (inches):				
Rifle w/bayonet knife	44.25	44.88	44.88	N/A
Overall rifle length	30.00	39.63	39.63	N/A
Buttstock closed	N/A	N/A	N/A	29.75
Buttstock open	N/A	N/A	N/A	33.0
OPERATIONAL CHARACTERISTICS:				
Barrel rifling-right hand 1 twist (inches)	12	7	7	7
Muzzle velocity (feet per second)	3,250	3,100	3,100	2,970
Cyclic rate of fire (rounds per minute)	700-800	700-900	800	700-900
MAXIMUM EFFECTIVE RATE OF FIRE:				
Semiautomatic (rounds per minute)	45-65	45	45	45
Burst (3-round bursts) (rounds per minute)	N/A	90	90	90
Automatic (rounds per minute)	150-200	150-200 A3	N/A	N/A
Sustained (rounds per minute)	12-15	12-15	12-15	12-15
RANGE (meters):				
Maximum range	2,653	3,600	3,600	3,600
Maximum effective range				
Point target	460	550	550	500
Area target	N/A	800	600	600

Table 2-1. Characteristics of the M16-/M4-series weapons.

NOTE: For further technical information, refer to TM 9-1005-319-10 and TM 9-1005-249-10.

CHARACTERISTICS	ACCESSORY				
	CCO	**PAQ-4C**	**PEQ-2A**	**MTWS**	**HTWS**
WEIGHT	6.2 oz	5.78 oz	7.5 oz	4.1 lbs.	4.5 lbs.
LENGTH	4.9 in	5.5 in	6.4 in	15.5 in	18 in
HEIGHT	2.5 in	1.2 in	1.2 in	6.25 in	6.25 in
RANGE	300m	*600m+	*600m +	1,600m +	2,200m +
MOUNTING DEVICE: M16A1/A2/A3 M4 carbine M16A4 and M4 MWS	 M16 mount **Upper receiver **Upper receiver	 Bracket Assy Bracket Assy ***Rail grabber	 Bracket Assy Bracket Assy ***Rail grabber	 M16 mount Upper receiver Upper receiver	 M16 mount Upper receiver Upper receiver
WINDAGE (1 increment clockwise) Top side mounted Left side mounted	 Left 4 mm N/A	 Left 1 cm Left 1 cm	 Right 1 cm Left 1 cm	Wide/Narrow 1 1/4cm/3/4cm N/A	Wide/Narrow 3/4cm/3/4cm N/A
ELEVATION (1 increment clockwise) Top side mounted Left side mounted	 Down 4 mm N/A	 Up 1 cm Down 1 cm	 Up 1 cm Up 1 cm	 1 1/4cm/3/4cm N/A	 3/4cm/3/4cm N/A

* Actual range is dependent upon ambient light, NVGs, and background contrast.
** With half-moon spacer installed.
*** Picatinny or Insight rail grabbers may be used.

Table 2-2. Characteristics of various accessories for the M16-/M4-series weapons.

NOTE: For further technical information on these accessories refer to TM 9-1240-413-12&P (CCO), TM 11-5855-301-12&P (PAQ-4B/C), TM 11-5855-308-12&P (PEQ-2A) and TM 11-5855-302-12&P (TWS)

a. The M16A1 (Figure 2-1) can be fired in either the semiautomatic or automatic fire mode by rotating the selector lever to the desired mode (SAFE, SEMI, and AUTO).

Figure 2-1. M16A1 rifle.

(1) ***Mechanically Zeroing the M16A1.*** Mechanically zeroing the M16A1 (Figure 2-2) is only necessary when the weapon zero is questionable, the weapon is newly assigned to the unit, or the weapon sights have been serviced. If necessary, the soldier should mechanically zero the weapon as follows:

(a) Adjust the front sight post (1) up or down until the base of the front sight post is flush with the front sight post housing (2). Then adjust the front sight post 11 clicks in the direction of UP.

(b) Adjust the rear sight windage drum (3) all the way left until it stops. Then turn the windage drum back (right) 17 clicks so the rear sight is approximately centered.

Figure 2-2. M16A1 rifle mechanical zero.

(2) ***Battlesight Zeroing the M16A1***. If necessary, the soldier should use the aperture marked “L” to battlesight zero the weapon (Figure 2-3). Table 2-3 and Table 2-4 (page 2-4) show how much one click of elevation or windage will move the strike of the round from a 25-meter zero all the way out to 500 meters.

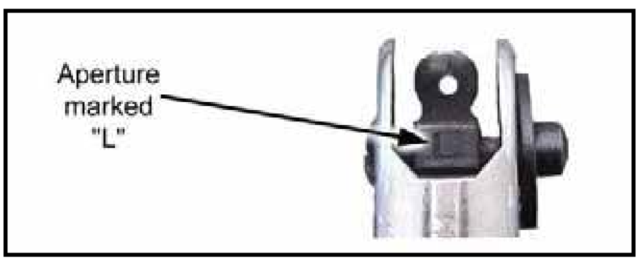


Figure 2-3. M16A1 rifle battlesight zero.

STANDARD SIGHTS						
RANGE (meters)	**25**	**100**	**200**	**300**	**400**	**500**
ELEVATION	17/64 in 0.7 cm	1 3/32 in 2.8 cm	2 13/64 in 5.6 cm	3 9/32 in 8.4 cm	4 3/8 in 11.2 cm	5 15/32 in 14 cm
WINDAGE	17/64 in 0.7 cm	1 3/32 in 2.8 cm	2 13/64 in 5.6 cm	3 9/32 in 8.4 cm	4 3/8 in 11.2 cm	5 15/32 in 14 cm

Table 2-3. Point of impact for M16A1 with standard sights.

LOW LIGHT LEVEL SIGHT SYSTEM						
RANGE (meters)	25	100	200	300	400	500
ELEVATION	2 3/64 in 0.9 cm	1 3/4 in 3.5 cm	2 3/4 in 7 cm	5 1/4 in 10.5 cm	7 in 17.7 cm	8 3/4 in 22.2 cm
WINDAGE	17/64 in 0.7 cm	1 3/32 in 2.8 cm	2 13/64 in 5.6 cm	3 9/32 in 8.4 cm	4 3/8 in 11.2 cm	5 15/32 in 14 cm

Table 2-4. Point of impact for M16A1 with LLLSS.

b. The M16A2/A3 rifle (Figure 2-4) features several improvements over the M16A1. It is designed to fire either semiautomatic or a three-round burst through the use of a selector lever (SAFE, SEMI, and BURST). The M16A3 has the same characteristics as the M16A2 with the exception of the selector lever (SAFE, SEMI and AUTO) this weapon fires full automatic.

Figure 2-4. M16A2/A3 rifle.

(1) ***Mechanically Zeroing the M16A2/A3***. Mechanically zeroing the weapon (Figure 2-5) is only necessary when the weapon zero is questionable, the weapon is newly assigned to the unit, or the weapon sights have been serviced. If necessary, the soldier should mechanically zero the weapon as follows:

(a) Adjust the front sight post (1) up or down until the base of the front sight post is flush with the front sight post housing (2).

(b) Adjust the elevation knob (3) counterclockwise, as viewed from above, until the rear sight assembly (4) rests flush with the carrying handle and the 8/3 marking is aligned with the index line on the left side of the carrying handle.

(c) Position the apertures (5) so the unmarked aperture is up and the 0-200 meter aperture is down. Rotate the windage knob (6) to align the index mark on the 0-200 meter aperture with the long center index line on the rear sight assembly.

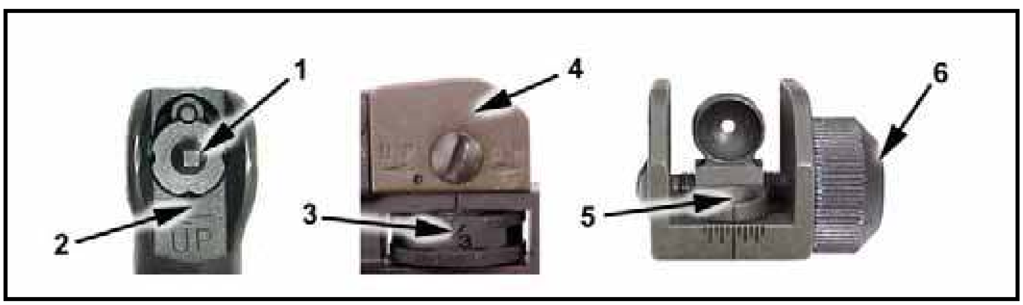


Figure 2-5. M16A2/A3 rifle mechanical zero.

(2) ***Battlesight Zero the M16A2/A3***. If necessary, the soldier should battlesight zero the weapon as follows (Figure 2-6):

(a) Adjust the elevation knob (1) counterclockwise, as viewed from above, until the rear sight assembly (2) rests flush with the carrying handle and the 8/3 marking is aligned with the index line (3) on the left side of the carrying handle. Then adjust the elevation knob one more click clockwise.

(b) Position the apertures (4) so the unmarked aperture is up and the 0-200 meter aperture is down. Rotate the windage knob (5) to align the index mark on the 0-200 meter aperture with the long center index line on the rear sight assembly.

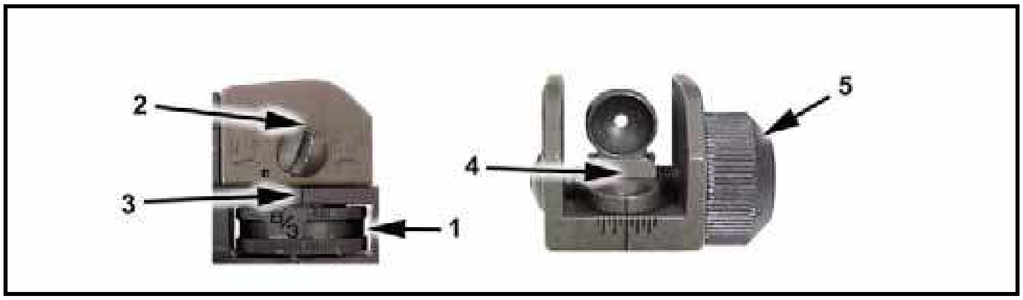


Figure 2-6. M16A2/A3 rifle battlesight zero.

(c) Table 2-5 shows how much one click of elevation or windage will move the strike of the round from a 25-meter zero all the way out to 600 meters.

RANGE (meters)	25	100	200	300	400	500	600
ELEVATION	3/4 in 0.9 cm	1 3/8 in 3.5 cm	2 3/4 in 7 cm	4 1/8 in 10.5 cm	5 1/2 in 14 cm	6 7/8 in 17.5 cm	8 1/4 in 20.9 cm
WINDAGE	1/8 in 0.3 cm	1/2 in 1.25 cm	1 in 2.5 cm	1 1/2 in 3.8 cm	2 in 5 cm	2 1/2 in 6.3 cm	3 in 7.6 cm

Table 2-5. Point of impact for M16A2/A3.

c. The M16A4 rifle (Figure 2-7) features additional product improvements that are illustrated in this chapter and in the operator's manual. It is designed to fire either semiautomatic or a three-round burst through the use of a selector lever (SAFE, SEMI, and BURST). The only changes from the M16A1/A2/A3 are the addition of the M5 rail adapter system and the detachable carrying handle.

Figure 2-7. M16A4 MWS.

(1) ***Mechanically Zeroing the M16A4***. Mechanically zeroing the weapon is only necessary when the weapon zero is questionable, the weapon is newly assigned to the unit, or the weapon sights have been serviced. If necessary, the soldier should mechanically zero the weapon as follows (Figure 2-8):

(a) Adjust the front sight post (1) up or down until the base of the front sight post is flush with the front sight post housing (2).

(b) Adjust the elevation knob (3) counterclockwise, when viewed from above, until the rear sight assembly (4) rests flush with the carrying handle and the 6/3 marking is aligned with the index line (5) on the left side of the carrying handle.

(c) Position the apertures (6) so the unmarked aperture is up and the 0-200 meter aperture is down. Rotate the windage knob (7) to align the index mark on the 0-200 meter aperture with the long center index line (8) on the rear sight assembly.

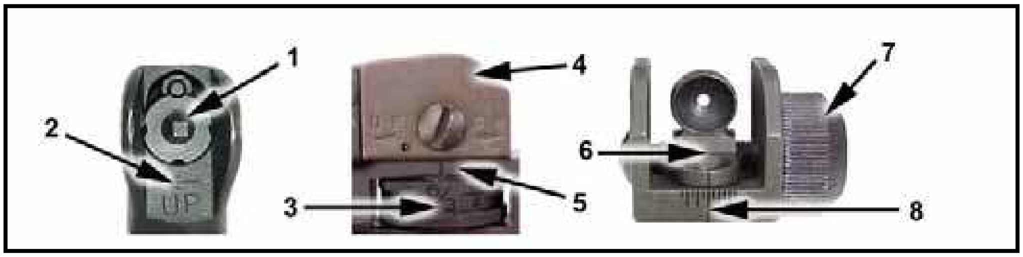


Figure 2-8. M16A4 MWS mechanical zero.

(2) ***Battlesight Zero the M16A4 MWS***. If necessary, the soldier should battlesight zero the weapon as follows (Figure 2-9):

(a) Adjust the elevation knob (1) counterclockwise, when viewed from above, until the rear sight assembly (2) rests flush with the detachable carrying handle and the 6/3 marking is aligned with the index line (3) on the left side of the detachable carrying handle. To finish the procedure, adjust the elevation knob two clicks clockwise so the index line on the left side of the detachable carrying handle is aligned with the "Z" on the elevation knob.

(b) Position the apertures (4) so the unmarked aperture is up and the 0-200 meter aperture is down. Rotate the windage knob (5) to align the index mark on the 0-200 meter aperture with the long center index line (6) on the rear sight assembly.

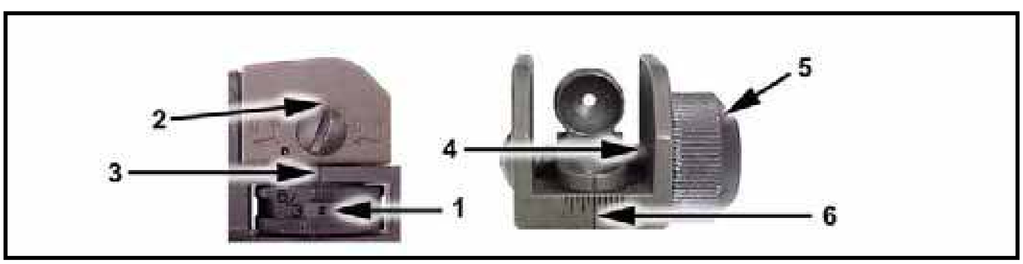


Figure 2-9. M16A4 MWS battlesight zero.

(c) Table 2-6 shows how much one click of elevation or windage will move the strike of the round from a 25-meter zero all the way out to 600 meters.

RANGE (meters)	25	100	200	300	400	500	600
ELEVATION	3/4 in 0.9 cm	1 3/8 in 3.5 cm	2 3/4 in 7 cm	4 1/8 in 10.5 cm	5 1/2 in 14 cm	6 7/8 in 17.5 cm	8 1/4 in 20.9 cm
WINDAGE	1/8 in 0.3 cm	1/2 in 1.25 cm	1 in 2.5 cm	1 1/2 in 3.8 cm	2 in 5 cm	2 1/2 in 6.3 cm	3 in 7.6 cm

Table 2-6. Point of impact for M16A4 MWS.

d. The M4-series carbine (Figure 2-10) features several modifications that make it an ideal weapon for close combat operations. The M4 is a 5.56-mm, magazine-fed, gas-operated, shoulder-fired weapon. It is designed to fire either semiautomatic or a three-round burst through the use of a selector lever (SAFE, SEMI, and BURST). The M4A1 is fully automatic. The M4-series carbine buttstock has four positions: closed, 1/2 open, 3/4 open, and full open. The M4 carbine becomes the M4 MWS when the M4 rail adapter system is installed on it (Figure 2-11).

Figure 2-10. M4/M4A1 carbine with standard handguards installed.

Figure 2-11. M4 MWS.

(1) ***Mechanically Zeroing the M4/M4A1 and M4 MWS***. Mechanically zeroing the weapon is only necessary when the weapon zero is questionable, the weapon is newly assigned to the unit, or the weapon sights have been serviced. If necessary, the soldier should mechanically zero the weapon as follows (Figure 2-12, page 2-8):

(a) Adjust the front sight post (1) up or down until the base of the front sight post is flush with the front sight post housing (2).

(b) Adjust the elevation knob (3) counterclockwise, when viewed from above, until the rear sight assembly (4) rests flush with the detachable carrying handle and the 6/3 marking is aligned with the index line (5) on the left side of the carrying handle.

(c) Position the apertures (6) so the unmarked aperture is up and the 0-200 meter aperture is down. Rotate the windage knob (7) to align the index mark (8) on the 0-200 meter aperture with the long center index line on the rear sight assembly.

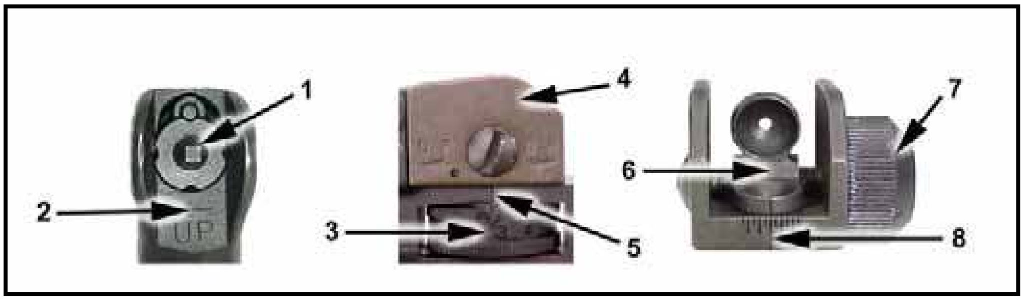


Figure 2-12. M4/M4A1 and M4 MWS mechanical zero.

(2) ***Battlesight Zero the M4/M4A1 and M4 MWS***. If necessary, the soldier should battlesight zero the weapon as follows (Figure 2-13):

(a) Adjust the elevation knob (1) counterclockwise, when viewed from above, until the rear sight assembly (2) rests flush with the detachable carrying handle and the 6/3 marking is aligned with the index line (3) on the left side of the detachable carrying handle. The elevation knob remains flush.

(b) Position the apertures (4) so the unmarked aperture is up and the 0-200 meter aperture is down. Rotate the windage knob (5) to align the index mark (6) on the 0-200 meter aperture with the long center index line on the rear sight assembly.

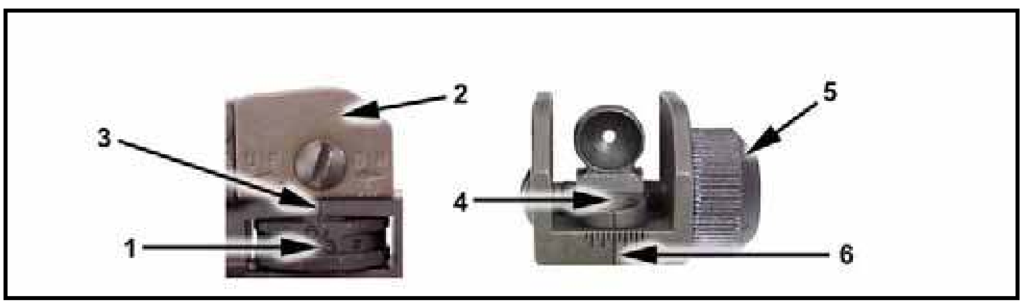


Figure 2-13. M4/M4A1 and M4 MWS battlesight zero.

NOTE: The "Z" marking on the elevation knob used in the detachable carrying handle of the M4-series weapon should be ignored. The "Z" marking is only used when the M16A4 is being zeroed.

(c) Table 2-7 shows how much one click of elevation or windage will move the strike of the round from a 25-meter zero all the way out to 500 meters.

RANGE (meters)	25	100	200	300	400	500
ELEVATION	3/4 in 0.9 cm	1 3/8 in 3.5 cm	2 3/4 in 7 cm	4 1/8 in 10.5 cm	5 1/2 in 14 cm	6 7/8 in 17.5 cm
WINDAGE	1/8 in 0.3 cm	1/2 in 1.25 cm	1 in 2.5 cm	1 1/2 in 3.8 cm	2 in 5 cm	2 1/2 in 6.3 cm

Table 2-7. Point of impact for M4/M4A1 and M4 MWS.

2-2. RAIL ADAPTER SYSTEM

The M4 rail adapter system (RAS) (Figure 2-14) consists of a set of lightweight sections that replace the standard handguards on the M4 carbine. The M5 RAS is standard issue on the M16A4. The RAS provides a secure mounting point for various accessories that may be mounted top, left and right. The user may only remove the lower assembly to perform preventive maintenance checks and services (PMCS). Accessories may be mounted on the right side of the RAS but, currently, are not supported with 10- and 25-meter zeroing procedures. Only accessories that do not require retention, such as a flashlight or vertical pistol grip, can be mounted on the bottom rail.

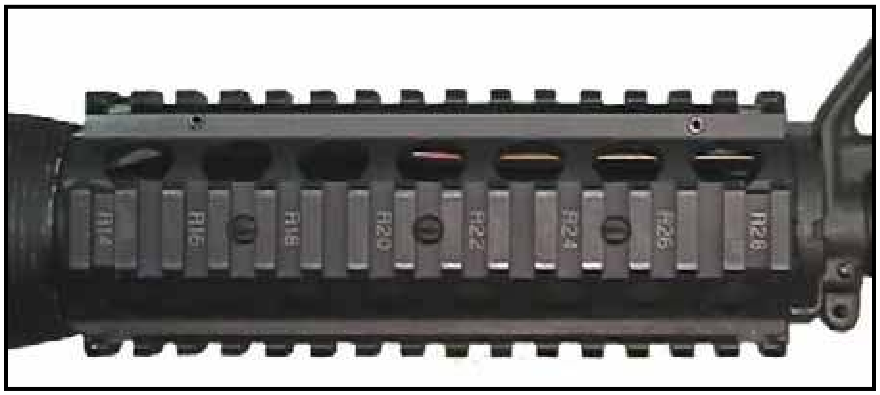


Figure 2-14. Rail adapter system.

NOTE: The bottom rail of the RAS will not retain zero.

a. The RAS rail covers/heat shields can be quickly attached and detached from the RAS. A spring latch at one end of each rail cover/heat shield automatically engages cutouts in the RAS. To slide the shield beyond a cutout, or to remove it, apply thumb pressure to the center of the spring latch and slide it in the desired direction. The rail cover/heat shield protects the shooter's hands from direct contact with the metal parts of the RAS and protects the RAS surfaces from excess wear and damage. The M5 RAS rail covers/heat shields are available in 11-, 9-, 6-, 5-, and 4-rib sections (Figure 2-15, page 2-10).

Figure 2-15. M5 rail covers/heat shields.

WARNING
When firing the weapon at high rates of sustained fire the barrel and metal components of the RAS can become hot enough to inflict serious burns. Cover exposed metal portions of the rail with the plastic rail covers. Use the vertical pistol grip during heavy sustained fire.

NOTES:

1. Keep the bottom, left, and right unused rail sections covered with full-length 11-rib rail cover/heat shield sections. If any accessories are mounted on a rail, cover the remaining rail surface with an appropriately sized rail cover/heat shield. The top full length rail cover/heat shield will be permanently removed if a backup iron sight is installed and replaced with a shorter rail cover/heat shield to protect the firer's nonfiring hand when the barrel is hot.
2. For ease of reference the shorter lengths can be referred to by the number of ribs along their outer surfaces.

b. The even numbered recoil grooves of each rail of the RAS are sequentially numbered within the recoil grooves themselves (Figure 2-16). Each number is preceded by a letter prefix indicating a specific slot on the RAS. The numbers of the top rail have a "T" prefix while those of the bottom rail have a "B" prefix. Additionally, the numbers of the rail to the shooter's left have an "L" prefix while those on the rail to the shooter's right have an "R" prefix. These addresses assist the user in remounting an accessory in the same position, allows standardization on precisely where to mount certain accessories, and identifies reference points for discussions on accessory mounting locations.

Figure 2-16. Address markings on RAS.

NOTE: Each RAS also contains holes within the notches that are threaded l/4-inch deep with 20 threads per inch (Figure 2-16). This is the standard thread size for a camera tripod adapter, which is used to attach standard camera or video accessories. For example, an RAS-equipped M4 carbine with a night vision device mounted may be attached to a standard camera tripod for "hands free" support during long periods of surveillance.

c. Each RAS comes with a vertical pistol grip (Figure 2-17). When installing the pistol grip (3) the rail cover/heat shield must be removed first. Once removed, unscrew the pistol grip lock (1) until the tip (2) is no longer visible through the hole in the pistol grip. Slide the pistol grip onto the RAS (it will cover five notches on the RAS). The tip on the top of the pistol grip lock (1) must then be aligned with a notch and hand tightened. (For further information on these accessories refer to TM 9-1005-319-10.)

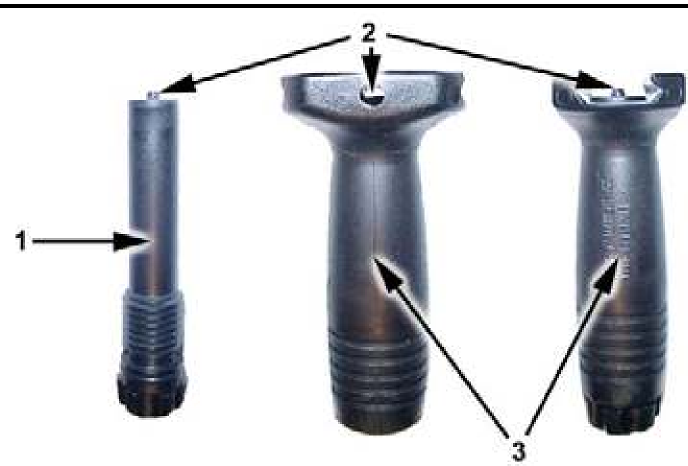


Figure 2-17. Vertical pistol grip.

2-3. RAIL GRABBERS AND MILES TRAINING EXTENDER

The Insight rail grabber (Figure 2-18) and the Picatinny rail grabber (Figure 2-20, page 2-14) were designed to mount accessories onto the M16A4 and M4-series weapons. Each rail grabber has proven its ability to retain zero when installed and tightened properly. Both rail grabbers attach accessories on the upper receiver and on all four sides of the RAS. Once zeroed the rail grabbers can be removed from the weapon and will retain zero as long as the rail grabber is not separated from the accessory and is remounted on the exact same notch it was zeroed on. If the accessory and rail grabber is reinstalled on a different notch, or the rail grabber is separated from the accessory, they must be rezeroed. A one-time retightening of the rail grabber and accessory is recommended after the first three rounds are fired to fully seat both. Details specific to each rail grabber are outlined in the following paragraphs.

NOTE: The bottom rail will not retain zero.

a. **Insight Rail Grabber** (Figure 2-18). The Insight rail grabber is used to install the AN/PEQ-2A and AN/PAQ-4B/C. This rail grabber must fully rest on the RAS in order to retain zero. The locking clamp (1) must grasp the RAS, and the screw that tightens the rail grabber must be tightened with a field tool such as a multipurpose tool.

(1) Both of the holes (2) located in the top of the rail grabber can be used to mount accessories, but the hole closest to the muzzle must be used. This ensures the majority of the rail grabber is supporting the accessory being mounted to prevent damage to the accessory.

(2) The rail grabber can be mounted where the tightening screw (3) is on either the left or right side (when top mounted) or top or bottom (when left side mounted) so it does not interfere with the operation of the weapon.

(3) Unless command-directed, all devices in a unit do not have to be mounted in the same location as long as the individual users record or mark the mounting location on their weapon to avoid unnecessary rezeroing. (Some examples of marking techniques are paint markers and grease pencils.)

(4) Even if the rail grabber is resting entirely on the RAS, accessories should not make contact with the front sight assembly or the collar of the barrel. The vibrations that occur during firing will interfere with the rail grabber's and accessory's zero retention capabilities.

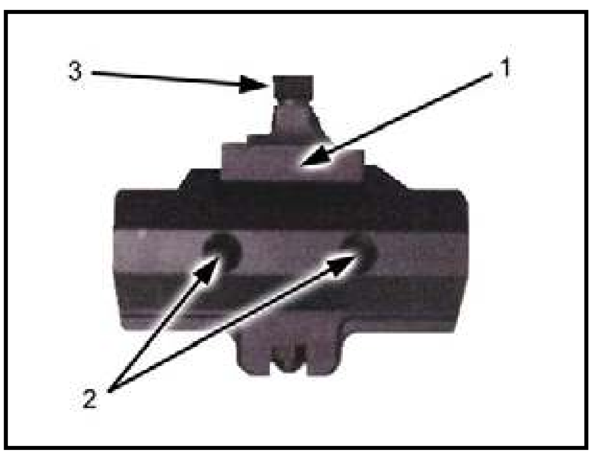


Figure 2-18. Insight rail grabber.

b. **MILES Training Extender for the Insight Rail Grabber** (Figure 2-19). The purpose of the training extender is to elevate the accessory above the MILES laser during force-on-force training. The extender is installed by using the thumbscrew (1) to hand tighten the extender into the mounting hole closest to the muzzle on the Insight rail grabber. Once the extender is installed, the accessory is installed on top of the extender and tightened. The training extender is only used when the Insight rail grabber is top mounted.

NOTE: TheAN/PEQ-2A and AN/PAQ-4B/C must be zeroed before and after using the MILES training extender.

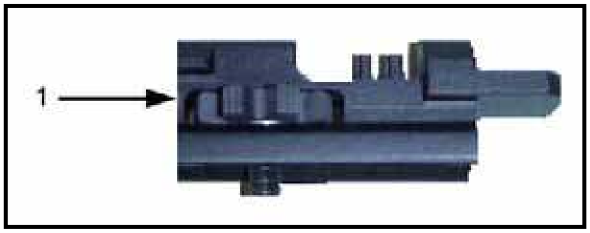


Figure 2-19. Insight rail grabber MILES training extender.

c. **Picatinny Rail Grabber** (Figure 2-20, page 2-14). The Picatinny rail grabber must fully rest on the RAS in order to retain zero. The locking clamp must grasp the RAS and the torque-limiting knob (1) that tightens the rail grabber must be hand tightened until it clicks two times.

(1) Both of the holes located in the top of the rail grabber (1) can be used to mount accessories, but the hole closest to the muzzle must be used. This ensures the majority of the rail grabber is supporting the accessory being mounted to prevent damage to the accessory. It also allows the torque-limiting knob (2) to be mounted on either the left or right side (when top mounted) or top or bottom (when side mounted) to ensure the torque-limiting knob does not interfere with the operation of the weapon.

(2) Unless command-directed, all devices in a unit do not have to be mounted in the same location as long as the individual users record or mark the mounting location on their weapon to avoid unnecessary zeroing. (Some examples of marking techniques are paint markers and grease pencils.)

(3) Even if the rail grabber is resting entirely on the RAS, accessories should not make contact with the front sight assembly or the collar of the barrel. The vibrations that occur during firing will interfere with the rail grabber's and accessory's zero retention capabilities.

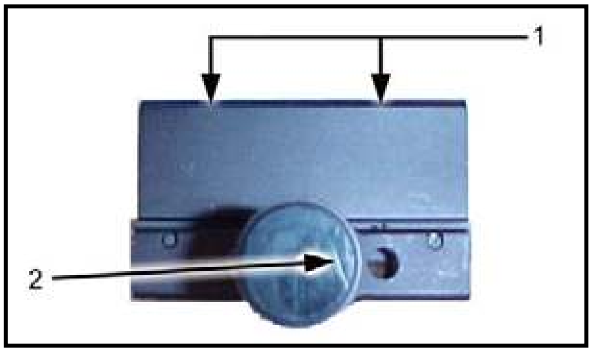


Figure 2-20. Picatinny rail grabber.

2-4. BACKUP IRON SIGHT

The backup iron sight (BIS) (Figure 2-21) is a semi-permanent flip up iron sight, equipped with a rail-grabbing base. It is intended to remain on the MWS while the M68 close combat optic (CCO) reflex sight is used as the primary means of day fire control. If the M68 fails, the prezeroed BIS can be flipped up and used to continue the mission. The BIS should only be removed by the armorer and remains on the MWS at all the times unless the carrying handle/sight is installed.

a. The BIS is installed by the armorer on the first notch of the integrated rail nearest the charging handle. The flip-up sight collapses towards the firer out of the way and can be used while the M68 is mounted. The BIS provides a backup capability effective out to at least 600 meters and can be installed on the M16A4 and M4-series weapons. Before installing the BIS, remove all rail covers/heat shields from the top except one 4-, 5-, or 6-rib shield. The remaining rail cover/heat shield can be positioned to accommodate accessories and protect the nonfiring hand when the barrel is hot.

Figure 2-21. Backup iron sight.

b. Once installed and zeroed, the BIS should be left in the stowed position for best durability and minimal interference unless its use is eminent (Figure 2-22). It provides a sighting capability when all other accessories have been removed, and it can be used to establish approximate zeros for other sighting components without requiring live fire. Zeros established using this method are only effective to approximately 20 meters and should be refined by a live-fire zero.

Figure 2-22. BIS in the stowed position.

2-5. M68, CLOSE-COMBAT OPTIC

The M68, close-combat optic (CCO) is a reflex (nontelescopic) sight (Figure 2-23). It uses a red dot aiming point and is designed for the "two-eyes-open" method of sighting. The M68 can be shot with one eye open as well. The dot follows the horizontal and vertical movement of the gunner's eye while remaining fixed on the target. A one-time retightening of the torque-limiting knob is recommended after the first three rounds are fired to fully seat the M68. No centering or focusing is required beyond 50 meters.

Figure 2-23. M68, close-combat optic.

a. **M16A1/A2/A3 Rifle** (Figure 2-24, page 2-16). The M68 mounts on the M16 mounting bracket (1) that attaches to the carrying handle on the M16A1/A2/A3. The half-moon spacer should not be installed but, if installed, it will not hinder firing performance. Firmly hand-tighten the bracket (1), O-ring (2), and machine screw (3). Align the locking bar (4) under the M68 with the notch in the rail ensuring the rotary switch (5) is facing the firer. Tighten the torque-limiting knob (not shown here) until it clicks two times.

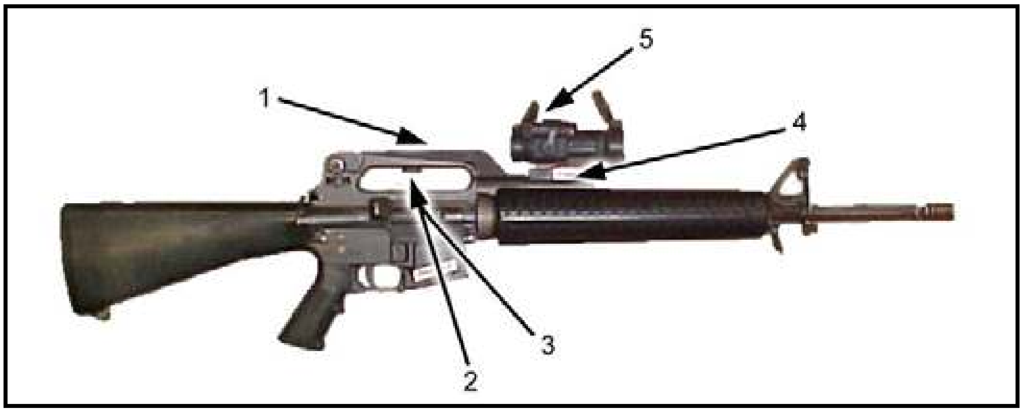


Figure 2-24. Mounting the M68 to the M16A1/A2/A3.

b. **M16A4 and M4-Series Weapons** (Figure 2-25). The M68 mounts directly to the integrated rail on top of the M16A4 and M4-series weapons (in place of the carrying handle). The half-moon spacer (1) should be installed to raise the M68 above the front sight post but the M68 can still be fired without the spacer. The soldier's preference dictates exactly which notch the M68 is mounted to. Although any notch is acceptable, testing has shown that the farther away the M68 is from the soldier's eyes, the better his field of view. Remove the carrying handle, align the locking bar with a notch, and tighten the torque-limiting knob until it clicks twice. If the M68 is remounted onto the same notch, it will retain zero.

Figure 2-25. M68 mounted on the M16A4/M4-series weapons.

c. **M16A4 and M4-Series Weapons with M68 and AN/PVS-14** (Figure 2-26). This combination is an effective passive means of engaging targets during hours of limited visibility. The brightness knob on the M68 should be on the lowest setting that presents the red dot clearly when viewed through the AN/PVS-14. The soldier must consider the following factors:

- The AN/PVS-14 should be mounted where the firer can acquire a good sight picture while performing the integrated act of shooting.

- The M68 can be mounted and zeroed on any slot forward of the AN/PVS-14 as long as the rail grabber fully rests on the RAS and the M68 lens does not rest on the front sight post.
- The closer the AN/PVS-14 is mounted to the M68, the larger the field of view will be.
- In order to get a clear sight picture with this configuration; fine adjustments must be made to the range focus, gain-control, and diopter on the AN/PVS-14.
- The eyecup should be exchanged with the eye guard that is shipped with the AN/PVS-14 to reduce the light signature from the display when not viewing.
- The red dot on settings 2 and 3 projects a negligible light signature at night, which can only be seen through a night vision device. Settings 4 through 10 will project a noticeable signature detectable by opposing forces using night vision devices.
- The brighter the dot, the larger the blooming effect becomes in the AN/PVS-14. (The blooming effect reduces the soldier's field of view and will prevent him from seeing targets behind the blooming.)

Remove the carrying handle and mount the M68 (1) by tightening the thumbscrew clamping knob. Mount the AN/PVS-14 (2) where the best field of view is achieved. Once the preferred location for the M68 is located, the M68 must be zeroed to that notch (if different from the notch the M68 was previously zeroed on). (For further information on the M68, refer to TM 9-1240-413-12&P and TM 11-5855-306-10 for the AN/PVS-14).

Figure 2-26. Mounting the M68/AN/PVS-14 combination on an MWS.

2-6. AN/PAQ-4B/C INFRARED AIMING LIGHT

The AN/PAQ-4B/C infrared aiming light (Figure 2-27, page 2-18) projects an infrared laser beam that cannot be seen with the eye but can be seen with night vision devices. This aiming light works with the AN/PVS-7-series goggles and the AN/PVS-14. The AN/PAQ-4B/C mounts on various M16-/M4-series weapons with mounting brackets or rail grabbers.

Figure 2-27. AN/PAQ-4B/C infrared aiming light.

a. **M16A1/A2/A3 Rifle** (Figure 2-28). The armorer must install the bracket assembly (1). The switch lever shroud (2) is aligned with the notches on the mounting rail (3). Lower the on/off switch. The AN/PAQ-4B/C (4) is then aligned with the notches on the switch lever shroud and hand tightened using the thumbscrew (5). Tool tightening is recommended to ensure zero retention if the thumbscrew is metal. The plastic thumbscrew must be hand tightened to avoid breakage. Retightening of the thumbscrew is recommended after a few rounds have been fired to ensure zero retention. The remote switch should be attached to the weapon where it is most convenient for the firer without interfering with the functioning of the weapon or hindering the firer's ability to fire the weapon.

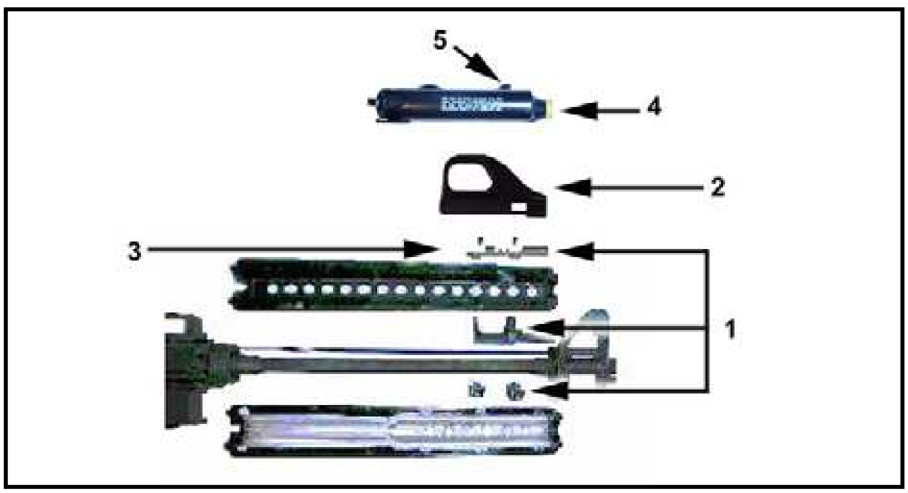


Figure 2-28. Mounting the AN/PAQ-4B/C on the M16A1/A2/A3 and M4 carbine.

b. **M16A4/M4 MWS Weapons** (Figure 2-29). The Picatinny rail grabber (1) or the insight rail grabber (5) is used to mount the AN/PAQ-4B/C to the RAS. Mount the rail grabber all the way forward on the top or either side of the RAS (2) ensuring it does not extend beyond the end of the RAS. (The AN/PAQ-4B/C will not retain zero if the rail grabber extends beyond the end of the integrated rail when mounted.) Tighten the torque-limiting knob (3) until it clicks twice. Align the thumbscrew (4) on the AN/PAQ-4B/C with the thumbscrew hole in the rail grabber nearest the muzzle. The mounting procedures are identical for the M16A4 and M4-series MWS. The remote switch should be attached to the weapon where it is most convenient for the firer without interfering with the functioning of the weapon or hindering the firers' ability to fire the weapon. If the aiming light and rail grabber are removed as a whole unit and mounted onto the same rail, the system will retain zero. If the rail grabber and AN/PAQ-4B/C are separated, the AN/PAQ-4B/C must be rezeroed to the weapon. (For further information refer to TM 11-5855-301-12&P.)

Figure 2-29. Mounting the AN/PAQ-4B/C on the MWS top or left.

2-7. AN/PEQ-2A TARGET POINTER/ILLUMINATOR/AIMING LIGHT

The AN/PEQ-2A target pointer/illuminator/aiming light (TPIAL) (Figure 2-30, page 2-20) is a Class IIIb laser that emits a highly collimated beam of infrared light for precise aiming of the weapon as well as a separate infrared illumination beam with adjustable focus to illuminate shadowed areas. The AN/PEQ-2A can be used during force-on-force training in the low power modes only. High power modes can only be used on live-fire ranges exceeding 220 meters. The AN/PEQ-2A is used in conjunction with night vision devices and can be used as either a handheld illuminator/pointer or can be weapon-mounted with included brackets/accessory mounts. The AN/PEQ-2A can be used to accurately direct fire as well as illuminate and designate areas and targets.

Figure 2-30. AN/PEQ-2A target pointer illuminator/aiming light.

a. **M16A1/A2/A3 Rifle and M4 Carbine** (Figure 2-31). The armorer must install the bracket assembly (1). The AN/PEQ-2A (2) thumbscrew (3) is then aligned with the hole in the mounting rail (4) nearest the muzzle and tool tightened. The remote switch should be attached to the weapon where it is most convenient for the firer without interfering with the functioning of the weapon or hindering the firer's ability to fire the weapon. Retightening of the rail grabber and thumbscrew is recommended after a few rounds have been fired to ensure zero retention.

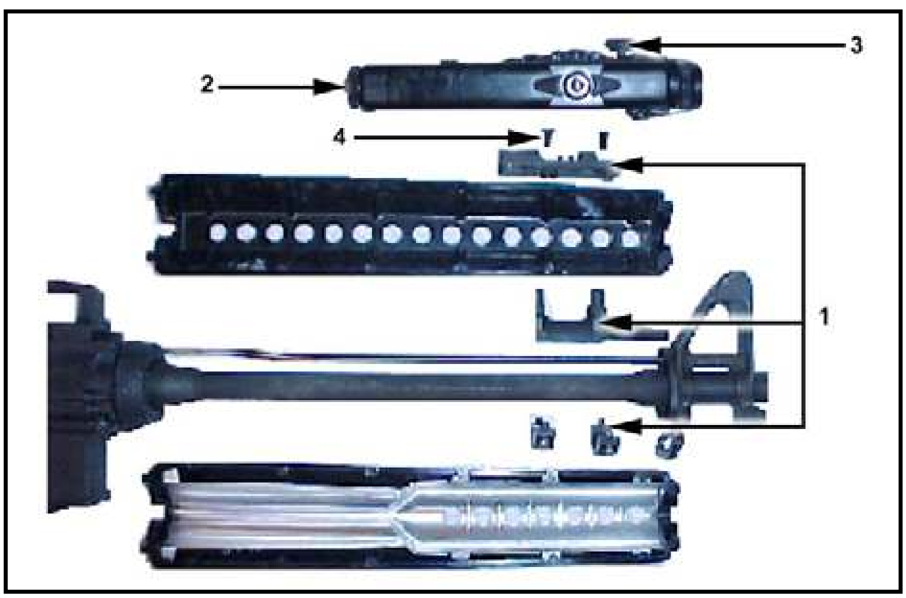


Figure 2-31. Mounting the AN/PEQ-2A to the M16A1/A2/A3 rifle and M4 carbine.

b. **M16A4/M4 MWS Weapons** (Figure 2-32). The Picatinny rail grabber (1) or the Insight rail grabber (2) may be used to mount the AN/PEQ-2A to the RAS. Mount the rail grabber all the way forward on the top or either side of the RAS ensuring it does not extend beyond the end of the RAS. (The AN/PEQ-2A will not retain zero if the rail grabber extends beyond the end of the integrated rail when mounted.) Tighten the torque-limiting knob (4) until it clicks twice. If installing the AN/PEQ-2A with the Insight rail grabber you must tool tighten the AN/PEQ-2A and rail grabber or it will come loose. Align the thumbscrew (5) on the AN/PEQ-2A with the hole that is closest to the front sight assembly located on the tope of the rail grabber. The mounting procedures are identical for the M16A4 and M4-series modular weapon systems. If the aiming light and rail grabber are removed as a whole unit and mounted onto the same rail, the system will retain zero. If the rail grabber and AN/PEQ-2A are separated, the AN/PEQ-2A must be rezeroed to the weapon.

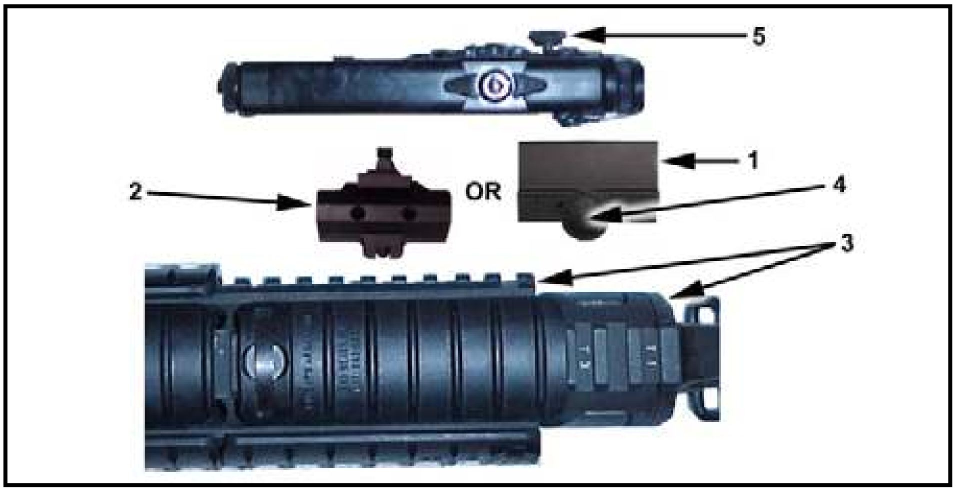


Figure 2-32. Mounting the AN/PEQ-2A on the M16A4 and M4 MWS.

c. **M16/M4 MILES Mounting Procedures** (Figure 2-33, page 2-22). When conducting MILES training with the Insight rail grabber (1) or bracket assembly (4), the AN/PEQ-2A is attached to the M16-/M4-series weapons using the training extender bracket (2). The training extender is hand tightened by turning the thumb wheel (3) on the training extender clockwise. The training extender bracket is not required when mounting the AN/PEQ-2A onto the side of the MWS. The Picatinny rail grabber does not require the training extender. (For further information refer to TM 11-5855-308-12&P.)

NOTE: The AN/PEQ-2A and AN/PAQ-4B/C must be zeroed before and after using the MILES training extender.

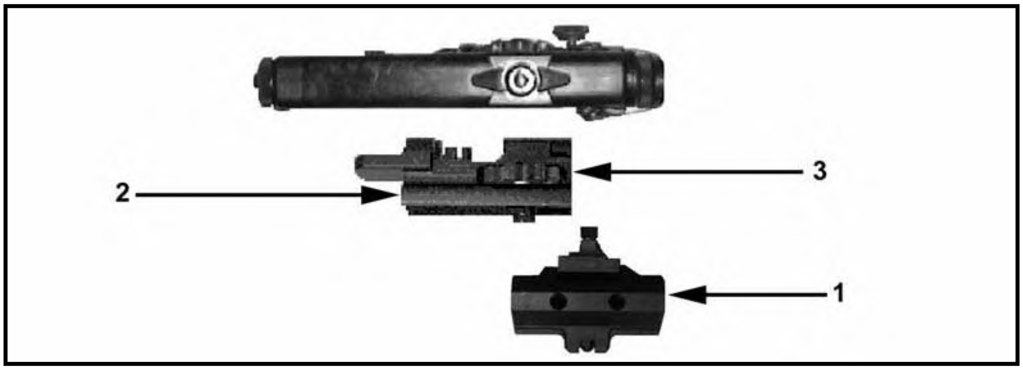


Figure 2-33. MILES training extender bracket installation on M16-/M4-series weapons.

2-8. AN/PAS-13 (V2) MEDIUM THERMAL WEAPON SIGHT and AN/PAS-13 (V3) HEAVY THERMAL WEAPON SIGHT

The AN/PAS-13 (V2) medium thermal weapon sight (MTWS) and the AN/PAS-13 (V3) heavy thermal weapon sight (HTWS) (Figure 2-34) are silent, lightweight, compact, and durable battery-powered infrared imaging sensors that operate with low battery consumption. (Both the MTWS and the HTWS are referred to henceforth as a singular thermal weapon sight [TWS]). The TWS is capable of target acquisition under conditions of limited visibility such as darkness, smoke, fog, dust, and haze. The TWS operates effectively at night and can also be used during the daytime. The TWS is composed of two functional groups: the telescope (1) and the basic sensor (2).

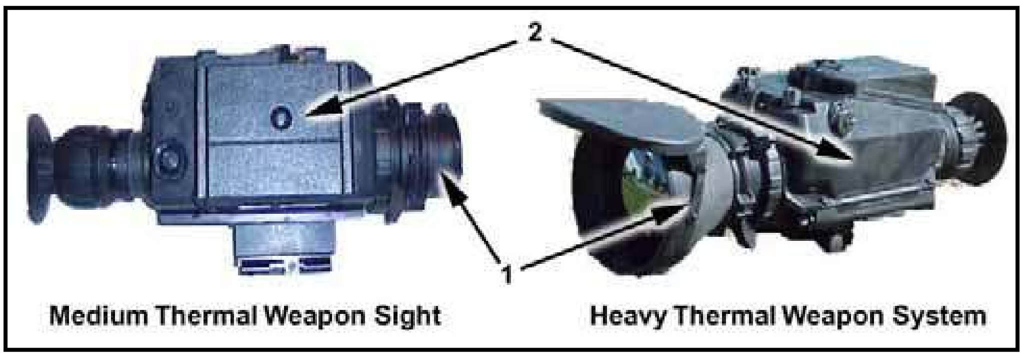


Figure 2-34. HTWS and MTWS models of the thermal weapon sight.

a. **M16A1/A2/A3 Rifle** (Figure 2-35). The M16A1/A2/A3 weapon bracket (1) is a standard item in the TWS carrying case. The weapon bracket's threaded rod (2) is inserted through the hole in the carrying handle of the M16A1/A2/A3 and secured with the thumb wheel (3). The Picatinny rail grabber (4) on the bottom of the TWS is then aligned with a notch on the bracket, ensuring the TWS is positioned to accommodate an effective firing position once the eyecup (5) is depressed. Ensure the rail grabber fully rests on the bracket when mounting the TWS or the sight will not retain zero.

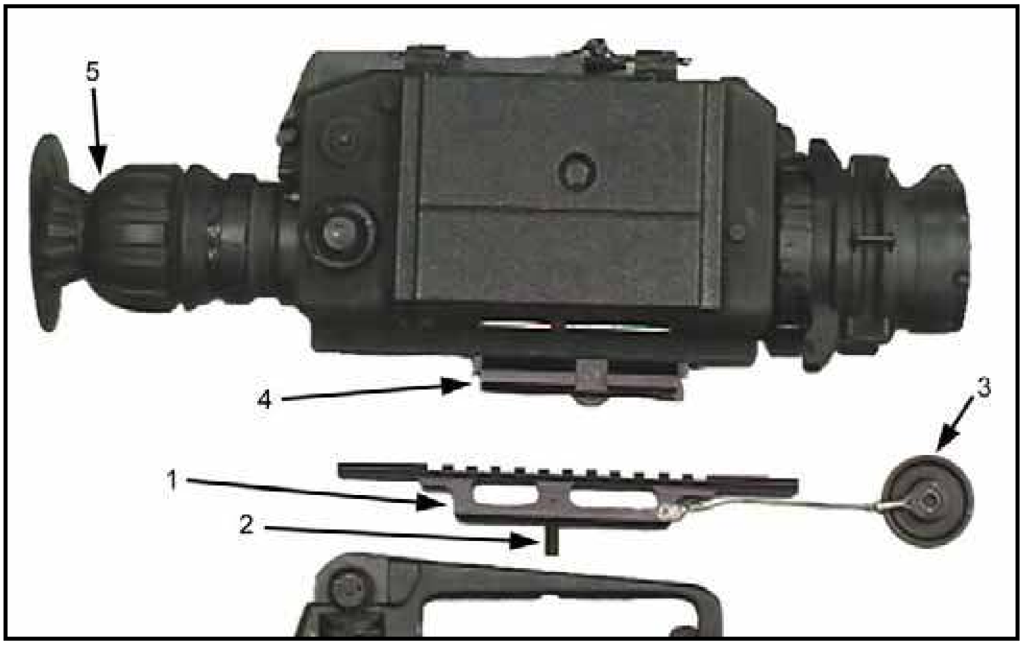


Figure 2-35. Mounting TWS on an M16A1/A2/A3.

b. **M16A4/M4-Series Weapons** (Figure 2-36). The Picatinny style rail grabber with spacer (1) on the bottom of the TWS is aligned with a notch on the integrated rail (2) of the M16A4/M4-series weapons ensuring the TWS is positioned to accommodate an effective firing position once the eyecup is depressed. The TWS will not retain zero if the rail grabber extends beyond the end of the integrated rail when mounted. Tighten the torque-limiting knob clockwise until it clicks twice. Retightening the rail grabber is recommended after a few rounds have been fired to ensure the sight is fully seated. The mounting procedures are identical for the M16A4 and M4-series MWS.

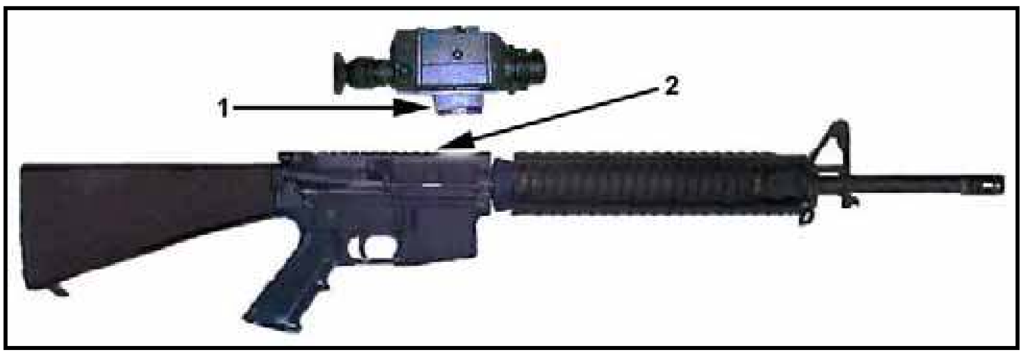


Figure 2-36. Mounting TWS on M16A4/M4-series weapons.

2-9. AN/PVS-4 NIGHT VISION SIGHT

The AN/PVS-4 night vision sight is a portable, battery-operated electro-optical instrument used for observation and aimed fire of weapons at night (Figure 2-37, page 2-24). It amplifies reflected light, such as moonlight, starlight, and sky glow, so that the viewed scene becomes clearly visible to the operator. The AN/PVS-4 does not emit visible or infrared light (except from the eyepiece) that can be detected by the enemy. It can be used on the M16A2 rifle, M4 carbine, and M4 modular weapon system. Mounting brackets are provided for each type of weapon.

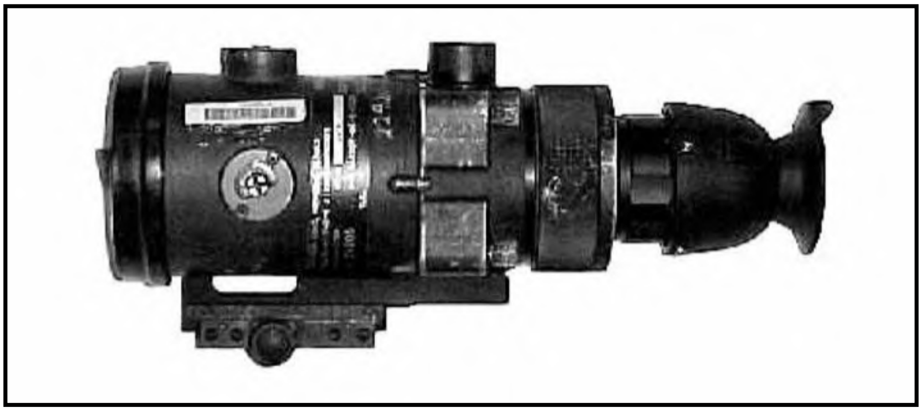


Figure 2-37. AN/PVS-4 night vision sight.

a. **M16A2-Series Weapons** (Figure 2-38). The AN/PVS-4 is mounted to the carrying handle on the M16A2-series weapons. Position the sight in the groove on the top of the carrying handle and align the threaded hole in the base of the sight-mounting adapter over the hole in the handle. Insert the mounting knob assembly through the hole in the carrying handle and screw it firmly clockwise into the sight-mounting adapter. If difficulty is encountered, turn the sight and the rifle upside down. Place the rifle handle onto the sight-mounting adapter, lining up the hole in the carrying handle with the hole in the sight-mounting adapter. Place the mounting knob assembly through the hole in the carrying handle and screw it clockwise.

Figure 2-38. AN/PVS-4 on the M16A2-series weapons.

b. **M4/M4-MWS-Series Weapons** (Figure 2-39). The Picatinny rail grabber with a mounting adapter (1) on the bottom of the AN/PVS-4 is aligned with a notch on the integrated rail (2) of the M4/M4-MWS-series weapons ensuring the AN/PVS-4 is positioned to accommodate an effective firing position once the eyecup is depressed. The AN/PVS-4 will not retain zero if the rail grabber extends beyond the end of the integrated rail when mounted.

Tighten the torque-limiting knob clockwise until it clicks twice. Retightening of the rail grabber is recommended after a few rounds have been fired to ensure the sight is fully seated. The mounting procedures are identical for the M4 and M4-MWS-series weapons.

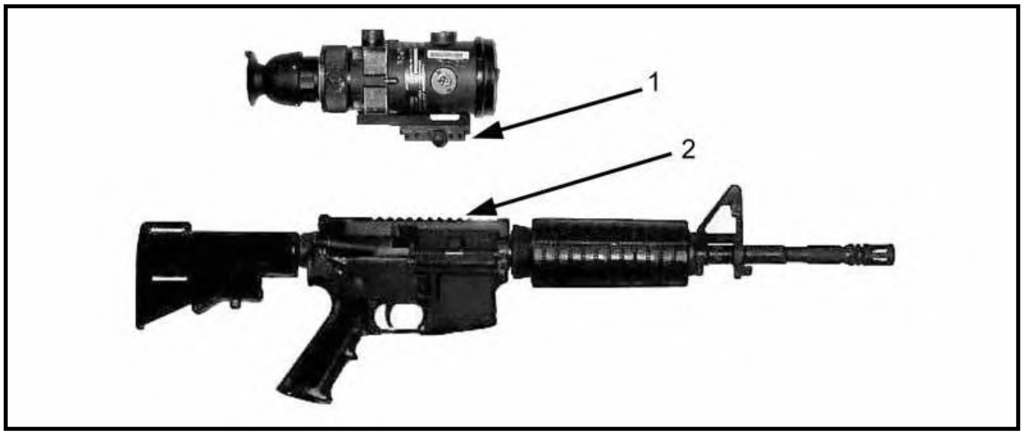


Figure 2-39. AN/PVS-4 on the M4/M4-MWS-series weapon.

2-10. BORELIGHT

The borelight (Figure 2-40) is an eye-safe laser that is used to zero aiming lasers, such as the AN/PAQ-4 or AN/PEQ-2, without a 25-meter confirmation. The borelight has four settings: OFF (the borelight is not in use); GOGGLE (when using NVGs; this mode is selected when using the borelight in a tactical environment); LOW (used during normal operations); and PULSE (used during dry-fire training mode). The borelight will also boresight optics and iron sights to ensure the first shot group hits the 25-meter zero target when zeroing the weapon. The borelight comes with a 5.56-mm, 7.62-mm, .50 caliber, and MK 19 mandrel.

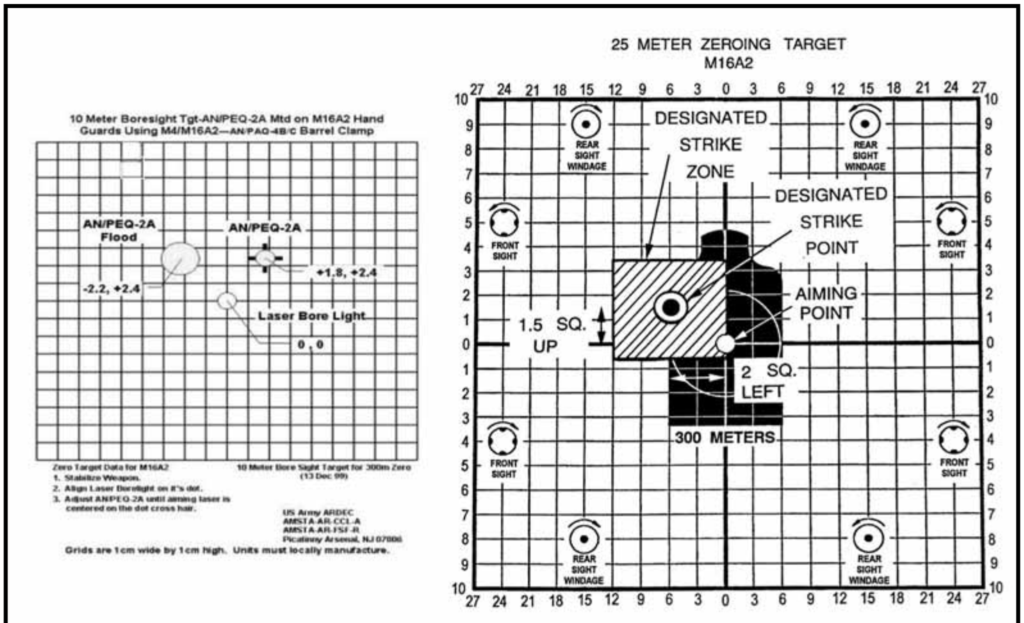
Figure 2-40. Borelight with a 5.56-mm mandrel.

a. Boresighting is conducted at 10 meters with the borelight, weapon, aiming device and a 10-meter offset. Each aiming device and weapon combination has a unique 10-meter offset (Appendix G).

b. Figure 2-41A depicts a 10-meter boresight target and Figure 2-41B (page 2-26) depicts a 25-meter zero target. When used properly these offsets will align the aiming device on the selected weapon to engage a target center mass at 300 meters.

(1) The 10-meter boresight target is used in conjunction with the borelight. The 10-meter boresight target is a 1-centimeter grid system with a crosshair and a circle. The crosshair is the aiming point for the aiming device and the circle is the point of impact for the borelight. (Refer to Chapter 8 for a detailed explanation of bore sighting procedures.)

(2) The 25-meter zero target is used when live firing at 25-meters. The 25-meter zero target for the M16- and M4-series weapons is the standard M16A2 zero target with the appropriate strike zone marked on the target (Figure 2-41B). The M4 zero target is only used when zeroing the iron sights on the M4. The aiming point is always center mass of the 300-meter scaled silhouette. The designated strike zone is a 4-by-4 square designating where the rounds should impact when you aim center mass. (Refer to Chapter 8 for a detailed explanation of the 25-meter offset zeroing procedures.)



A. 10-meter boresight target B. 25-meter zero offset

Figure 2-41. 10-meter boresight target and 25-meter zero offset.

2-11. AMMUNITION TYPES AND CHARACTERISTICS

This paragraph provides information on different types of standard military ammunition used in the M16-/M4-series weapons (Figure 2-42, page 2-28). Use only authorized ammunition manufactured to U.S. and NATO specifications. (Figures 2-43 through 2-47 [pages 2-28 through 2-30] show ammunition trajectory data.)

a. **Cartridge, 5.56-mm, Ball, M193.** The M193 cartridge is a center-fire cartridge with a 55-grain, gilded metal-jacketed, lead alloy core bullet. The M193 round is the standard cartridge for field use with the M16A1 rifle and has no identifying marks (1, Figure 2-42, page 2-28).

b. **Cartridge, 5.56-mm, Tracer, M196.** (Used in the M16A1 rifle) The M196 cartridge has a red or orange painted tip (2, Figure 2-42, page 2-28). Its main uses are for observation of fire, incendiary effect, and signaling. Soldiers should avoid long-term use of 100 percent tracer rounds, which could cause deposits of incendiary material, or chemical compounds that could damage the barrel. Therefore, when tracer rounds are fired, they are mixed with ball ammunition in a ratio of no greater than one-to-one with a preferred ratio of three or four ball rounds to one tracer round.

c. **Cartridge, 5.56-mm, Dummy, M199.** (Used in all rifles.) The M199 dummy cartridge is used during dry firing and other training (3, Figure 2-42, page 2-28). This cartridge can be identified by the six grooves along the sides of the case beginning about 1/2 inch from its tip. It contains no propellant or primer. The primer well is open to prevent damage to the firing pin.

d. **Cartridge, 5.56-mm, Blank, M200.** (Used in all rifles.) The M200 blank cartridge has no projectile. The case mouth is closed with a seven-petal rosette crimp and shows a violet tip (4, Figure 2-42, page 2-28).

* e. **Cartridge, 5.56-mm, Ball, M855.** (Used in the M16A2/3/4 and M4-series weapons.) The M855 cartridge has a 62-grain, gilded metal-jacketed, lead alloy core bullet with a steel penetrator. The primer and case are waterproof. This round is also linked and used in the M249. It has a green tip (5, Figure 2-42, page 2-28). This ammunition should not be used in the M16A1 except under emergency conditions, and only at targets less than 90 meters in distance. (The twist of the M16A1 rifling is not sufficient to stabilize the length of the 62-grain projectile of the round.)

* f. **Cartridge, 5.56-mm, Tracer, M856.** (Used in the M16A2/3/4 and M4-series weapons.) The M856 tracer cartridge has characteristics similar to the M196 tracer with a slightly longer tracer burnout distance. This cartridge has a 63.7-grain bullet. The M856 does not have a steel penetrator. It has a red tip (orange when linked 4 to 1 for the M249) (6, Figure 2-42, page 2-28). This ammunition should not be used in the M16A1 except under emergency conditions, and only at targets less than 90 meters in distance. (The twist of the M16A1 rifling is not sufficient to stabilize the length of the 63.7-grain projectile of the round.)

g. **Cartridge, 5.56-mm Short-Range Training Ammunition (SRTA), M862.** (Used in all rifles.) The M862 SRTA (7, Figure 2-42, page 2-28) is designed exclusively for training. It can be used in lieu of service ammunition on indoor ranges and by units that have a limited range fan that does not allow the firing of service ammunition. SRTA ammunition must be used with the M2 training bolt.

(1) Although SRTA closely replicates the trajectory and characteristics of service ammunition out to 25 meters, it should not be used to set battle sight zero of weapons to fire service ammunition. The settings that are placed on the sights for SRTA could be different for service ammunition.

(2) If adequate range facilities are not available for sustainment training, SRTA can be used for any firing exercise of 25 meters or less. This includes the 25-meter scaled silhouette, 25-meter alternate qualification course, and quick-fire training. SRTA can also be used for Urban Operations training. (See Appendix A for use of SRTA in training.)

* h. **Cartridge, 5.56-mm, Armor Piercing (AP) M995**. The M995 cartridge (8, Figure 2-42, page 2-28) is used by the M249 (SAW), M16/A2/A3/A4, and M4 series weapons. Procurement is intended for use against light armored targets. The M995 offers the capability to defeat these targets at ranges two to three times that of currently available 5.56-mm ammunition. The M995 cartridge consists of a projectile and a propelling charge contained in a brass cartridge case. The projectile is a dense metal penetrator (tungsten carbide) enclosed by a standard gilding metal jacket. An aluminum

cup sits at the rear of the projectile for the purpose of properly locating the penetrator within the projectile. The cartridge utilizes a conventional brass case and double base propellant. A standard rifle cartridge primer is used in the case to initiate the propelling charge.

i. **Storage.** When storing ammunition in the open is necessary, it must be raised on dunnage at least 6 inches from the ground and protected with a cover, leaving enough space for air circulation. Since moisture and high temperatures adversely affect ammunition and explosives, the following must be adhered to:

- Do not open ammunition boxes until ready to use.
- Protect ammunition from high temperatures and the direct rays of the sun.
- Do not attempt to disassemble ammunition or any of its components.
- Never use lubricants or grease on ammunition.

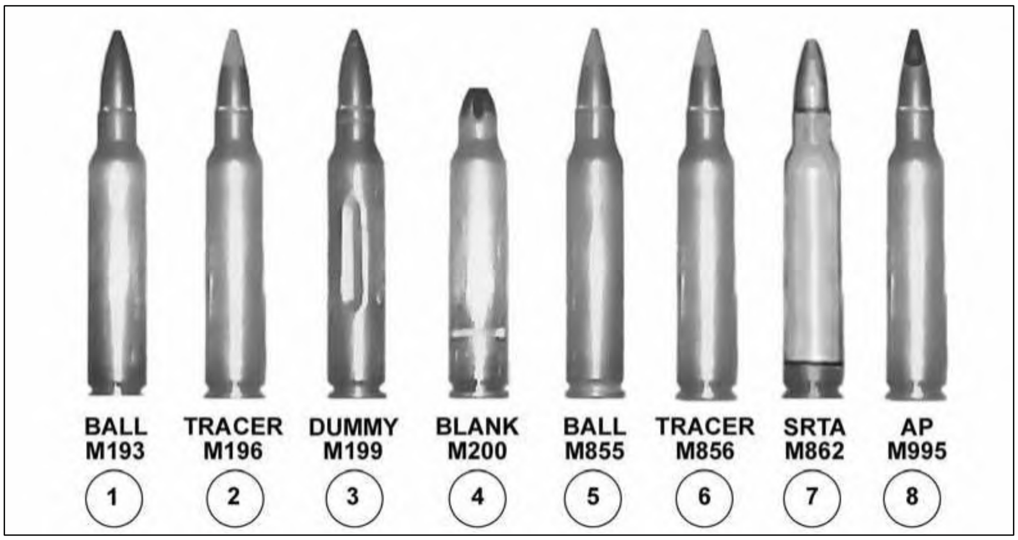


***Figure 2-42. Ammunition, 5.56-mm for the M16- and M4-series weapons.**

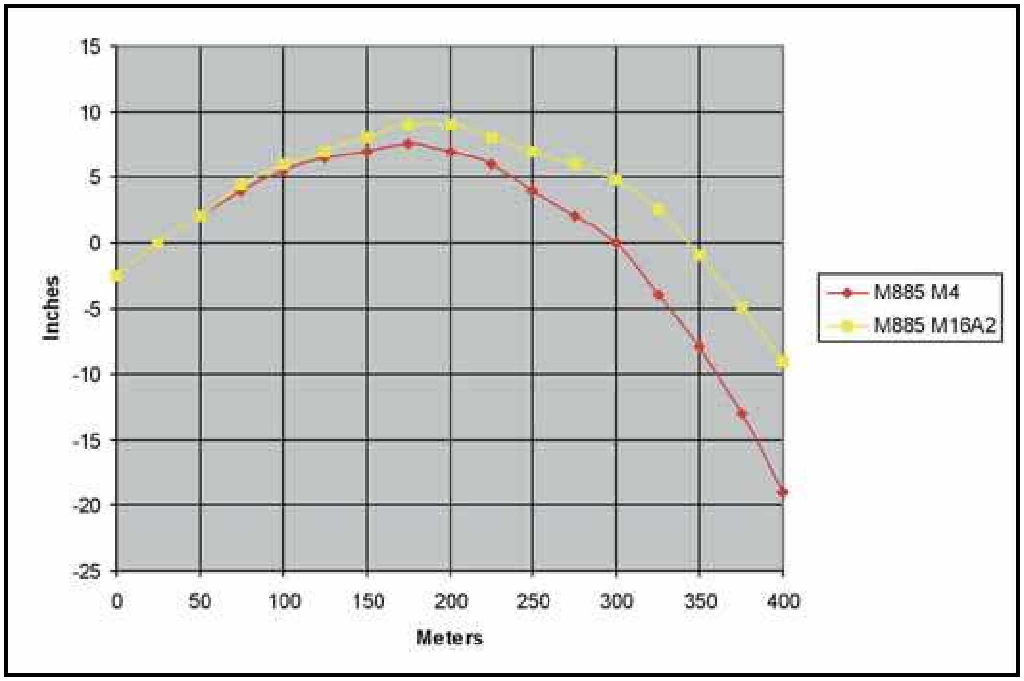


Figure 2-43. M855 drop during 25-meter zeroing (M16A2 at 8/3+1; M4 at 6/3).

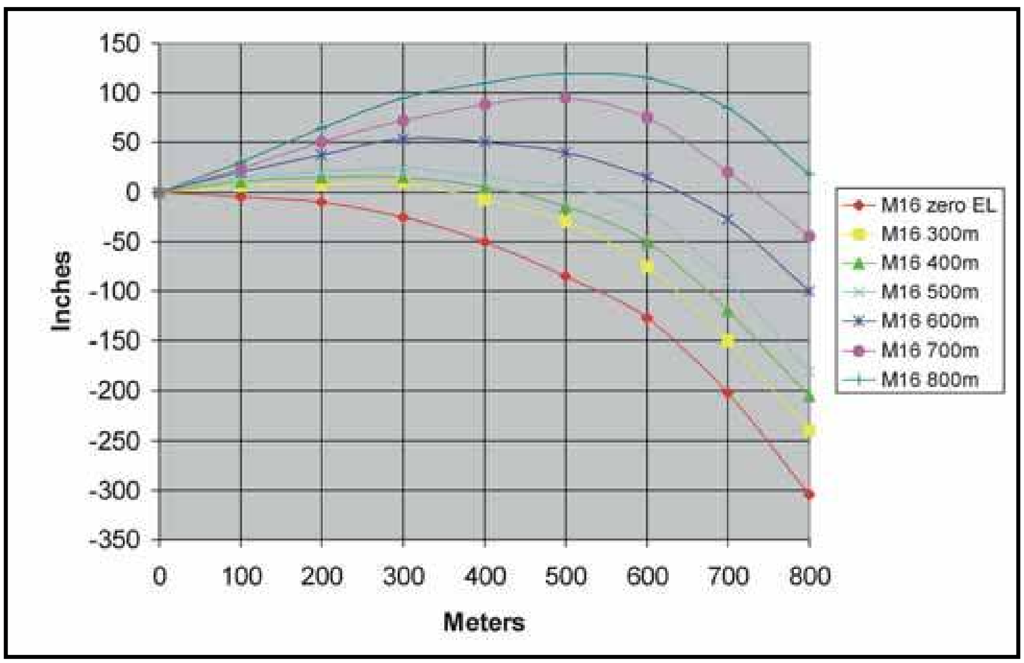


Figure 2-44. Bullet drop of M855 ammunition with M16A2 (8/3).

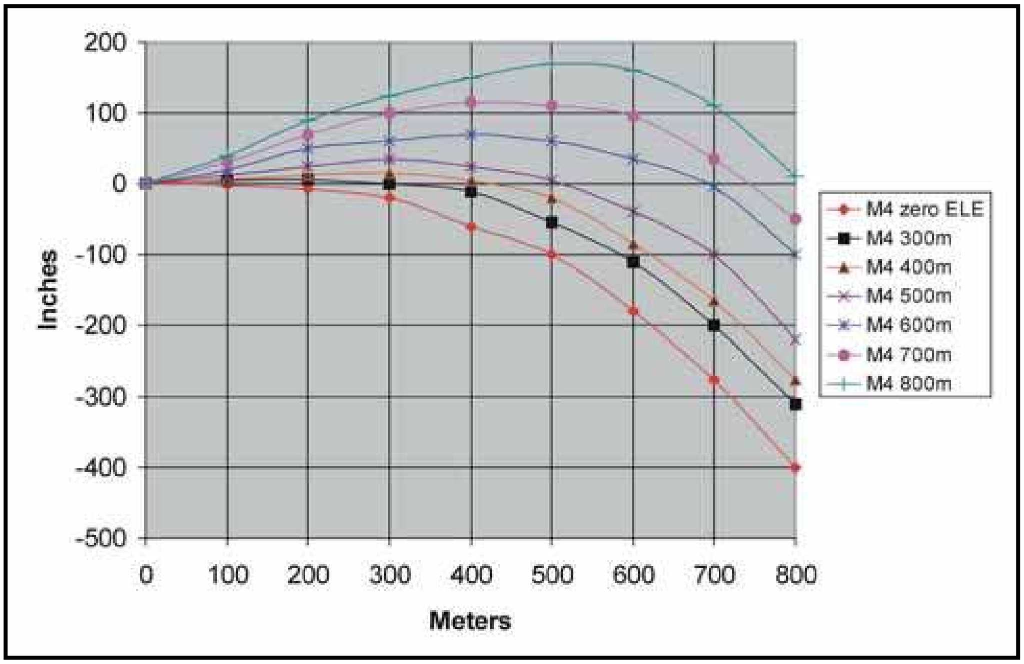


Figure 2-45. Bullet drop of M855 ammunition with M4 (6/3).

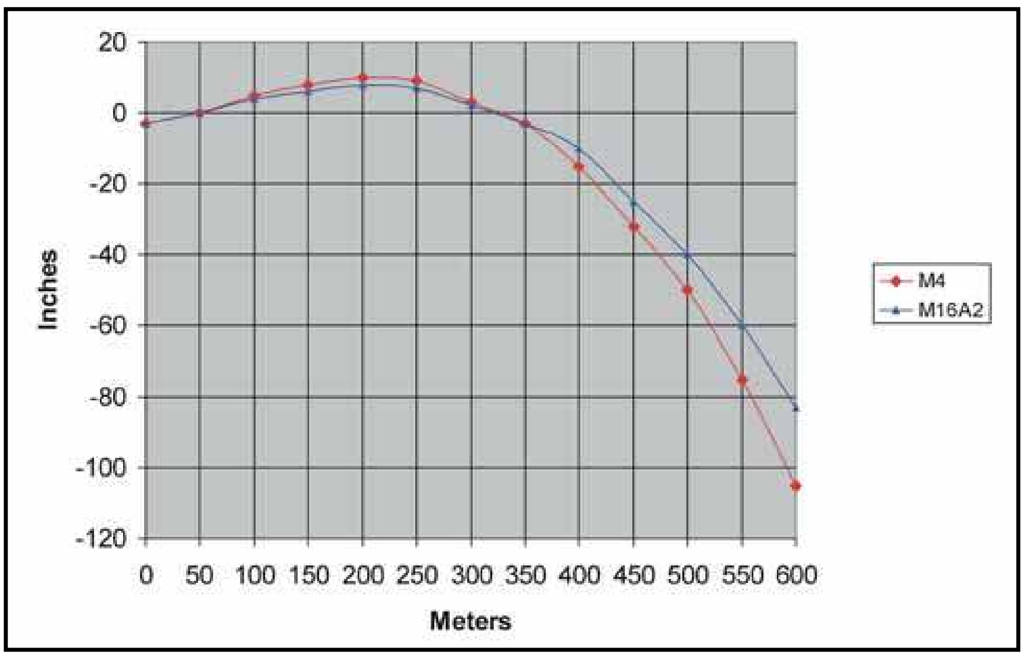


Figure 2-46. M4 carbine and M16A2 rifle bullet trajectory comparison.

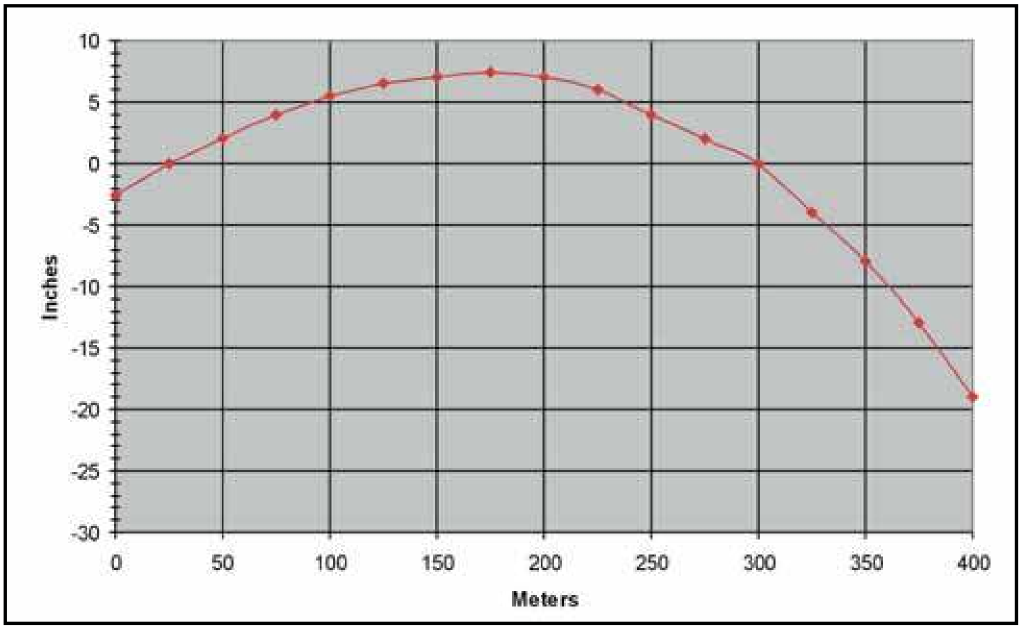


Figure 2-47. Bullet drop of M4/M855 during 25-meter zeroing on 6/3.

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CHAPTER 3

TROUBLESHOOTING AND DESTRUCTION

Commanders and unit armorers are responsible for the organizational and direct support maintenance of weapons and for the destruction of weapons when necessary. Soldiers are responsible for always keeping their weapons clean and operational in training and in combat and, therefore, should be issued an operator's technical manual and cleaning equipment for their assigned weapons.

3-1. STOPPAGES

A stoppage is a failure of an automatic or semiautomatic firearm to complete the cycle of operation. The firer can apply immediate or remedial action to clear the stoppage. Some stoppages cannot be cleared by immediate or remedial action and may require weapon repair to correct the problem. A complete understanding of how the weapon functions is an integral part of applying immediate action procedures.

a. **Immediate Action.** Immediate action involves quickly applying a possible correction to reduce a stoppage without performing troubleshooting procedures to determine the actual cause. The key word **SPORTS** will help the firer remember the steps in order during a live-fire exercise. To apply immediate action, the soldier:

- **S**laps gently upward on the magazine to ensure it is fully seated, and the magazine follower is not jammed (see note).
- **P**ulls the charging handle fully to the rear.
- **O**bserves for the ejection of a live round or expended cartridge. (If the weapon fails to eject a cartridge, perform remedial action.)
- **R**eleases the charging handle (do not ride it forward).
- **T**aps the forward assist assembly to ensure bolt closure.
- **S**queezes the trigger and tries to fire the rifle.

Only apply immediate action once for a stoppage. If the rifle fails to fire a second time for the same malfunction inspect the weapon to determine the cause of the stoppage or malfunction and take the appropriate remedial action outlined below.

NOTE: When slapping up on the magazine, be careful not to knock a round out of the magazine into the line of the bolt carrier, causing more problems. Slap only hard enough to ensure the magazine is fully seated. Ensure that the magazine is locked into place by quickly pulling down on the magazine.

b. **Remedial Action.** Remedial action is the continuing effort to determine the cause for a stoppage or malfunction and to try to clear the stoppage once it has been identified. To apply the corrective steps for remedial action, first try to place the weapon on SAFE, then remove the magazine, lock the bolt to the rear, and place the weapon on safe (if not already done).

NOTE: A bolt override may not allow the weapon to be placed on SAFE.

3-2. MALFUNCTIONS

Malfunctions are caused by procedural or mechanical failures of the rifle, magazine, or ammunition. Pre-firing checks and serviceability inspections identify potential problems before they become malfunctions. This paragraph describes the primary categories of malfunctions.

a. **Failure to Feed, Chamber, or Lock.** A malfunction can occur when loading the rifle or during the cycle of operation. Once the magazine has been loaded into the rifle, the forward movement of the bolt carrier group could lack enough force (generated by the expansion of the action spring) to feed, chamber, or lock the bolt (Figure 3-1).

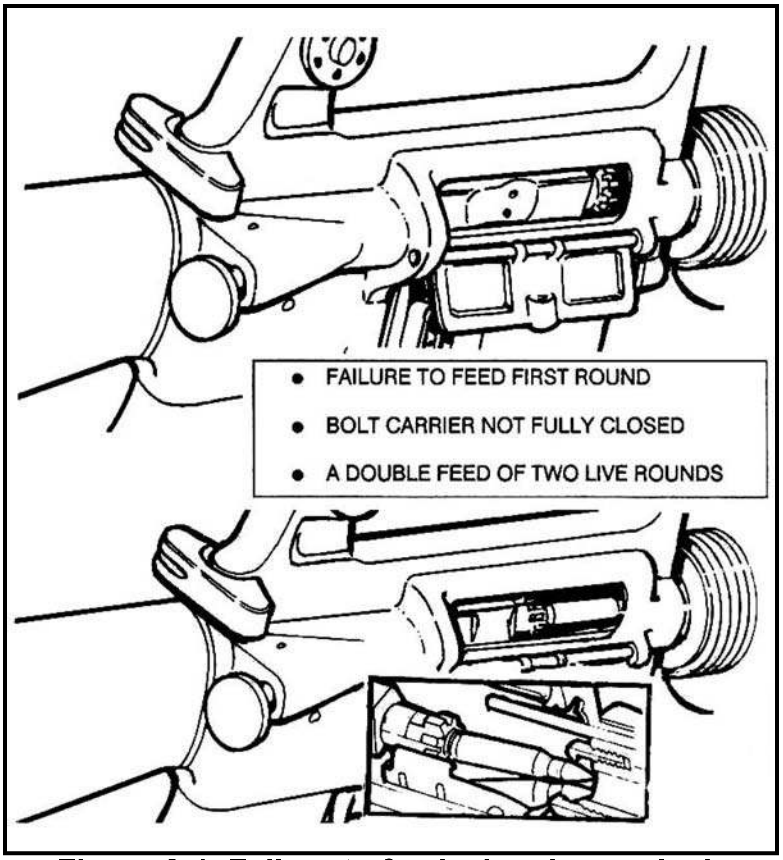

Figure 3-1. Failure to feed, chamber, or lock.

(1) ***Probable Causes.*** The cause could be the result of one or more of the following:

- Excess accumulation of dirt or fouling in and around the bolt and bolt carrier.
- Defective magazine (dented, bulged, or a weak magazine spring).
- Improperly loaded magazine.
- Defective round (projectile forced back into the cartridge case, which could result in a stubbed round or the base of the previous cartridge could be separated, leaving the remainder in the chamber).
- Damaged or broken action spring.
- Exterior accumulation of dirt in the lower receiver extension.
- Fouled gas tube resulting in short recoil.

- A magazine resting on the ground or pushed forward could cause an improper lock.

(2) ***Corrective Action.*** Applying immediate action usually corrects the malfunction. To avoid the risk of further jamming, the firer should watch for ejection of a cartridge and ensure that the upper receiver is free of any loose rounds. If immediate action fails to clear the malfunction, remedial action must be taken. The carrier should not be forced. If resistance is encountered, which can occur with an unserviceable round, the bolt should be locked to the rear, the magazine removed, and the malfunction cleared. For example, a bolt override is when a cartridge has wedged itself between the bolt and charging handle. The best way to correct this problem is by—

- Ensuring the charging handle is pushed forward and locked in place.
- Securing the rifle and pulling the bolt to the rear until the bolt seats completely into the buffer well.
- Turning the rifle upright and allowing the overridden cartridge to fall out.

b. **Failure to Fire Cartridge.** This is a failure of a cartridge to fire despite the fact that a round has been chambered, the trigger pulled, and the sear released the hammer. This occurs when the firing pin fails to strike the primer with enough force or when the ammunition is defective.

(1) ***Probable Causes.*** Excessive carbon buildup on the firing pin (Figure 3-2, A) is often the cause, because the full forward travel of the firing pin is restricted. A defective or worn firing pin can give the same results. Inspection of the ammunition could reveal a shallow indentation or no mark on the primer, indicating a firing pin malfunction (Figure 3-2, B). Cartridges that show a normal indentation on the primer, but did not fire indicate faulty ammunition.

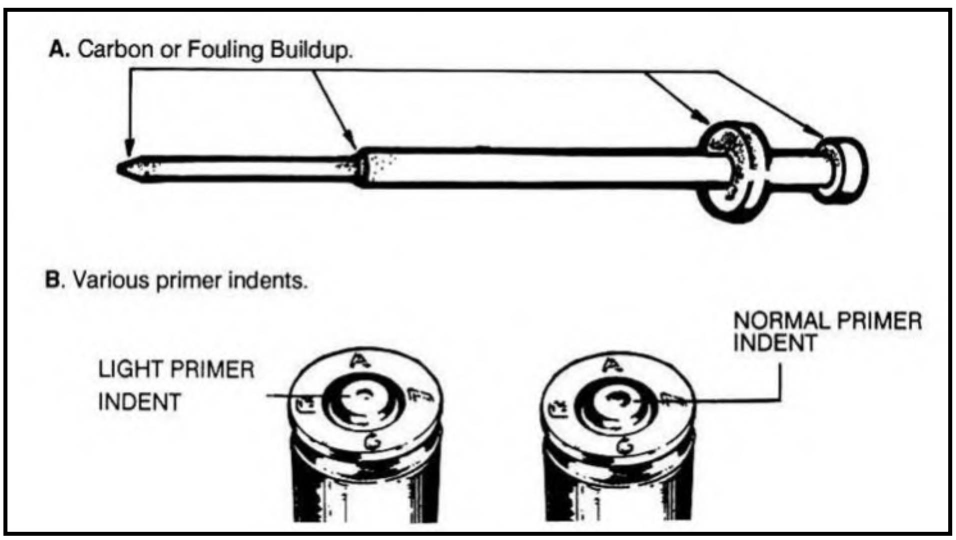

Figure 3-2. Failure to fire.

(2) ***Corrective Action.*** If the malfunction continues, the firing pin, bolt, carrier, and locking lug recesses of the barrel extension should be inspected, and any accumulation of excessive carbon or fouling should be removed. The firing pin should also be inspected for damage. Cartridges that show a normal indentation on the primer, but failed to fire could

indicate a bad ammunition lot. Those that show a complete penetration of the primer by the firing pin could also indicate failure of the cartridge to fully seat in the chamber.

NOTE: If the round is suspected to be faulty, it is reported and returned to the agency responsible for issuing ammunition.

WARNING

If an audible "POP" or reduced recoil occurs during firing, immediately cease-fire. This POP or reduced recoil could be the result of a round being fired without enough force to send the projectile out of the barrel. Do not apply immediate action. Remove the magazine, lock the bolt to the rear, and place the selector lever in the safe position. Visually inspect the bore to ensure a projectile is not lodged in the barrel. If a projectile is lodged in the barrel, do not try to remove it. Turn the rifle in to the armorer.

c. **Failure to Extract.** A failure to extract results when the cartridge case remains in the chamber of the rifle. While the bolt and bolt carrier could move rearward only a short distance, more commonly the bolt and bolt carrier recoil fully to the rear, leaving the cartridge case in the chamber. A live round is then forced into the base of the cartridge case as the bolt returns in the next feed cycle. This malfunction is one of the hardest to clear.

WARNING

A failure to extract is considered an extremely serious malfunction, requiring the use of tools to clear. A live round could be left in the chamber and accidentally discharged. If a second live round is fed into the primer of the chambered live round, the rifle could explode and cause personal injury. This malfunction must be properly identified and reported. Failures to eject should not be reported as extraction failures.

(1) ***Probable Cause***. Short recoil cycles and fouled or corroded rifle chambers are the most common causes of failures to extract. A damaged extractor or a weak or broken extractor spring can also cause this malfunction.

(2) ***Corrective Action***. The severity of a failure to extract determines the corrective action procedures. If the bolt has moved rearward far enough to strip a live round from the

magazine in its forward motion, the bolt and carrier must be locked to the rear. The magazine and all loose rounds must be removed before clearing the stoppage. Usually, tapping the butt of the rifle on a hard surface causes the cartridge to fall out of the chamber. However, if the cartridge case is ruptured, it can be seized. When this occurs, a cleaning rod can be inserted into the bore from the muzzle end. The cartridge case can be forced from the chamber by tapping the cleaning rod against the inside base of the fired cartridge. If cleaning and inspecting the mechanism and chamber reveals no defects but failures to extract persist, the extractor and extractor spring should be replaced. If the chamber surface is damaged, the entire barrel must be replaced.

d. **Failure to Eject.** Ejection of a cartridge is an element in the cycle of functioning of the rifle, regardless of the mode of fire. A malfunction occurs when the cartridge is not ejected through the ejection port and either remains partly in the chamber or becomes jammed in the upper receiver as the bolt closes. When the firer initially clears the rifle, the cartridge could strike an inside surface of the receiver and bounce back into the path of the bolt.

(1) ***Probable Cause***. The cartridge must extract before it can eject. Failures to eject can also be caused by a buildup of carbon or fouling on the ejector spring or extractor, or from short recoil. Short recoil is usually due to a buildup of fouling in the carrier mechanism or gas tube, which could result in many failures to include a failure to eject. Resistance caused by a carbon-coated or corroded chamber can impede the extraction, and then the ejection of a cartridge.

(2) ***Corrective Action***. While retraction of the charging handle usually frees the cartridge and permits removal, the charging handle must not be released until the position of the next live round is determined. If another live round has been sufficiently stripped from the magazine or remains in the chamber, then the magazine and all live rounds could also require removal before the charging handle can be released. If several malfunctions occur and are not corrected by cleaning and lubricating, the ejector spring, extractor spring, and extractor should be replaced.

e. **Other Malfunctions.** The following paragraphs describe some other malfunctions that can occur.

(1) The bolt fails to remain in a rearward position after the last round in the magazine is fired. Check for a bad magazine or short recoil.

(2) The bolt fails to lock in the rearward position when the bolt catch has been engaged. Check bolt catch; turn in to unit armorer.

(3) The weapon fires two or more rounds when the trigger is pulled and the selection lever is in the SEMI position. This indicates a worn sear, cam, or disconnector. Turn in to armorer to repair and replace trigger group parts as required.

(4) The trigger fails to pull or return after release with the selector set in a firing position. This indicates that the trigger pin (A, Figure 3-3, page 3-6) has backed out of the receiver or the hammer spring is broken. Turn in to armorer to replace or repair.

(5) The magazine fails to lock into the magazine well (B, Figure 3-3). Check the magazine and magazine catch for damage. Turn in to armorer to adjust the catch; replace as required.

(6) Any part of the bolt carrier group fails to function (C, Figure 3-3). Check for incorrect assembly of components. Correctly clean and assemble the bolt carrier group, or replace damaged parts.

(7) The ammunition fails to feed from the magazine (D, Figure 3-3). Check for damaged magazine. A damaged magazine could cause repeated feeding failures and should be turned in to the armorer or exchanged.

NOTE: Additional technical information on troubleshooting malfunctions and replacing components is contained in the organizational and direct support maintenance publications and manuals.

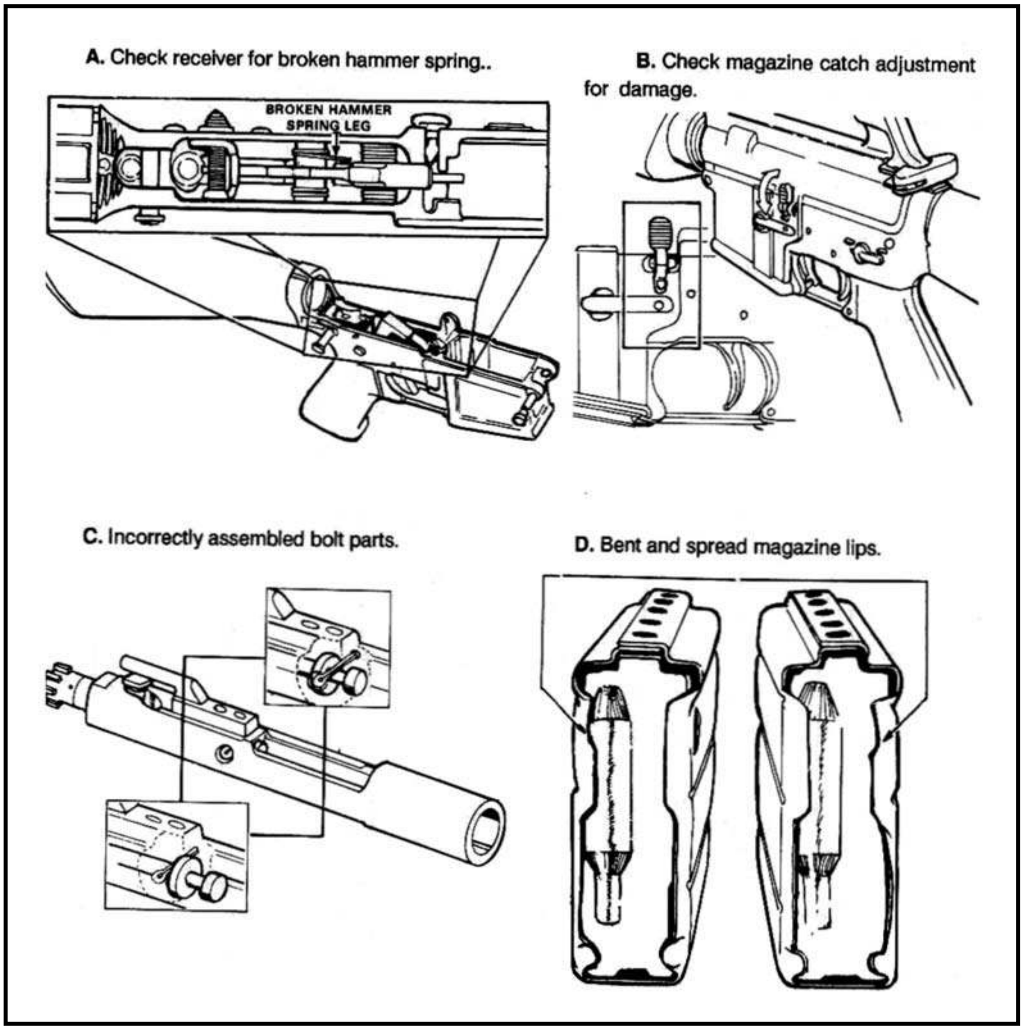

Figure 3-3. Other possible malfunctions.

3-3. DESTRUCTION PROCEDURES

Only on the authority of the unit commander, IAW orders or policies established by the Army, may rifles subject to capture or abandonment in the combat zone be destroyed. The destruction of equipment is reported through regular command channels.

a. **Means of Destruction.** Certain procedures outlined require the use of explosives and incendiary grenades. Issue of these and related principles and specific conditions under which destruction is effected, are command decisions. Of the several means of destruction, the following apply:

(1) ***Mechanical.*** Requires axe, pick mattock, sledgehammer, crowbar, or other heavy implement.

(2) ***Burning.*** Requires gasoline, oil, incendiary grenades, and other flammable materials, or welding or cutting torch.

(3) ***Demolition.*** Requires suitable explosives or ammunition. Under some circumstances, hand grenades can be used.

(4) ***Disposal.*** Requires burying in the ground, dumping in streams or marshes, or scattering so widely as to preclude recovery of essential parts.

NOTE: The same parts should be destroyed on all like materiel, including spare parts, so that the enemy cannot rebuild one complete unit from several damaged units. If destruction is directed, appropriate safety precautions must be observed.

b. **Field-Expedient Methods.** If destruction of the individual rifle must be performed to prevent enemy use, the rifle must be damaged so it cannot be restored to a usable condition. Expedient destruction requires that key operational parts be separated from the rifle or damaged beyond repair. Priority is given in the following order:

- **FIRST.** Bolt carrier group: removed and discarded or hidden.
- **SECOND.** Upper receiver group: separated and discarded or hidden.
- **THIRD.** Lower receiver group: separated and discarded or hidden.

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CHAPTER 4

PRELIMINARY MARKSMANSHIP INSTRUCTION (Phase I of Basic Rifle Marksmanship)

An infantryman's basic battlefield tool is his weapon. To effectively employ his weapon, marksmanship must be mastered from the basics of rifle marksmanship to the advanced stages of target engagement. This will greatly enhance the infantryman's capability to close with and destroy the enemy.

Understanding the operation and functions of any machine is vital to becoming an expert with that machine. The same theory applies to rifle marksmanship. Commanders must keep this in mind when setting up a training program. This chapter covers the mechanical training of the M16-/M4-series weapons. With this knowledge, a soldier is able to assess and correct any malfunction to keep the weapon always operating properly.

Section I. INTRODUCTION TO BASIC RIFLE MARKSMANSHIP AND MECHANICAL TRAINING

This training program (Figure 4-1) introduces the soldiers to BRM and teaches them how to maintain, operate, and correct malfunctions on an M16-/M4-series weapon. It also teaches peer coaching responsibilities and sight manipulation while emphasizing safety.

Introduction to Basic Rifle Marksmanship and Mechanical Training

Period 1 (4 hours)

Instructional Intent:

Introduce the soldiers to BRM and teach them how to maintain, operate and correct malfunctions on a M16-/M4-series weapon. Teach peer coaching responsibilities and sight manipulation while emphasizing safety.

Observables:

Soldiers can disassemble and assemble their weapon (refer to TM 9-1005-319-10).
Soldiers can identify all components of their weapon (refer to TM 9-1005-319-10).
Soldiers can maintain, load and unload their magazines (refer to TM 9-1005-319-10).
Soldiers can maintain, load, unload and clear their weapons (refer to TM 9-1005-319-10).
Soldiers can handle and identify 5.56-mm ammunition (refer to TM 9-1005-319-10).
Soldiers can perform SPORTS on their weapon within five seconds (TM 9-1005-319-10).
Soldiers understand the eight cycles of function and can troubleshoot their weapon IAW this manual.
Soldiers can perform a function check on their weapon (refer to TM 9-1005-319-10).
Soldiers can correctly manipulate their sights without assistance (refer to TM 9-1005-319-10).
Soldiers are emphasizing safety through out training (refer to TM 9-1005-319-10).
Soldiers are taught peer-coaching techniques and responsibilities IAW this manual.

Notes:
1. Care must be taken in teaching immediate action (SPORTS) to clear a weapon stoppage. This technique must not be confused with the procedure for correctly loading a magazine into the weapon due to the position of the bolt.
2. Soldiers who do not meet the standard will receive remedial training before subsequent instruction.

Figure 4-1. Introduction to basic rifle marksmanship and mechanical training.

*4-1. CLEARING

This paragraph explains the techniques and procedures for clearing the M16-/M4-series weapon (Figure 4-2). Additional mechanical training is available in TM 9-1005-319-10 to include disassembly, maintenance, assembly, loading, and sight manipulation.

WARNING

To be considered SAFE before disassembly, cleaning, inspecting, transporting, or storing, the weapon must be cleared.

NOTE: Get a buddy to witness and verify all steps of clearing procedures.

a. Point the muzzle in a designated SAFE DIRECTION. Attempt to place selector lever on SAFE. If weapon is not cocked, lever cannot be placed on SAFE.

b. Remove the magazine by depressing the magazine catch button and pulling the magazine down.

c. To lock bolt open, pull charging handle rearward. Press bottom of bolt catch and allow bolt to move forward until it engages bolt catch. Return charging handle to full forward position. If you have not done so before, place the selector lever on SAFE.

d. Visually (*not physically*) inspect the receiver and chamber to ensure these areas contain no ammo.

e. With the selector lever pointing toward SAFE, allow the bolt to go forward by pressing the upper portion of the bolt catch.

f. Place the selector lever on SEMI and squeeze the trigger.

g. Pull the charging handle fully rearward and release it, allowing the bolt to return to the full forward position.

h. Place the selector lever on SAFE.

i. Close the ejection port cover.

NOTE: If the rifle will not be fired, immediately close the ejection port cover.

4-2. CYCLES OF FUNCTIONING

The soldier must understand the rifle components and the mechanical sequence of events during the firing cycle. The eight cycles of functioning (feeding, chambering, locking, firing, unlocking, extracting, ejecting, and cocking) begin after the loaded magazine has been inserted in the weapon.

a. **Feeding** (Figure 4-3, page 4-4). As the bolt carrier group moves rearward, it engages the buffer assembly and compresses the action spring into the lower receiver extension. When the bolt carrier group clears the top of the magazine, the expansion of the magazine spring forces the follower and a new round up into the path of the forward movement of the bolt. The expansion of the action spring sends the buffer assembly and bolt carrier group forward with enough force to strip a new round from the magazine.

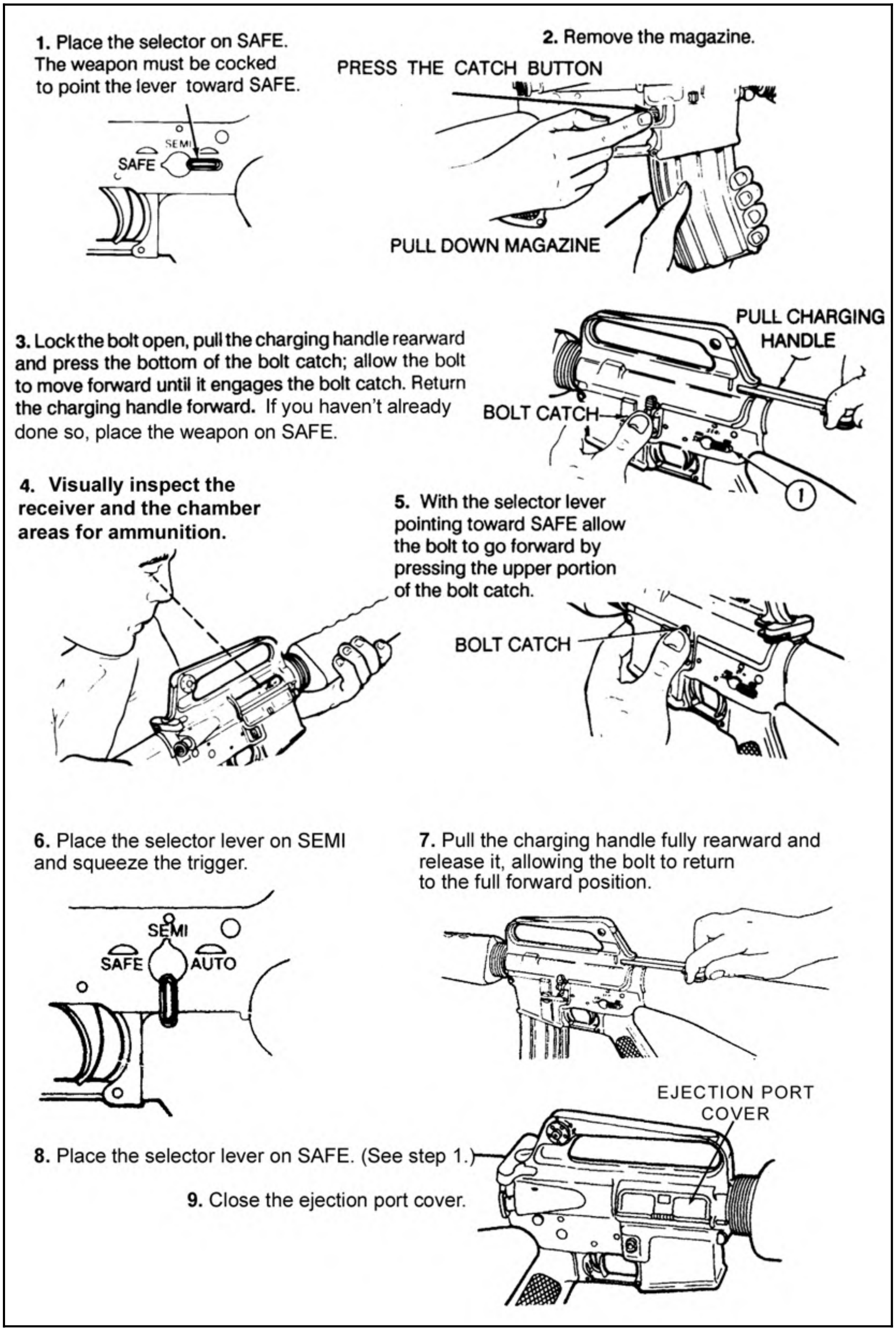

***Figure 4-2. Clearing.**

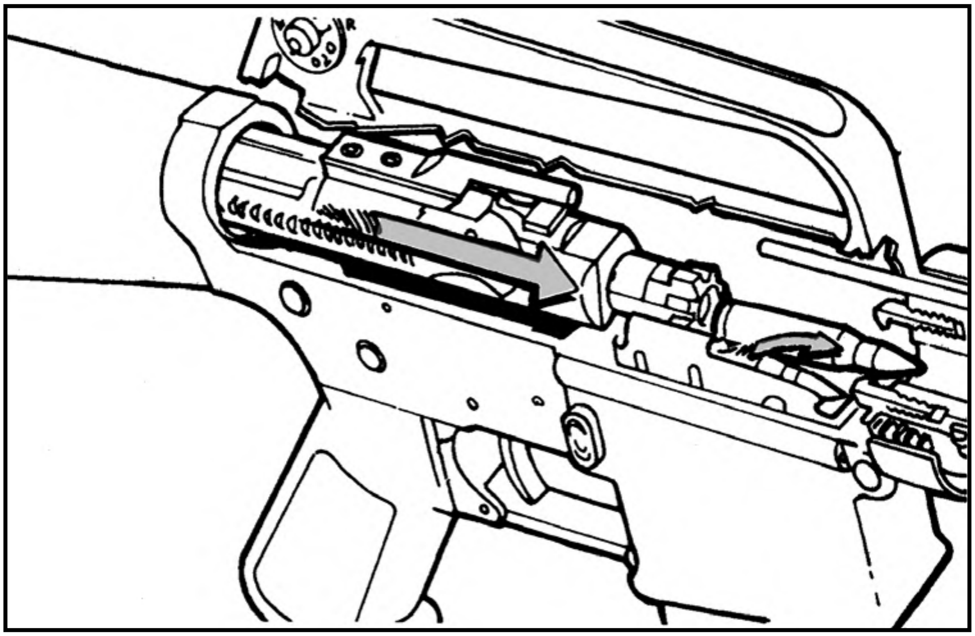

Figure 4-3. Feeding.

b. **Chambering** (Figure 4-4). As the bolt carrier group continues to move forward, the face of the bolt thrusts the new round into the chamber. At the same time, the extractor claw grips the rim of the cartridge, and the ejector is compressed.

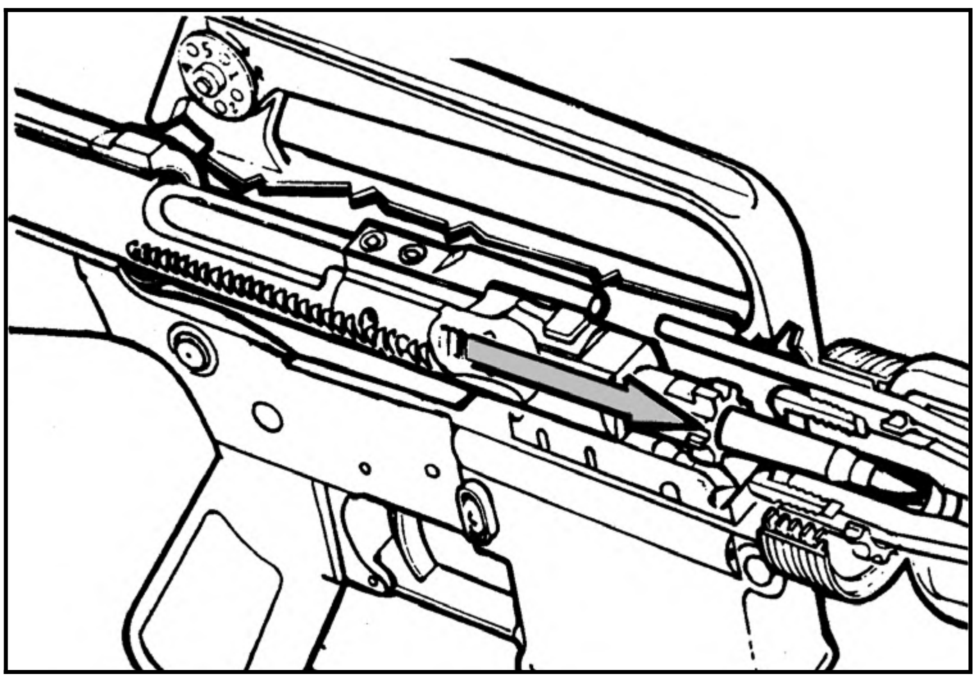

Figure 4-4. Chambering.

c. **Locking** (Figure 4-5). As the bolt carrier group moves forward, the bolt is kept in its most forward position by the bolt cam pin riding in the guide channel in the upper receiver. Just before the bolt locking lugs make contact with the barrel extension, the bolt cam pin emerges from the guide channel. The pressure exerted by the contact of the bolt locking lugs and barrel extension causes the bolt cam pin to move along the cam track (located in the bolt carrier) in a counterclockwise direction, rotating the bolt locking lugs in line behind the barrel extension locking lugs. The rifle is ready to fire.

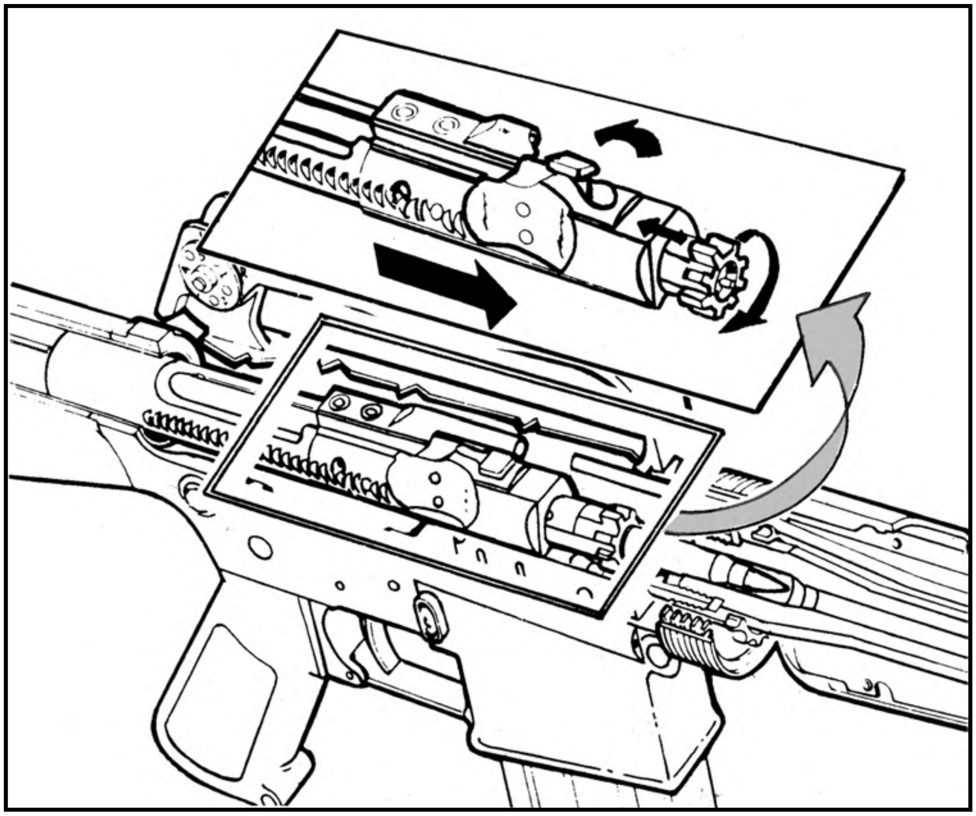

Figure 4-5. Locking.

d. **Firing** (Figure 4-6, page 4-6). With a round in the chamber, the hammer cocked, and the selector on SEMI, the firer squeezes the trigger. The trigger rotates on the trigger pin, depressing the nose of the trigger, and disengaging the notch on the bottom of the hammer. The hammer spring drives the hammer forward. The hammer strikes the head of the firing pin, driving the firing pin through the bolt into the primer of the round. When the primer is struck by the firing pin, it ignites and causes the powder in the cartridge to ignite. The gas generated by the rapid burning of the powder forces the projectile from the cartridge and propels it through the barrel. After the projectile has passed the gas port (located on the upper surface of the barrel under the front sight, Figure 4-5) and before it leaves the barrel, some gas enters the gas port and moves into the gas tube. The gas tube directs the gas into the bolt carrier. It passes through the key downward into a space between the rear of the carrier's bolt cavity and the rear of the bolt itself. The gas then expands. The bolt is locked into the barrel extension and unable to move forward, and the carrier is thus forced to the rear by the expanding gas.

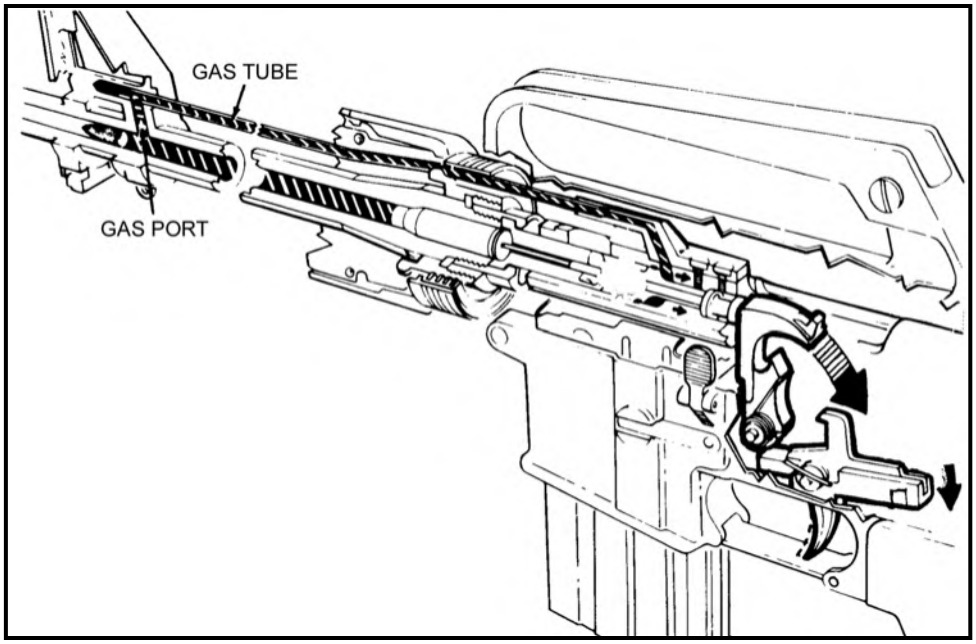

Figure 4-6. Firing.

e. **Unlocking** (Figure 4-7). As the bolt carrier moves to the rear, the bolt cam pin follows the path of the cam track (located in the bolt carrier). This action causes the cam pin and bolt assembly to rotate simultaneously until the locking lugs of the bolt are no longer in line behind the locking lugs of the barrel extension.

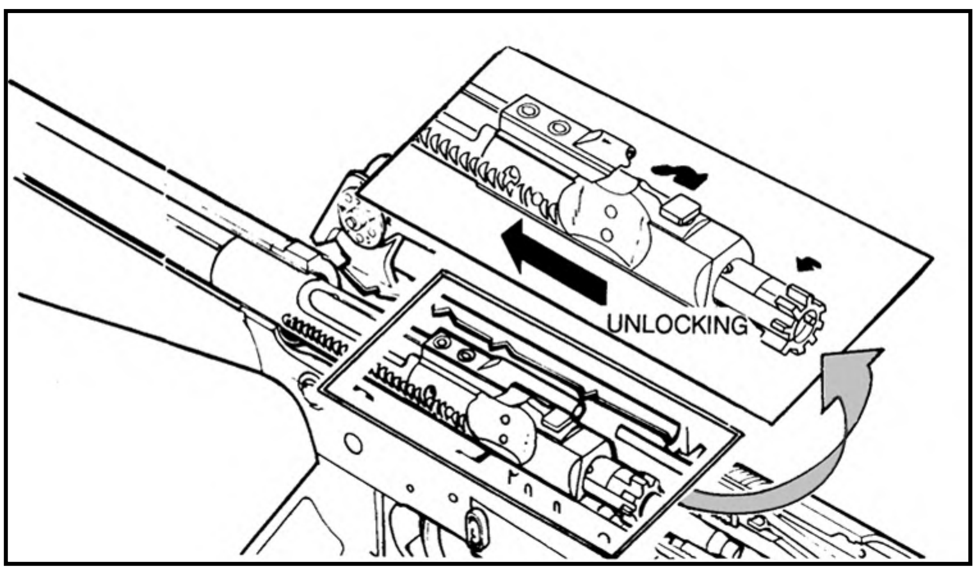

Figure 4-7. Unlocking.

f. **Extracting** (Figure 4-8). The bolt carrier group continues to move to the rear. The extractor (which is attached to the bolt) grips the rim of the cartridge case, holds it firmly against the face of the bolt, and withdraws the cartridge case from the chamber.

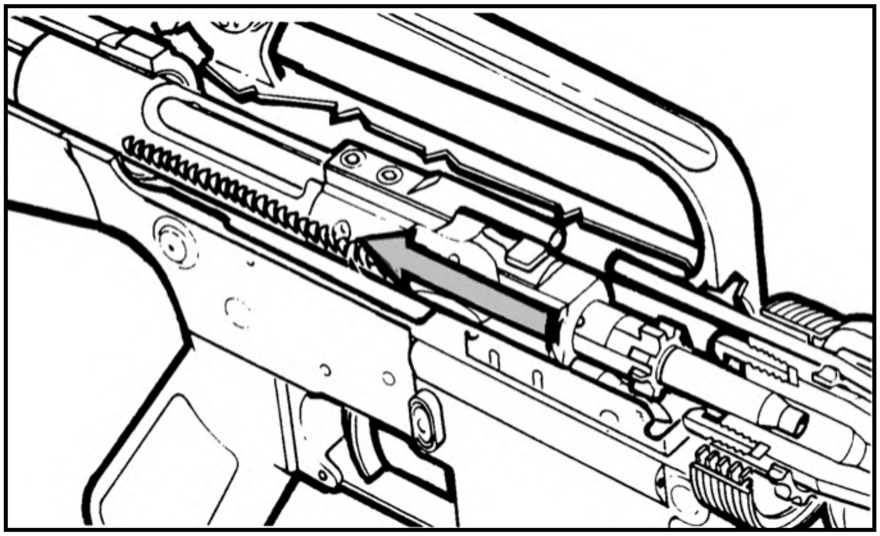

Figure 4-8. Extracting.

g. **Ejecting** (Figure 4-9). With the base of a cartridge case firmly against the face of the bolt, the ejector and ejector spring are compressed into the bolt body. As the rearward movement of the bolt carrier group allows the nose of the cartridge case to clear the front of the ejection port, the cartridge is pushed out by the action of the ejector and spring.

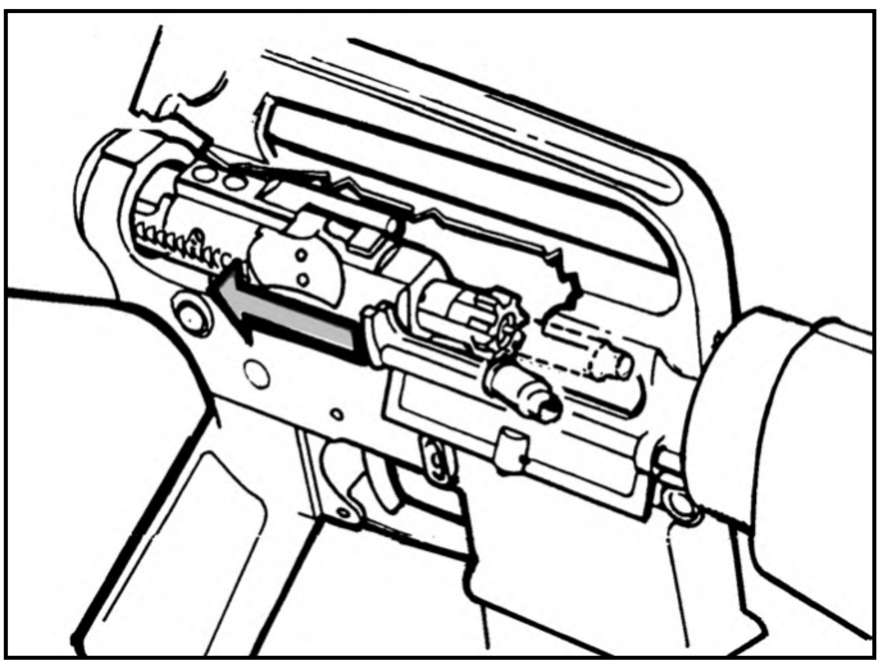

Figure 4-9. Ejecting.

h. **Cocking** (Figure 4-10). The rearward movement of the bolt carrier overrides the hammer, forcing it down into the receiver and compressing the hammer spring, cocking the hammer in the firing position. The action of the rifle is much faster than human reaction; therefore, the firer cannot release the trigger fast enough to prevent multiple firing.

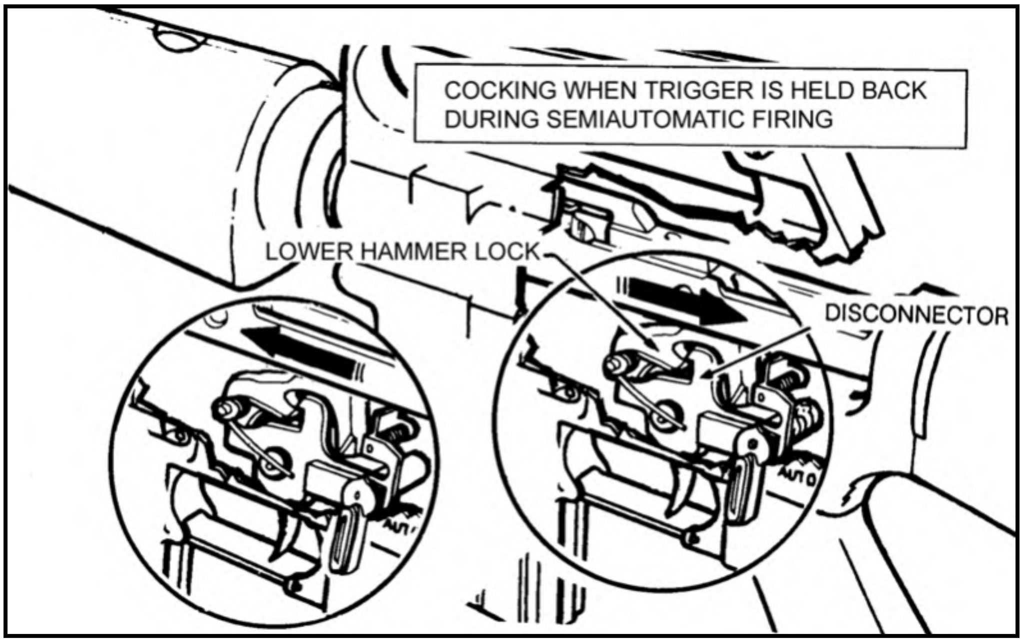

Figure 4-10. Cocking.

4-3. MODES OF FIRE

The M16A3 and M4A1 rifles function in either the semiautomatic or automatic mode. The M16A2, M16A4, and M4 carbine function in either the semiautomatic or three-round burst mode.

a. **Semiautomatic Fire Mode (M16-/M4-series).** The disconnector is a mechanism installed so the firer can fire single rounds. It is attached to the trigger and rotated forward by action of the disconnector spring. When the recoil of the bolt carrier cocks the hammer, the disconnector engages the lower hook of the hammer and holds it until the trigger is released. Then the disconnector rotates to the rear and down, disengaging the hammer and allowing it to rotate forward until caught by the nose of the trigger. This prevents the hammer from following the bolt carrier forward and causing multiple firing. The trigger must be squeezed again before the next round will fire.

b. **Automatic Fire Mode (M16A3 Rifle, M4A1 Carbine Only).** When the selector lever (Figure 4-11) is set on the AUTO position, the rifle continues to fire as long as the trigger is held back and ammunition is in the magazine. The functioning of certain parts of the rifle changes when firing automatically.

(1) Once the trigger is squeezed and the round is fired, the bolt carrier group moves to the rear and the hammer is cocked. The center cam of the selector depresses the rear of the disconnector and prevents the nose of the disconnector from engaging the lower hammer hook. The bottom part of the automatic sear catches the upper hammer hook and holds it

until the bolt carrier group moves forward. The bottom part strikes the top of the sear and releases the hammer, causing the rifle to fire automatically.

(2) If the trigger is released, the hammer moves forward and is caught by the nose of the trigger. This ends the automatic cycle of fire until the trigger is squeezed again.

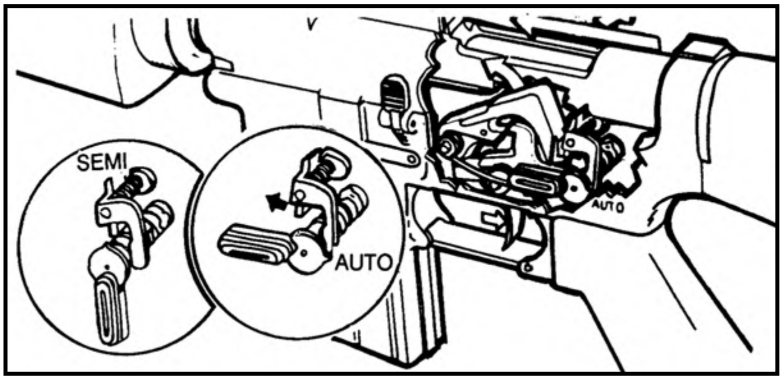

Figure 4-11. Automatic fire mode.

c. **Burst Fire Mode (M16A2/A4 Rifle, M4 Carbine).** When the selector lever is set on the BURST position (Figure 4-12), the rifle fires a three-round burst if the trigger is held to the rear during the complete cycle. The weapon continues to fire three-round bursts with each separate trigger pull as long as ammunition is in the magazine. Releasing the trigger or exhausting ammunition at any point in the three-round cycle interrupts fire, producing one or two shots. Reapplying the trigger only completes the interrupted cycle; it does not begin a new one. This is not a malfunction. The M16A2/4 and M4 disconnectors have a three-cam mechanism that continuously rotates with each firing cycle. Based on the position of the disconnector cam, the first trigger pull (after initial selection of the BURST position) can produce one, two, or three firing cycles before the trigger must be pulled again. The burst cam rotates until it reaches the stop notch.

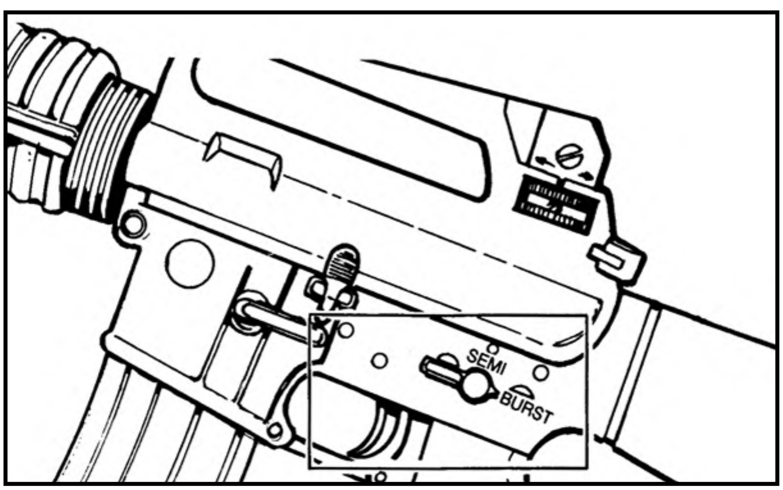

Figure 4-12. Burst fire mode.

4-4. PEER COACHING

Peer coaching is using two soldiers of equal firing proficiency and experience to assist (coach) each other during marksmanship training. Some problems exist with peer coaching. If the new soldier does not have adequate guidance, a "blind-leading-the-blind" situation results, which can lead to negative training and safety violations. However, when adequate instruction is provided, peer coaching can be helpful even in the IET environment. Since all soldiers in units have completed BRM, peer coaching should yield better results.

a. **Benefits.** The pairing of soldiers can enhance learning for both of them. The coach learns what to look for and what to check as he provides guidance to the firer. Communication between peers is different than communication between a soldier and drill sergeant or senior NCO. Peers have the chance to ask simple questions and to discuss areas that are not understood. Pairing soldiers who have demonstrated good firing proficiency with those who have firing problems can improve the performance of problem firers.

b. **Duties.** The peer coach assists the firer in obtaining a good position and in adjusting sandbags. He watches the firer not the target to see that the firer maintains a proper, relaxed, steady position; that he holds his breath before the final trigger squeeze; that he applies initial pressure to the trigger; and that no noticeable trigger jerk, flinch, eye blink, or other reaction can be observed in anticipation of the rifle firing. The peer coach can use a variety of training aids to assist in coaching the soldier. At other times, he could be required to observe the target area. For example, when field-fire targets are being engaged and the firer cannot see where he is missing targets. The peer coach can add to range safety procedures by helping safety personnel with preliminary rifle checks.

c. **Checklist for the Coach.** The procedures to determine and eliminate rifle and firer deficiencies follow.

(1) The coach checks to see that the—

- Rifle is cleared and defective parts have been replaced.
- Ammunition is clean, and the magazine is properly placed in the pouch.
- Sights are blackened and set correctly for long or short range.

(2) The coach observes the firer to see if he—

- Uses the correct position and properly applies the steady-position elements.
- Properly loads the rifle.
- Obtains the correct sight alignment (with the aid of an M16 sighting device).
- Holds his breath correctly (by watching his back at times).
- Applies proper trigger squeeze; determines whether he flinches or jerks by watching his head, shoulders, trigger finger, and firing hand and arm.
- Is tense and nervous. If the firer is nervous, the coach has the firer breath deeply several times to relax.

(3) Supervisory personnel and peer coaches correct errors as they are detected. If many common errors are observed, it is appropriate to call the group together for more discussion and demonstration of proper procedures and to provide feedback.

d. **Position of the Coach.** The coach constantly checks and assists the firer in applying marksmanship fundamentals during firing. He observes the firer's position and his application of the steady position elements. The coach is valuable in checking factors the firer is unable to observe for himself and in preventing the firer from repeating errors.

(1) During an exercise, the coach should be positioned where he can best observe the firer when he assumes position. He then moves to various points around the firer (sides and rear) to check the correctness of the firer's position. The coach requires the firer to make adjustments until the firer obtains a correct position.

(2) When the coach is satisfied with the firing position, he assumes a coaching position alongside the firer. The coach usually assumes a position like that of the firer (Figure 4-13), which is on the firing side of the firer.

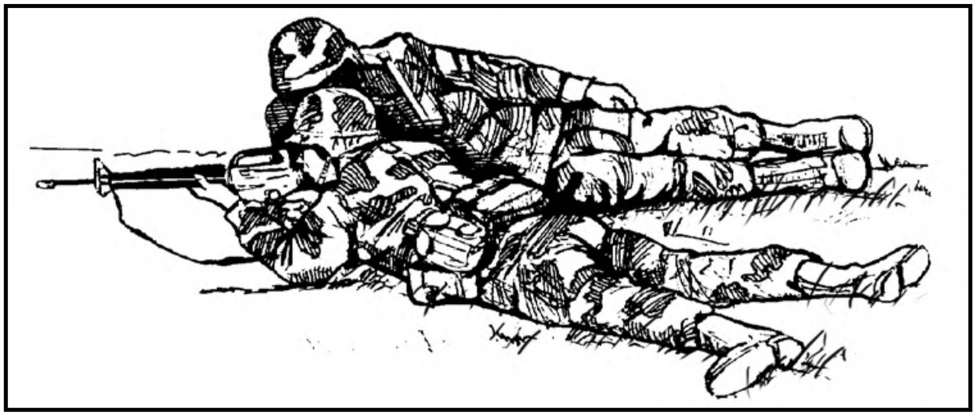

Figure 4-13. Prone position of coach (right-handed firer).

NOTE: Bending one knee is optional in this position (soldier's preference).

Section II. MARKSMANSHIP FUNDAMENTALS I

This training program (Figure 4-14 and Figure 4-15, page 4-12) reinforces BRM and trains the four fundamentals through dry-firing to standard during circuit training. It teaches range and safety procedures.

Marksmanship Fundamentals I
Period 2 (8 hours)
Instructional Intent:
Reinforce BRM 1 and train the four fundamentals, with hands-on training, through dry firing to standard during circuit training with an M16-/M4-series weapon. Teach range and safety procedures.
Observables:
Live-fire range procedures replicated and enforced. (IAW local SOP)
Equipment fitted properly to maximize training. (IAW local SOP)
Ensure all dry firing is well-aimed fire using 25m zero targets.
Ensure peer coaching is being emphasized IAW this manual.
Ensure the four fundamentals are being integrated into all exercises IAW this manual.

Figure 4-14. Marksmanship Fundamentals I training program.

Tasks:
The four fundamentals IAW with this manual.
Basic firing positions IAW with this manual.
Range and safety procedures IAW with local standard operating procedures.
Dominant eye training. IAW with this manual.
Demonstrate the integrated act of shooting during dry fire exercises.
M15A1 aiming card 6 consecutive alignments. (3 using side alignment and 3 using bottom up alignment.)
Target box and paddle exercise at 25 meters. (6 consecutive within a 2-cm circle)
Modified dime or washer exercise. (6 consecutive from prone and foxhole)

Notes: 1. Additional training aids are listed in Appendix A of this manual.
2. Soldiers who do not meet the standard will receive remedial training on the fundamentals of rifle marksmanship before subsequent instruction.

Figure 4-15. Marksmanship Fundamentals I training program (continued).

4-5. THE FOUR FUNDAMENTALS

The soldier must understand and apply the four key fundamentals before he approaches the firing line. He must establish a steady position allowing observation of the target. He must aim the rifle at the target by aligning the sight system, and fire the rifle without disturbing this alignment by improper breathing or during trigger squeeze. These skills are known collectively as the four fundamentals. Applying these four fundamentals rapidly and consistently is the integrated act of firing.

a. **Steady Position.** When the soldier approaches the firing line, he should assume a comfortable, steady firing position. The time and supervision each soldier has on the firing line are limited. He must learn how to establish a steady position during integrated act of dry-fire training (Figure 4-16). The firer is the best judge of the quality of his position. If he can hold the front sight post steady through the fall of the hammer, he has a good position. The steady position elements are as follows.

(1) ***Nonfiring Handgrip***. The rifle hand guard rests on the heel of the hand in the V formed by the thumb and fingers. The grip of the non-firing hand is light.

(2) ***Rifle Butt Position***. The butt of the rifle is placed in the pocket of the firing shoulder. This reduces the effect of recoil and helps ensure a steady position.

(3) ***Firing Handgrip***. The firing hand grasps the pistol grip so it fits the V formed by the thumb and forefinger. The forefinger is placed on the trigger so the lay of the rifle is not disturbed when the trigger is squeezed. A slight rearward pressure is exerted by the remaining three fingers to ensure that the butt of the stock remains in the pocket of the shoulder, minimizing the effect of recoil.

(4) ***Firing Elbow Placement.*** The firing elbow is important in providing balance. Its exact location depends on the firing/fighting position used. Placement should allow shoulders to remain level.

(5) ***Nonfiring Elbow***. The non-firing elbow is positioned firmly under the rifle to allow a comfortable and stable position. When the soldier engages a wide sector of fire, moving targets, and targets at various elevations, his non-firing elbow should remain free from support.

(6) ***Cheek-to-Stock Weld***. The stock weld should provide a natural line of sight through the center of the rear sight aperture to the front sight post and on to the target. The firer's

neck should be relaxed, allowing his cheek to fall naturally onto the stock. Through dry-fire training, the soldier practices this position until he assumes the same cheek-to-stock weld each time he assumes a given position, which provides consistency in aiming. Proper eye relief is obtained when a soldier establishes a good cheek-to-stock weld. A small change in eye relief normally occurs each time that the firer assumes a different firing position. The soldier should begin by trying to touch the charging handle with his nose when assuming a firing position. This will aid the soldier in maintaining the same cheek-to-stock weld hold each time the weapon is aimed. The soldier should be mindful of how the nose touches the charging handle and should be consistent when doing so. This should be critiqued and reinforced during dry-fire training.

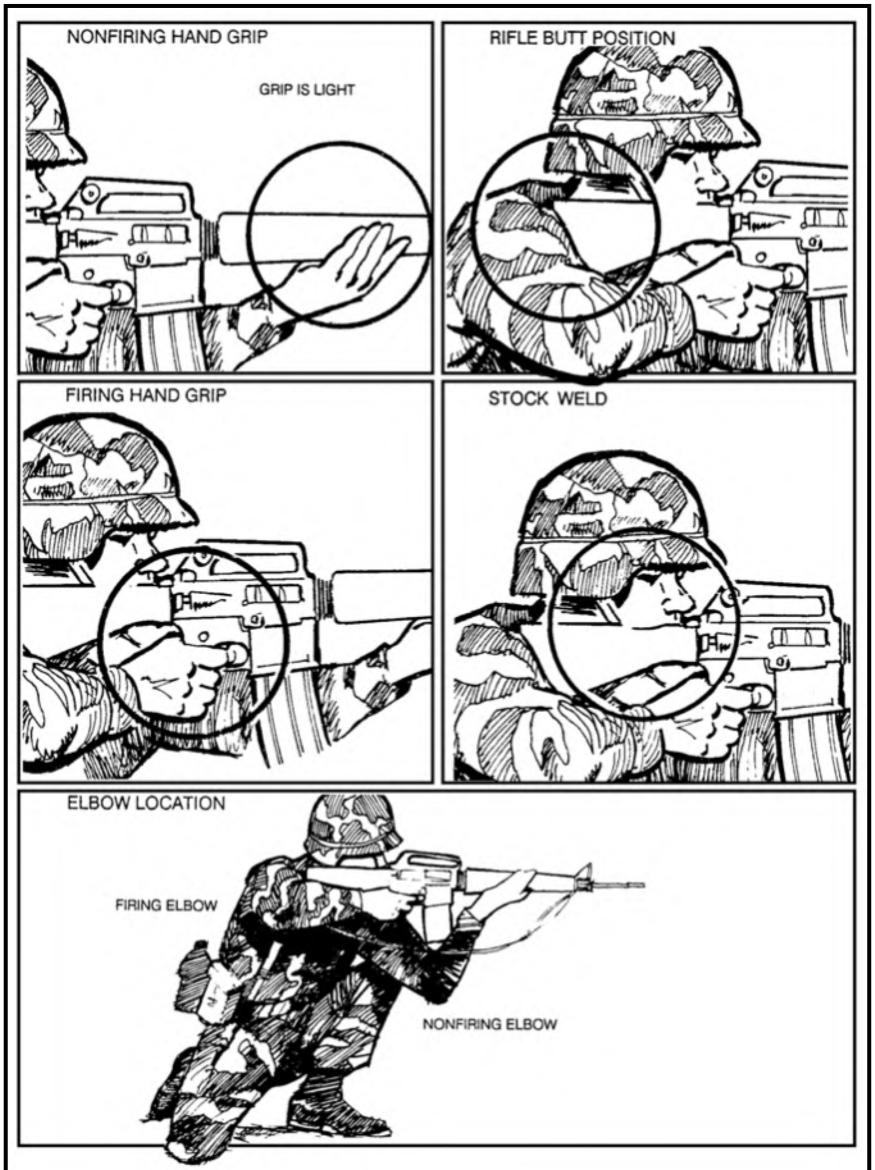

Figure 4-16. Steady position.

(7) ***Support***. When artificial support (sandbags, logs, stumps) is available, it should be used to steady the position and support the rifle. If it is not available, then the bones, not the muscles, in the firer's upper body must support the rifle.

(8) ***Muscle Relaxation***. If support is used properly, the soldier should be able to relax most of his muscles. Using artificial support or bones in the upper body as support allows him to relax and settle into position. Using muscles to support the rifle can cause it to move due to muscle fatigue.

(9) ***Natural Point of Aim***. When the soldier first assumes his firing position, he orients his rifle in the general direction of his target. Then he adjusts his body to bring the rifle and sights exactly in line with the desired aiming point. When using proper support and consistent cheek to stock weld the soldier should have his rifle and sights aligned naturally on the target. When correct body-rifle-target alignment is achieved, the front sight post must be held on target, using muscular support and effort. As the rifle fires, muscles tend to relax, causing the front sight to move away from the target toward the natural point of aim. Adjusting this point to the desired point of aim eliminates this movement. When multiple target exposures are expected (or a sector of fire must be covered), the soldier adjusts his natural point of aim to the center of the expected target exposure area (or center of sector).

b. **Aiming.** Having mastered the task of holding the rifle steady, the soldier must align the rifle with the target in exactly the same way for each firing. The firer is the final judge as to where his eye is focused. The instructor or trainer emphasizes this point by having the firer focus on the target and then focus back on the front sight post. He checks the position of the firing eye to ensure it is in line with the rear sight aperture.

(1) ***Rifle Sight Alignment***. Alignment of the rifle with the target is critical. It involves placing the tip of the front sight post in the center of the rear sight aperture (Figure 4-17). Any alignment error between the front and rear sights repeats itself for every 1/2 meter the bullet travels. For example, at the 25-meter line, any error in rifle alignment is multiplied 50 times. If the bullet is misaligned by 1/10 inch, it causes a target at 300 meters to be missed by 5 feet.

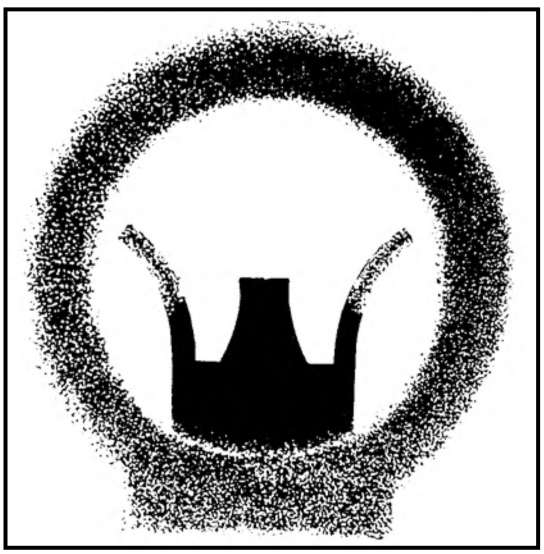

Figure 4-17. Correct sight alignment.

(2) ***Focus of the Eye***. A proper firing position places the eye directly in line with the center of the rear sight aperture. When the eye is focused on the front sight post, the natural ability of the eye to center objects in a circle and to seek the point of greatest light (center of the aperture) aid in providing correct sight alignment. For the average soldier firing at

combat-type targets, the natural ability of the eye can accurately align the sights. Therefore, the firer can place the tip of the front sight post on the aiming point, but the eye must be focused on the tip of the front sight post. This causes the target to appear blurry, while the front sight post is seen clearly. Two reasons for focusing on the front sight post are:

(a) Only a minor aiming error should occur since the error reflects only as much as the soldier fails to determine the target center. A greater aiming error can result if the front sight post is blurry due to focusing on the target or other objects.

(b) Focusing on the tip of the front sight post aids the firer in maintaining proper sight alignment (Figure 4-18).

(3) ***Sight Picture.*** Once the soldier can correctly align his sights, he can obtain a sight picture. A correct sight picture has the target, front sight post, and rear sight aligned. The sight picture includes two basic elements: sight alignment and placement of the aiming point.

(a) Placement of the aiming point varies, depending on the engagement range. For example, Figure 4-18 shows a silhouette at 300 meters where the aiming point is the center of mass, and the sights are aligned for a correct sight picture.

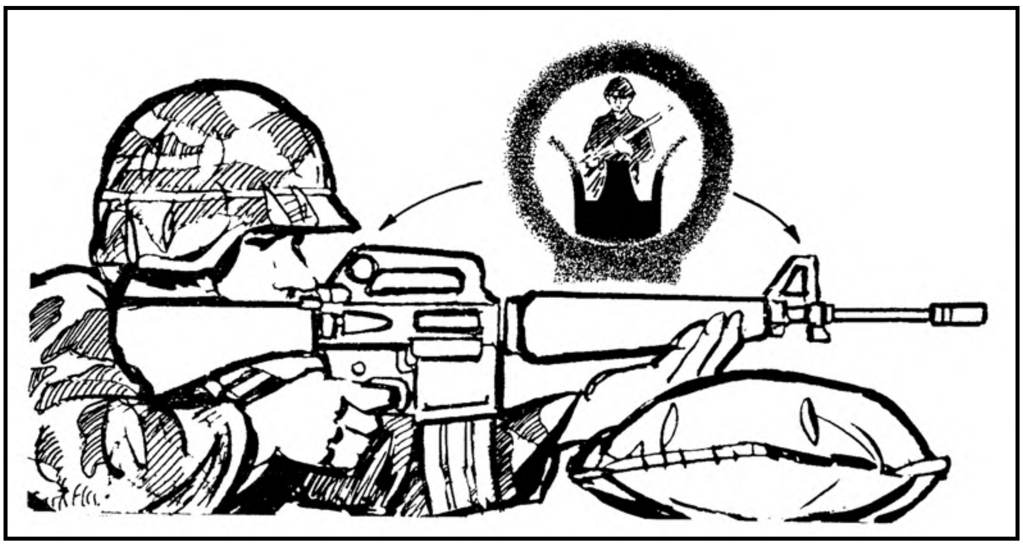

Figure 4-18. Correct sight picture.

(b) A technique to obtain a good sight picture is the side aiming technique (Figure 4-19, page 4-16). It involves positioning the front sight post to the side of the target in line with the vertical center of mass, keeping the sights aligned. The front sight post is moved horizontally until the target is directly centered on the front sight post.

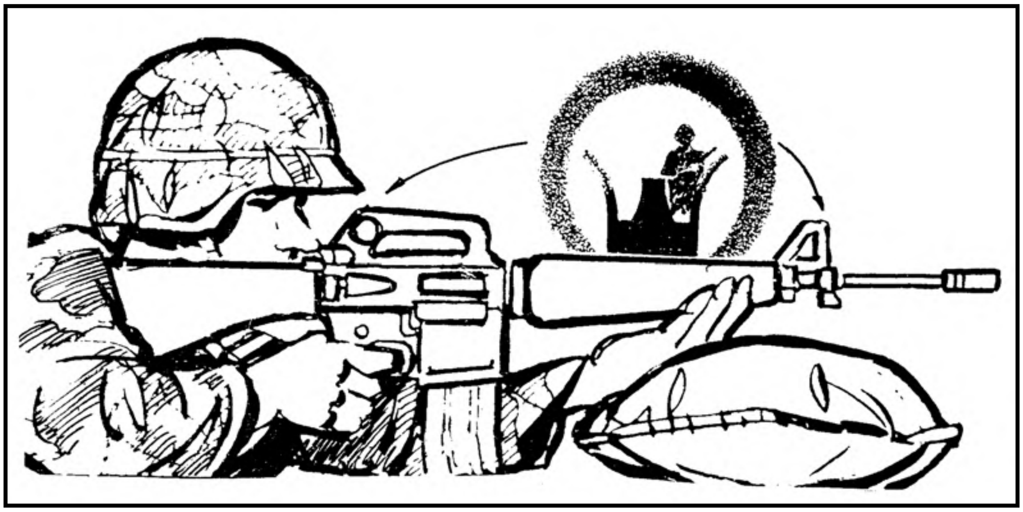

Figure 4-19. Side aiming technique.

(4) ***Front Sight***. The front sight post is vital to proper firing and should be replaced when damaged. The post should be blackened anytime it is shiny since precise focusing on the tip of the front sight post cannot be done otherwise.

(5) ***Aiming Practice***. Aiming practice is conducted before firing live rounds. During day firing, the soldier should practice sight alignment and placement of the aiming point. Using training aids such as the M15A1 aiming card can do this.

c. **Breath Control.** As the firer's skills improve and as timed or multiple targets are presented, he must learn to control his breath at any part of the breathing cycle. Two types of breath control techniques are practiced during dry fire. The coach/trainer ensures that the firer uses two breathing techniques and understands them by instructing him to exaggerate his breathing. The firer must be aware of the rifle's movement (while sighted on a target) as a result of breathing.

(1) The first technique is used during zeroing (and when time is available to fire a shot) (Figure 4-20). There is a moment of natural respiratory pause while breathing when most of the air has been exhaled from the lungs and before inhaling. Breathing should stop after most of the air has been exhaled during the normal breathing cycle. The shot must be fired before the soldier feels any discomfort.

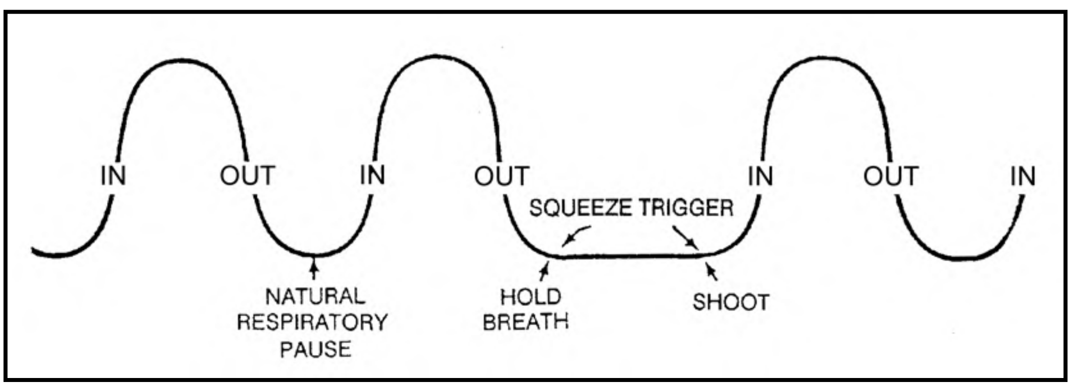

Figure 4-20. Breath control for engaging single targets.

(2) The second breath control technique is employed during rapid fire (short-exposure targets) (Figure 4-21). Using this technique, the soldier stops his breath when he is about to squeeze the trigger.

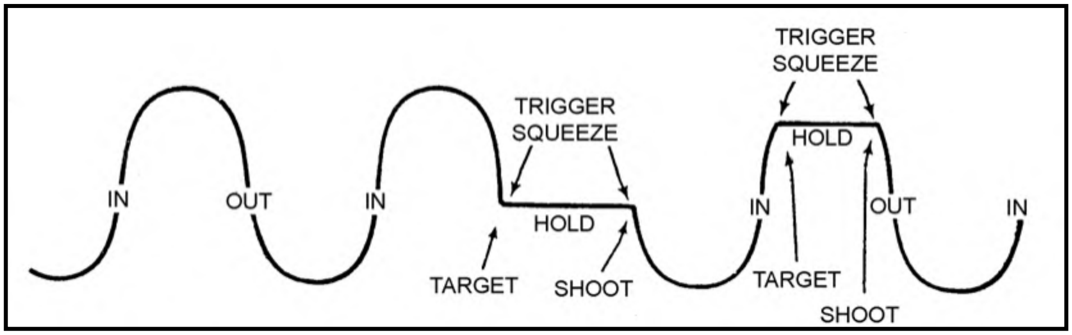

Figure 4-21. Breath control while engagement of short-exposure targets.

d. **Trigger Squeeze.** A novice firer can learn to place the rifle in a steady position and to correctly aim at the target if he follows the basic principles. If the trigger is not properly squeezed, the rifle will be misaligned with the target at the moment of firing.

(1) ***Rifle Movement***. Trigger squeeze is important for two reasons: First, any sudden movement of the finger on the trigger can disturb the lay of the rifle and cause the shot to miss the target. Second, the precise instant of firing should be a surprise to the soldier. The soldier's natural reflex to compensate for the noise and slight punch in the shoulder can cause him to miss the target if he knows the exact instant the rifle will fire. The soldier usually tenses his shoulders when expecting the rifle to fire. It is difficult to detect since he does not realize he is flinching. When the hammer drops on a dummy round and does not fire, the soldier's natural reflexes demonstrate that he is improperly squeezing the trigger.

(2) ***Trigger Finger***. The trigger finger (index finger on the firing hand) is placed on the trigger between the first joint and the tip of the finger (not the extreme end) and adjusted depending on hand size, grip, and so on. The trigger finger must squeeze the trigger to the rear so the hammer falls without disturbing the lay of the rifle. When a live round is fired, it is difficult to see what effect trigger pull had on the lay of the rifle. It is important to experiment with many finger positions during dry-fire training to ensure the hammer is falling with little disturbance to the aiming process.

(a) As the firer's skills increase with practice, he needs less time spent on trigger squeeze. Novice firers can take five seconds to perform an adequate trigger squeeze, but, as skills improve, he can squeeze the trigger in a second or less. The proper trigger squeeze should start with slight pressure on the trigger during the initial aiming process. The firer applies more pressure after the front sight post is steady on the target and he is holding his breath.

(b) The coach/trainer observes the trigger squeeze, emphasizes the correct procedure, and checks the firer's applied pressure. He places his finger on the trigger and has the firer squeeze the trigger by applying pressure to the coach/trainer's finger. The coach/trainer ensures that the firer squeezes straight to the rear on the trigger avoiding a left or right twisting movement. The coach/trainer observes that the firer follows through and holds the trigger to the rear for approximately one second after the round has been fired. A steady position reduces disturbance of the rifle during trigger squeeze.

(c) Wobble area is the movement of the front sight around the aiming point when the rifle is in the steadiest position. From an unsupported position, the firer experiences a greater wobble area than from a supported position. If the front sight strays from the target during the firing process, pressure on the trigger should be held constant and resumed as soon as sighting is corrected. The position must provide for the smallest possible wobble area. From a supported position, there should be minimal wobble area and little reason to detect movement. If movement of the rifle causes the front sight to leave the target, more practice is needed. The firer should never try to quickly squeeze the trigger while the sight is on the target. The best firing performance results when the trigger is squeezed continuously, and the rifle is fired without disturbing its lay.

4-6. FIRING POSITIONS

During preliminary marksmanship instruction only the basic firing positions are taught. The other positions are added later in training to support tactical conditions. The two firing positions used during initial training are the individual foxhole supported firing position and the basic prone unsupported firing position. Both offer a stable platform for firing the rifle. They are also the positions used during basic record fire.

a. **Individual Foxhole Supported Firing Position.** This position provides the most stable platform for engaging targets (Figure 4-22). Upon entering the position, the soldier adds or removes dirt, sandbags, or other supports to adjust for his height. He then faces the target, executes a half-face to his firing side, and leans forward until his chest is against the firing-hand corner of the position. He places the rifle hand guard in a V formed by the thumb and fingers of his nonfiring hand, and rests the nonfiring hand on the material (sandbags or berm) to the front of the position. The soldier places the butt of the weapon in the pocket of his firing shoulder and rests his firing elbow on the ground outside the position. (When prepared positions are not available, the prone supported position can be substituted.) Once the individual supported fighting position has been mastered, the firer should practice various unsupported positions to obtain the smallest possible wobble area during final aiming and hammer fall. The coach-trainer can check the steadiness of the position by observing movement at the forward part of the rifle, by looking through the Ml6 sighting device, or by checking to see support is being used.

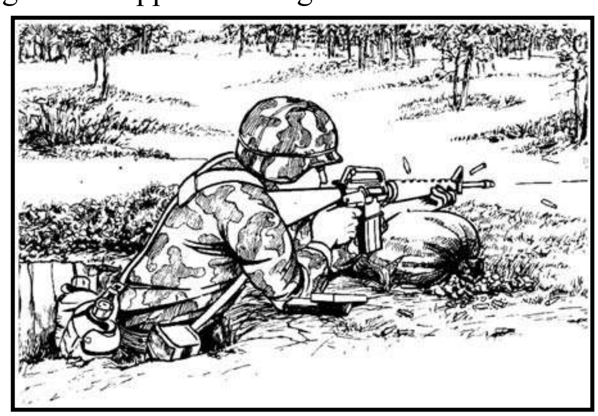

Figure 4-22. Individual foxhole supported firing position.

NOTE: The objective is to establish a steady position under various conditions. The ultimate performance of this task is combat. Although the firer must be positioned high enough to observe all targets, he must remain as low as possible to provide added protection from enemy fire.

b. **Basic Prone Unsupported Firing Position.** This firing position (Figure 4-23) offers another stable firing platform for engaging targets. To assume this position, the soldier faces his target, spreads his feet a comfortable distance apart, and drops to his knees. Using the butt of the rifle as a pivot, the firer rolls onto his nonfiring side, placing the nonfiring elbow close to the side of the magazine. He places the rifle butt in the pocket formed by the firing shoulder, grasps the pistol grip with his firing hand, and lowers the firing elbow to the ground. The rifle rests in the V formed by the thumb and fingers of the non-firing hand. The soldier adjusts the position of his firing elbow until his shoulders are about level, and pulls back firmly on the rifle with both hands. To complete the position, he obtains a stock weld and relaxes, keeping his heels close to the ground.

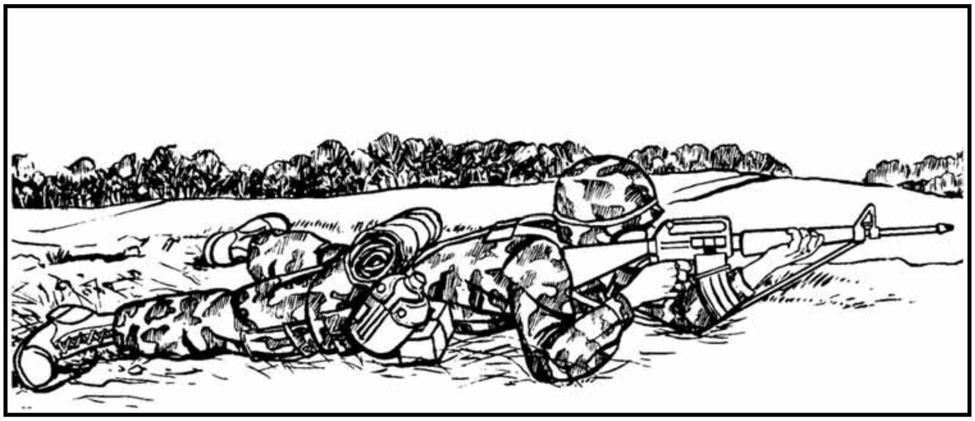

Figure 4-23. Basic prone unsupported firing position.

*4-7. PROPER WEAR AND FIT OF INTERCEPTOR BODY ARMOR

The new BRM strategy includes the wearing of Interceptor body armor (IBA) minus the throat, collar, and groin attachments during all BRM periods and concurrent training. Though the conditions have changed, marksmanship fundamentals remain unchanged. Improper wear and fit of IBA impedes a soldier's marksmanship ability. Prior to BRM training, use an IBA immersion approach so the soldier can adapt to weight and movement restrictions. Incrementally introduce the outer tactical vest (OTV) and front/back small arms protective insert (SAPI) plates for an easier weight transition. While the natural "pocket of the shoulder" is covered by the OTV, the buttstock is still placed where the "pocket" would be.

* a. **Quantity and Sizing.** Have adequate IBA quantities (Figure 4-24, page 4-20) on hand for all soldiers during IBA immersion. Make a conscious effort to size IBA to the soldier by conducting deliberate fit procedures to reduce or eliminate fit and size problems. Ensure that the SAPI size corresponds to the OTV. Also make sure nothing else is in the OTV/SAPI compartment.

***Figure 4-24. Interceptor body armor.**

* b. **Wear of Helmets.** When in the prone position the back plate in IBA tends to shove the personnel armor system for ground troops (PASGT) helmet over soldiers' eyes. To minimize as much as possible the PASGT helmet positioning problem, always make sure it is properly sized and fitted. Excessive hair between the IBA and helmet further forces the helmet down over the shooter's eyes. Encourage female soldiers to wear a short (chin length) haircut or cornrow hairstyle. A hair bun adds more material between the IBA rear SAPI and PASGT helmet. If short hair is not a female soldier's prerogative, allow her hair to be worn down when firing. This allows soldiers to establish a foundation in firing with IBA before adding additional body armor components. Tightening the suspension harness and sweat band (raising the helmet higher in the head) can lessen interference with the IBA, hair, and helmet. The Army combat helmet (ACH) is lighter, has better weight distribution, and contains less material that can impede a soldier's prone position firing vision than is contained in the PASGT helmet. The ACH does not interfere with the IBA and block a soldier's vision while in the prone position.

* c. **Tactics, Techniques, and Procedures.** To increase comfort and increase stability while wearing IBA in the prone position, sand or dirt should be scooped underneath the chest while preparing to fire. To alleviate pain and pressure on elbows and knees the added weight of IBA causes, elbow and knee pads can be used. If used in the kneeling position, the elbow pad should not rest on the knee pad; hard plastic on hard plastic is not conducive to a steady position. To help with stability while firing in the kneeling position, pinch and squeeze the rifle buttstock between the SAPI plate and bicep. Loosen the firing side straps and tighten the nonfiring side straps to shift the SAPI away from the firing side. Attaching canteens, ammunition pouches, or first aid pouches directly to IBA (instead of using load bearing equipment [LBE]) can minimize interference with LBE shoulder straps, IBA, and helmet. Reserve IBA firing with throat, collar, or groin protectors for advanced rifle marksmanship (ARM). Shorter stature soldiers may have to increase their body-line to rifle-axis-angle to more of an "L" shape so they can position themselves comfortably (physically reach the hand guards). Soldiers should be in a comfortable firing position to leverage the natural point of aim. The more the target and rifle are naturally in line, while in a relaxed position the less movement is needed to acquire a proper sight picture.

***4-8. FIRING POSITIONS WITH INTERCEPTOR BODY ARMOR**

While the natural "pocket of the soldier" is covered by the OTV, the buttstock is still placed where the "pocket" would be.

* a. **Prone Supported Firing Position.** To assume the prone supported firing position, the soldier faces his target and drops to the ground, breaking his fall with the butt of the weapon (Figure 4-25). Legs are spread apart with the firing leg bent to relieve pressure on the lower body. The prone supported firing position uses sandbags or any other suitable object to support the handguard. The nonfiring hand in this position remains free for use on any part of the rifle. Both elbows are placed on the ground to support the upper body. The firing hand is placed on the pistol grip; the nonfiring hand is placed on the upper handguard. Elbow and knee pads can be worn to relieve IBA induced pain and pressure in these areas. The butt of the weapon should be placed between the SAPI plate and bicep to help stabilize the weapon and absorb recoil.

***Figure 4-25. Prone supported firing position.**

* b. **Prone Unsupported Firing Position.** To assume the prone unsupported firing position, the soldier faces his target and drops to the ground, breaking his fall with the butt of the weapon. Legs are spread apart with the firing leg bent to relieve pressure on the lower back (Figure 4-26). Both elbows are placed on the ground to support the upper body. The firing hand is placed on the pistol grip; the nonfiring hand is placed on the upper handguard. Elbow and knee pads can be worn to relieve pressure and IBA induced pain in these areas. The butt of the weapon should be placed between the SAPI plate and bicep to help stabilize the weapon and absorb recoil.

***Figure 4-26. Prone unsupported firing position.**

* c. **Kneeling Unsupported Firing Position.** To assume the kneeling firing position, the soldier keeps his left foot in place, steps back with the right foot, then drops to the right knee (Figure 4-27). He places the left nonfiring hand on the upper handguard with the upper arm (triceps) on the left knee for support. The right firing hand is placed on the pistol grip with the butt of the weapon between the SAPI plate and bicep to help stabilize the weapon and absorb recoil. The ball of the right foot should rest firmly on the ground so the soldier can sit back with his buttock on the heel. Relaxing and leaning forward into the position can help absorb recoil. The butt of the weapon should be placed between the SAPI plate and bicep to help stabilize the weapon and absorb recoil.

***Figure 4-27. Kneeling unsupported firing position.**

* d. **Standing Unsupported Firing Position.** To assume the standing unsupported firing position, the soldier faces his target, executes a facing movement to his firing side, then spreads his feet a comfortable distance apart (Figure 4-28, page 4-23). With his firing hand on the pistol grip and his nonfiring hand on the upper hand guard or bottom of the magazine, the soldier places the butt of the rifle between the SAPI plate of the IBA and his bicep. This stabilizes the weapon and absorbs recoil. The soldier shifts his feet until aiming naturally at the target and his weight is evenly distributed. The standing position provides the least stability, but can be assumed quickly while moving, and is a good position for target area observation. Support for any portion of the body or rifle improves stability. More stability can be obtained by adjusting the ammunition pouch to support the nonfiring elbow. This allows the rifle magazine to rest in the nonfiring hand.

***Figure 4-28. Standing unsupported firing position.**

* e. **Standing Supported Firing Position Around Obstacles.** To assume the standing firing position, the soldier faces his target, executes a facing movement to his firing side, then spreads his feet a comfortable distance apart (Figure 4-29). With his firing hand on the pistol grip and his nonfiring hand on the upper handguard, the soldier places the butt of the rifle between the SAPI plate and his bicep. This helps stabilize the weapon and absorbs the recoil. The soldier then leans into the wall or obstacle with his nonfiring forearm, shoulder, and nonfiring thigh touching the obstacle for support. The soldier shifts his feet until he is aiming naturally at the target and his weight is evenly distributed.

***Figure 4-29. Standing supported firing position around obstacles.**

*4-9. TRAINING DEVICES AND EXERCISES

Several marksmanship training devices are available to aid in sustainment training when used with the appropriate training strategies. They are beneficial when ammunition is limited for training or practice exercises. Some training devices are complex, costly, and in limited supply, while others are relatively simple, cheap, and in large supply. Devices and aids can be used alone or in combinations. Individuals or squads can sustain or practice basic marksmanship skills and fundamentals with devices and aids.

a. **Dominant Eye Training.** This exercise assists the coach and the firer in determining which eye the firer should use when engaging targets. The firer's dominant eye should be identified early in the training process to prevent unnecessary problems such as a blurred sight picture or the inability to acquire a tight shot group during the grouping exercise. (Refer to Appendix A for a detailed explanation on the dominant eye training exercise and training standards.)

b. **M15A1 Aiming Card.** This exercise measures the soldier's ability to acquire the same sight picture each time the firer places his sights on a target using iron sights (Refer to Appendix A for a detailed explanation on the M15A1 aiming card exercise and training standards.)

c. **Target Box and Paddle Exercise.** This exercise incorporates the soldier's position and breathing while aiming at a target 25 meters away, simulating a live fire 25-meter engagement. This exercise reinforces the basic fundamentals while refining the soldier's muscle memory during the integrated act of dry firing. This exercise specifically focuses on the soldier's position, breathing and sight picture. (Refer to Appendix A for a detailed explanation of the target box and paddle exercise and training standards.)

d. **Dime and Washer Exercise.** This exercise incorporates the soldier's position; breathing and trigger squeeze at a target 25 meters away, simulating a live fire 25-meter engagement. The soldier must successfully dry-fire his weapon six consecutive times without the washer falling to the ground. This exercise specifically focuses on all four of the soldier's fundamentals. (Refer to Appendix A for a detailed explanation of the dime and washer exercise and training standards.)

Section III. MARKSMANSHIP FUNDAMENTALS II

This training program (Figure 4-30) reinforces BRM and the four fundamentals while demonstrating the integrated act of shooting on the Weaponeer.

Marksmanship Fundamentals II
Period 3 (8 hours)
Instructional Intent:
Reinforce BRM 1, 2 and the four fundamentals while demonstrating the integrated act of shooting on the Weaponeer.
Observables:
All fundamentals emphasized and applied on the Weaponeer.
Weapons safety reinforced on the Weaponeer.
Peer coaching is emphasized during Weaponeer firing.
Remediate all soldiers who fail to hit six out of nine shots at the 300-meter Weaponeer target.
Tasks:
Demonstrate the integrated act of firing while using the Weaponeer device.

Note: Soldiers who do not meet the standard will receive remedial training before subsequent instruction.

Figure 4-30. Marksmanship Fundamentals II training program.

*4-10. WEAPONEER

The Weaponeer is capable of simulating all of the BRM live-fire scenarios without firing rounds. Immediate feedback is available for critiquing the soldier's application of the integrated act of firing while using the Weaponeer device to include misfire procedures. (Refer to Appendix A for a detailed explanation of the Weaponeer training procedures and training standards.) This exercise incorporates all four fundamentals while giving immediate downrange feedback.

*4-11. ENGAGEMENT SKILLS TRAINER 2000

The engagement skills trainer (EST) 2000 is a portable firearms training simulator system that provides training of marksmanship, squad tactical, and close-range shoot-don't shoot techniques and skills for small arms weapons. EST 2000 will not be used as a substitute for live fire qualification. Commanders should review DA PAM 350-38, Standards in Training Commission (STRAC), for those live-fire events that can be executed in the EST 2000. Features that differentiate the EST 2000 from other systems are superior accuracy and state of the art graphics. (Refer to Appendix A for a detailed explanation of the EST 2000 training simulator.)

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CHAPTER 5
DOWNRANGE FEEDBACK
(Phase II of Basic Rifle Marksmanship)

This chapter contains guidelines for the instructor-trainer to conduct training on ranges that provide detailed feedback from the targets down range, such as bullet impact locations and shot group size. Primarily this chapter contains grouping and zeroing procedures and how to conduct the 3 types of known distance ranges. It also contains the instructional intent, special instructions, and subject areas that should be observed to ensure quality training.

Downrange feedback provides precise knowledge of what happens to bullets at range. It provides for an effective transition between 25-meter firing and firing on the field-fire range. Knowing precisely where all bullets are hitting or missing the target, the poor firer (with instructor-trainer assistance) can improve his performance and the good firer can bring his shots to target center. Firers develop the knowledge and skills required to perform with confidence on the field-fire range, where only hit-or-miss information is available.

NOTE: The TRADOC commander must approve any change to the authorized qualification courses. All questions concerning authorized qualification courses should be forwarded to: Commandant, US Army Infantry School, ATTN: ATSH-INB, Fort Benning, GA 31905.

5-1. GROUPING PROCEDURES

This paragraph provides guidelines for the instructor-trainer to conduct a grouping range (Figure 5-1). It includes concept, organization, shot group marking, shot group analysis, multiple shot group analysis and troubleshooting of the fundamentals.

Instructional Intent:
Reinforce preliminary marksmanship instruction (PMI) by performing the integrated act of shooting, and shoot two consecutive shot groups within a 4-cm circle at 25 meters.
Special Instructions:
Ensure M16A1 rear sight is set on the aperture marked L.
Ensure proper rear sight setting to zero (M16A2/3=8/3+1, M16A4=6/3+2, M4=6/3).
Ensure the rear sight aperture is set on 300+1, not 800+1.
Ensure small aperture is being used.
Enforce proper and accurate shot group marking.
Name is clearly marked on the target.
Observables:
Coaches are analyzing the firer's fundamentals.
Majority of the round must be inside the circle to be counted.
Two consecutive 3-round groups are shot with 6 of 6 rounds in the 4-cm circle.

Figure 5-1. Grouping procedures.

a. **Concept of Grouping.** Shot grouping is a form of practice firing with two primary objectives: firing tight shot groups and consistently placing those groups in the same location. Shot grouping should be conducted between dry-fire training and zeroing. The initial live-fire training should be a grouping exercise with the purpose of practicing and refining marksmanship fundamentals. Since this is not a zeroing exercise, few sight changes are made. Grouping exercises can be conducted anywhere that provides precise location of bullet hits and misses such as a 25-meter live-fire zeroing range, KD range, Weaponeer, MACS, LOMAH, LMTS, or EST. No sight adjustments should be made to the sights until the firer can shoot six consecutive shots (two shot groups) inside a 4-centimeter circle. Once this is accomplished the soldier is now ready to conduct zeroing procedures.

b. **Organization of Grouping on a 25-meter range.** The organization and conduct of a grouping range are based on the availability of ammunition, number of personnel, and the firing ability of personnel in training.

(1) The unit is divided into firing orders. The first order fires while the second order coaches. Ten firing points are reserved to conduct corrective instruction.

(2) Sandbags should be provided at each firing point to accommodate supported firing positions (Figure 5-2).

(3) Each shot is fired using the same aiming point (center of mass) from a supported firing position.

(4) Each soldier ensures his sights are set for 25-meter firing.

(5) The soldier fires a three-round shot group at the 25-meter zero target. The firing line is cleared, and he moves downrange to examine the shot group. The soldier and coach examine the shot group for fundamental errors, triangulate the shot group and put the number 1 in the center of the shot group.

(6) If the shot group is off of the 25-meter zero target the weapon should be mechanically zeroed. If the shot group is barely on the target a bold adjustment should be made.

(7) Each shot is fired using the same aiming point (center of mass). The objective is to fire tight shot groups and to place those shot groups inside a 4-centimeter circle (the actual location of groups on the target is not important).

(8) The soldier returns to the firing line and fires a second three-round shot group.

(9) The firing line is cleared, and he moves downrange to examine the second shot group, triangulate, and mark the center of the shot group with the number 2. The soldier groups the two shot groups and marks the center.

(10) Steps 1 through 8 are repeated until the soldier places six out of six consecutive rounds inside a 4-centimeter circle. (The majority of the round must be inside the circle or it is not counted). If the soldier is not grouped in 18 rounds, he should be removed from the firing line and given remedial training before attempting to group again.

(11) Once firing proficiency has been demonstrated from the supported firing position, grouping exercises can be conducted from the unsupported firing position. For example, 27 rounds are allocated for the grouping exercise, if the soldier groups in 18 rounds, he can fire the remaining 9 rounds from the unsupported firing position.

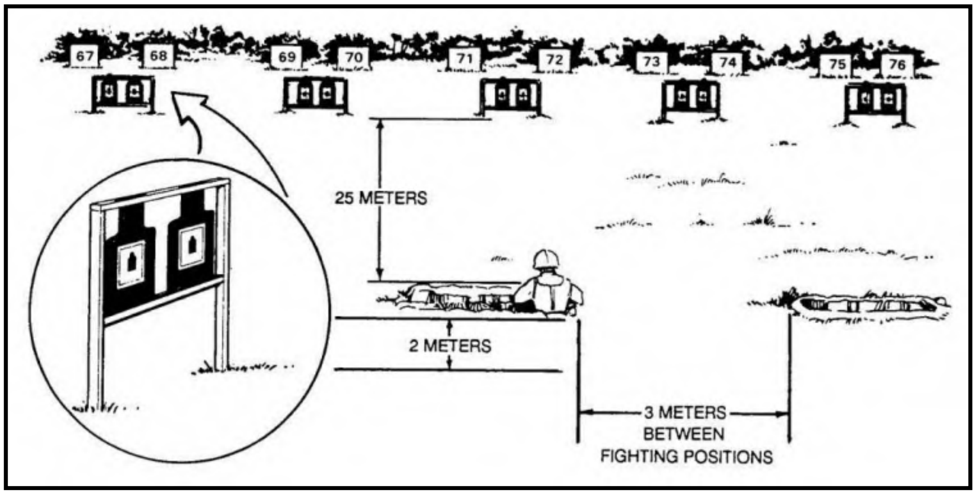


Figure 5-2. The 25-meter range.

c. **Shot-Group Marking.** The instructor-trainer must understand how to analyze shot groups correctly. If the soldier is to benefit from this exercise and if the instructor-trainer (or coach) is to provide useful guidance, the soldier must mark each shot group for a clear record of his firing practice (Figure 5-3). He connects the three bullet holes on his target with a straight line and places a number inside the shot group. The number represents the center of the three shots. When two shots are near one end of the group and the third shot is toward the other end, the number is placed closer to the two near shots (Figure 5-4). This is not a precise marking that requires a measurement but a procedure to help shot-group analysis. The three-round shot group allows the firer's performance to be evaluated. While some of the variation in a single shot group is due to the rifle and ammunition.

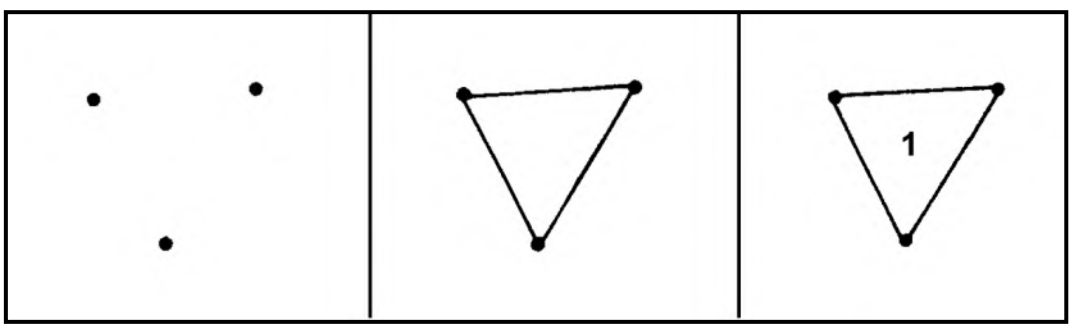


Figure 5-3. Shot-group marking.

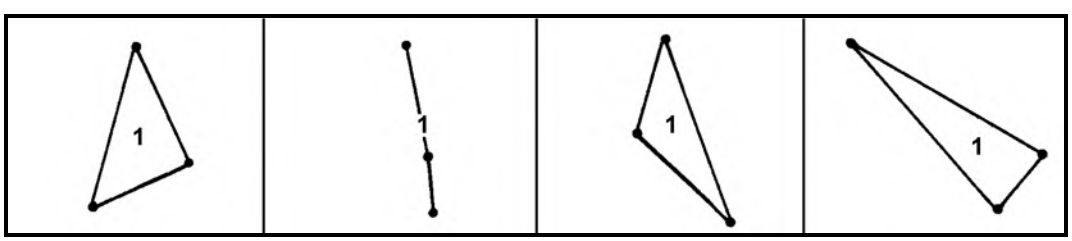


Figure 5-4. Central point of an odd-shaped group.

d. **Shot-Group Analysis.** The purpose of shot-group analysis is to identify firer errors on the single shots of a shot group so the soldier can correct these errors while firing the next shot group. Shot-group analysis begins with the instructor-trainer observing the soldier while he fires. The instructor-trainer observes the firer's position, aiming, trigger squeeze and breathing. The instructor-trainer then analyzes the shot group to confirm problem areas. The coach should not use shot-group analysis as a stand-alone tool without observing the firer. The ideal shot group will have all three rounds within a 2-centimeter circle. Three rounds within a 4-centimeter circle is the minimum standard.

NOTE: The M16A2 zero target squares are .96 centimeter in size while the M4 zero target squares are 1.3 centimeters in size. Two single shots on a 25-meter zero target that are 2 centimeters apart does not equate to two squares from each other on the M4 zero target. The M16A2 25-meter zero targets difference in distance is so small that it can be disregarded.

(1) ***Match-Grade Performance***. The target shown in Figure 5-5 illustrates a match-grade quality rifle-ammunition combination, which places all bullets in almost the same hole, and helps detect the slightest errors of the firer.

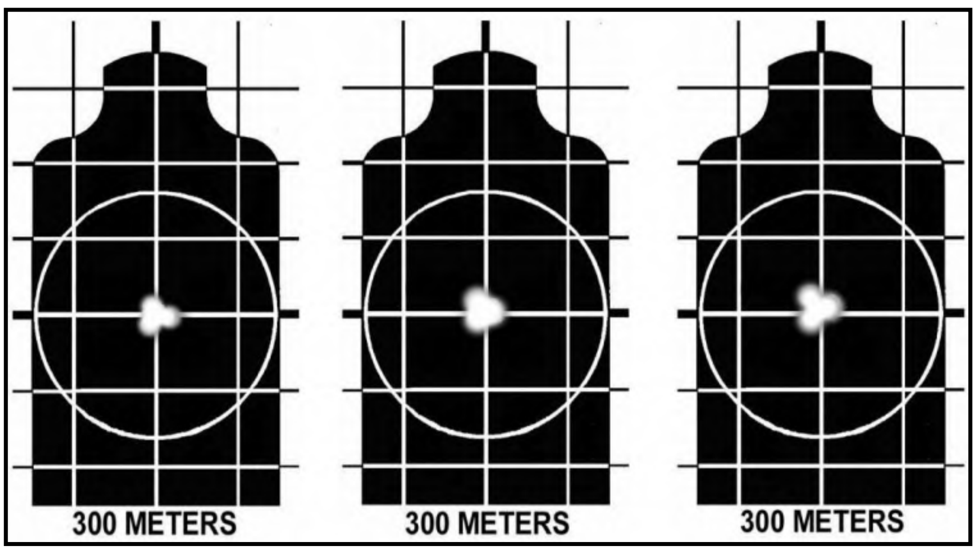


Figure 5-5. 25-meter match grade performance.

(2) ***2-Centimeter Shot Groups***. When firing a standard service rifle and standard ammunition combination the dispersion pattern may be up to 2 centimeters apart without human error. This dispersion pattern is not considered firer error. The targets shown in Figure 5-6 reflect possible 25-meter shot group performances by standard rifle-ammunition combinations and proper soldier performance. The variances of the standard rifle and standard ammunition must be considered during shot-group analysis and the instructor-trainer must ensure the soldier understands that his weapon or ammunition may not be capable of placing three rounds within a 1-centimeter square.

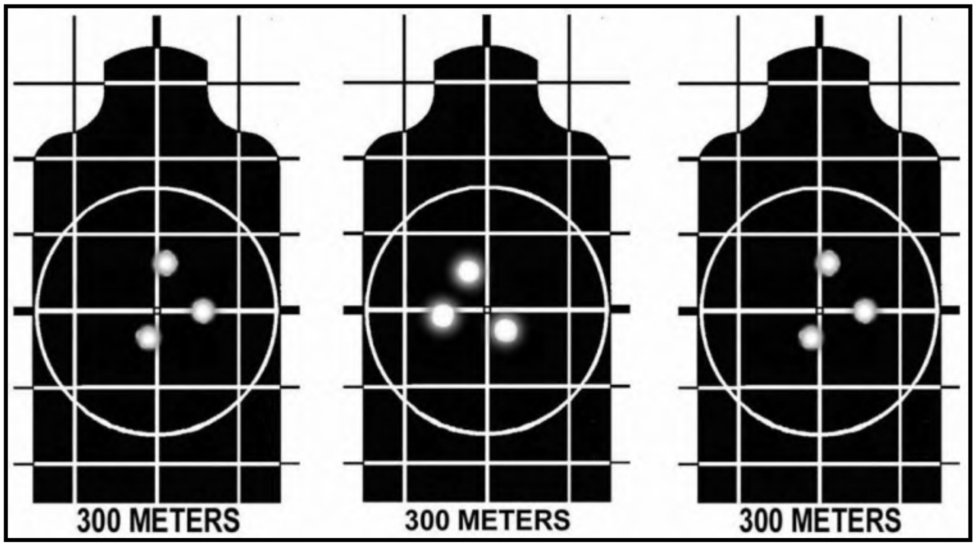


Figure 5-6. Shot groups indicate no firer error.

NOTE: The following figures and paragraphs discuss indicators that may assist the trainer-coach or firer by identifying potential problems with the firer's four fundamentals.

(3) ***3-Centimeter Shot Groups***. The targets shown in Figure 5-7 represent minimum acceptable firing performances. A better firing performance should be expected, and the instructor-trainer should ensure the soldier is properly applying the four marksmanship fundamentals. He should explain that this shot group size is not due to weapon or ammunition performance. The placement of shots in these groups (about 3 centimeters apart on the target) reflects minor shooting error. Any of these three shot groups could have been a minor change in sight picture, breathing, trigger squeeze, position or an erratic round.

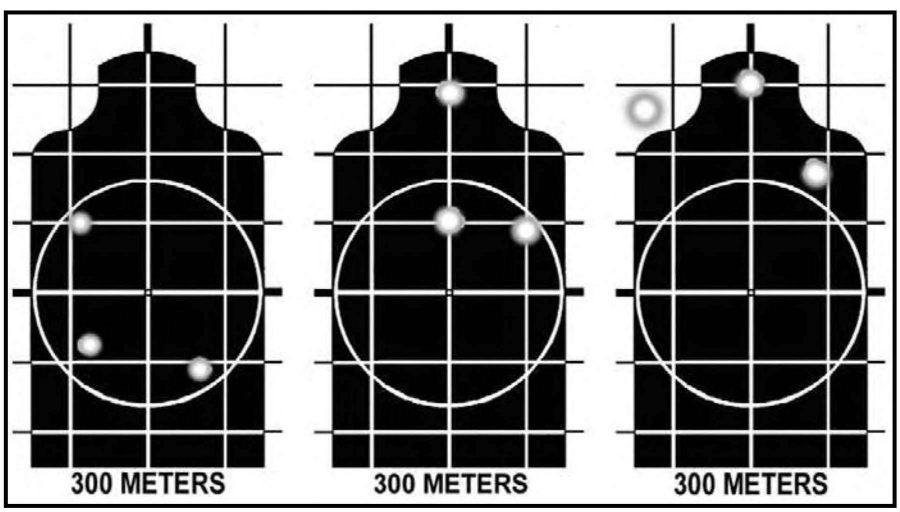


Figure 5-7. Shot groups indicate minor shooting error.

(4) ***4- to 5-Centimeter Shot Groups***. The targets shown in Figure 5-8 represent unacceptable firing performance. A better firing performance should be expected, and the instructor-trainer should ensure the soldier is properly applying the four marksmanship fundamentals. He should explain that this shot group size is not due to weapon or ammunition performance. The placement of shots in these groups (about 4 to 5 centimeters apart on the target) reflects considerable shooting error. Any of these three shot groups could have been a change in position, sight picture, breathing, trigger squeeze or an erratic round. Firers with these shot groups should receive dry-fire training to help correct firing problems. (See Appendix A for more information.)

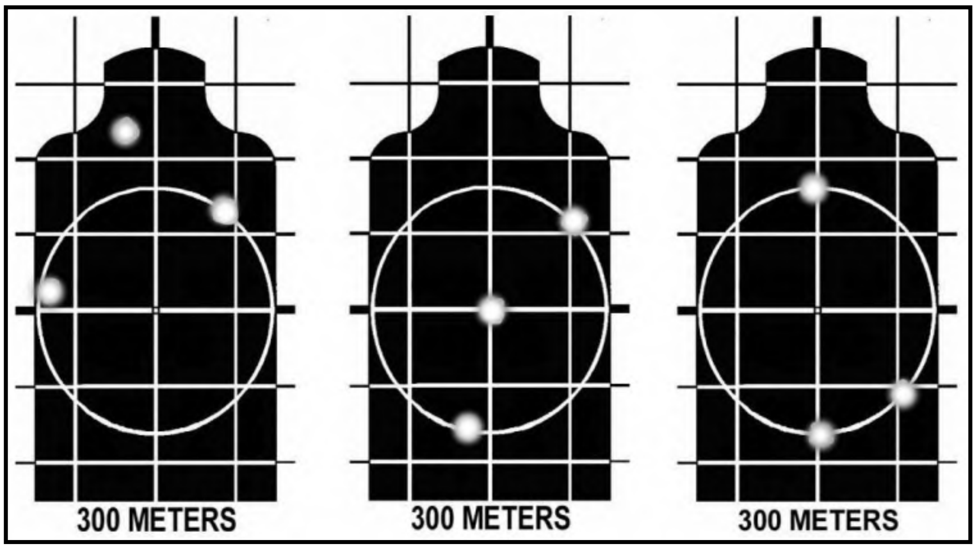


Figure 5-8. Shot groups indicate considerable shooting error.

(5) ***6-Centimeter or Larger Shot Groups.*** The targets shown in Figure 5-9 represent unacceptable firing performance. A better firing performance should be expected, and the instructor-trainer should ensure the soldier is properly applying the four marksmanship fundamentals. He should explain that group size is not due to weapon or ammunition performance. The placement of shots in these groups (more than 6 centimeters apart on the target) reflects major shooting error. Any of these three shot groups could have been a change in position, sight picture, breathing; or trigger squeeze, or the firer may be anticipating the shot. Firers with these shot groups should receive extensive dry-fire training to help correct firing problems. (See Appendix A for more information.)

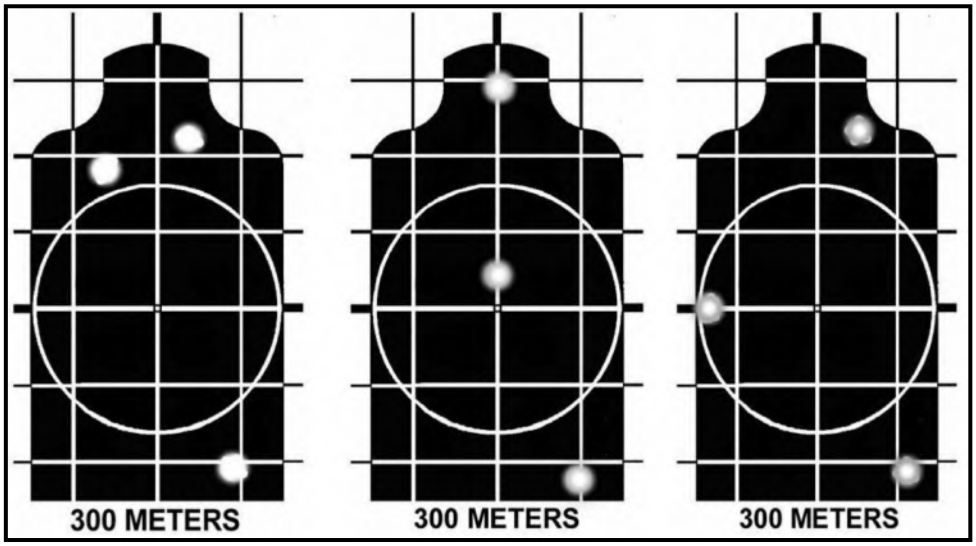


Figure 5-9. Shot groups indicate major shooting error.

e. **Multiple Shot-Group Analysis.** Shot-grouping analysis is the ongoing analyses of individual shot groups while comparing them to each other for consistent aiming. The instructor-trainer must understand how to mark shot groupings correctly. If the soldier is to benefit from this exercise, and if the instructor-trainer (or coach) is to provide useful guidance, the soldier must mark each shot group individually and locates the center of more than one shot group. In Figure 5-10 three shot groups were fired. Each shot group was individually connected, marking the center of each with a number (1, 2, 3 and so on). Next, the soldier connects the numbers and places an X in the center. The X represents the center of all three shot groups.

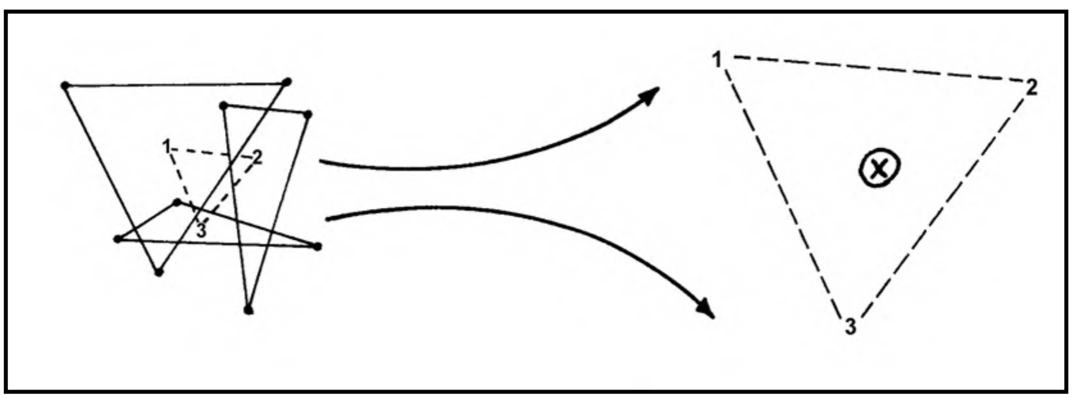


Figure 5-10. Central point of three shot groups.

(1) ***Acceptable Shot-Grouping Performance***. The shot groups in Figure 5-11 represent acceptable shot groups (4 centimeters or less) in the same location. A soldier firing this shot grouping should make a sight change of left 10 and down 4. Any change should be clearly marked on the target and saved for reference. The soldier would then be ready to zero his weapon.

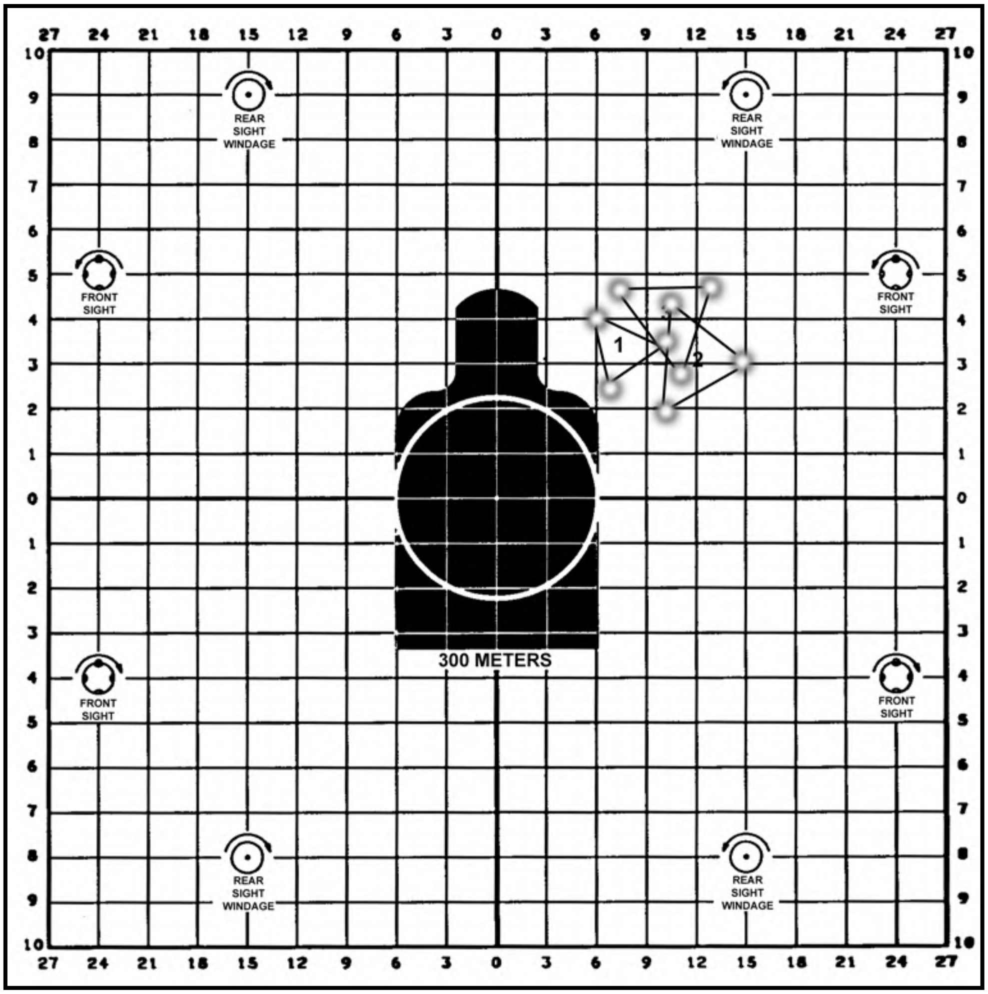


Figure 5-11. Acceptable shot grouping performance.

NOTE: Location of the shot group on the 25-meter target is not important when conducting a grouping exercise. The size of the shot groups and the dispersion of the shot groupings are the main focus of this exercise. Two consecutive shot groupings must fall within a 4-centimeter circle at 25-meters before the soldier should be allowed to make any adjustments or to start zeroing procedures.

(2) ***Shot Groups with Inconsistent Aiming***. The groups in Figure 5-12 indicate that the soldier for each shot group is applying proper firing fundamentals, but is using a different aiming point each time a shot group is fired. The soldier's understanding of the aiming process is questioned, and his position checked for consistency. The instructor-trainer cannot determine which shot group best represents the firer's zero.

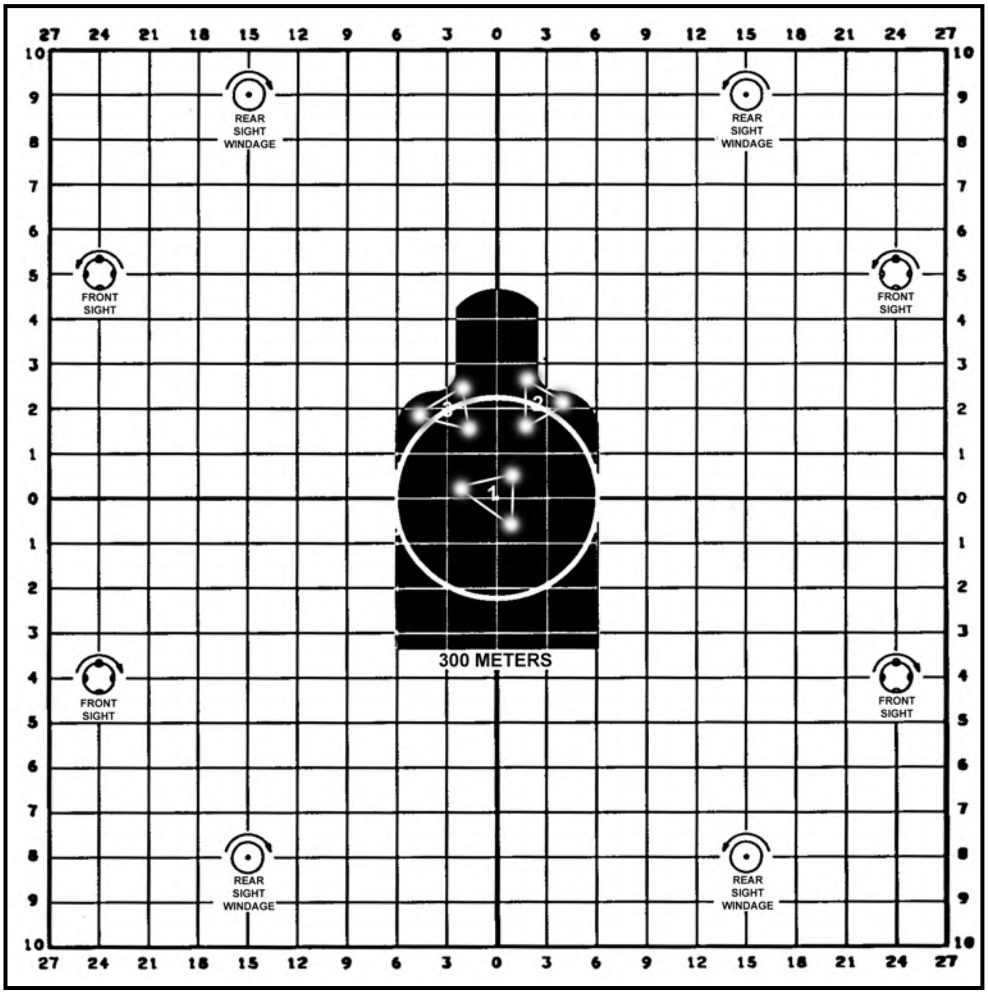


Figure 5-12. Shot groups with inconsistent aiming.

(3) ***Shot Groups with Consistent Aiming and Major Shooting Error***. The groups in Figure 5-13 indicate consistent aiming, but the soldier is not applying the four fundamentals properly while firing each shot group. The firer should be assigned a coach to troubleshoot the soldier's four fundamentals in an attempt to isolate the soldier's firing errors.

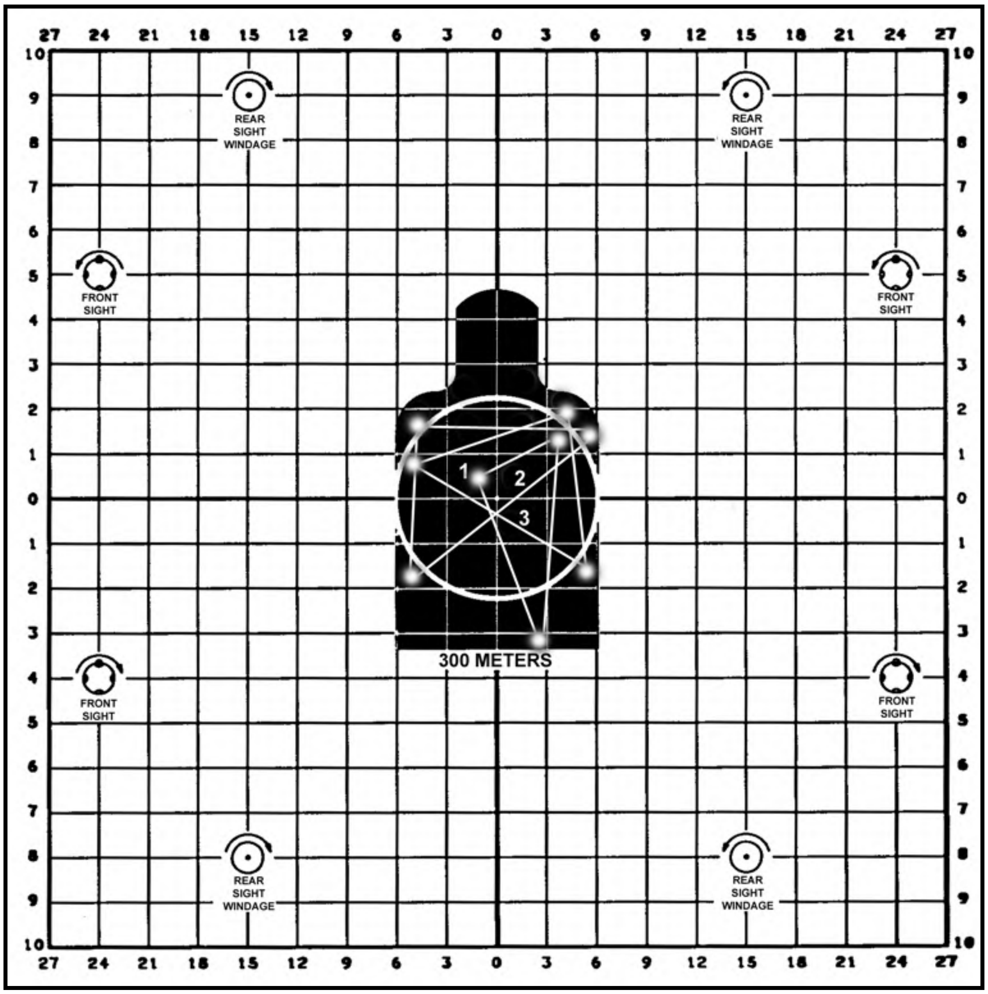


Figure 5-13. Shot groups with consistent aiming and major shooting error.

(4) ***Shot Groups with Inconsistent Aiming and Major Shooting Error***. The groups shown in Figure 5-14 indicate inconsistent aiming and major shooting errors. The firer should be assigned a coach to troubleshoot the soldier's four fundamentals in an attempt to isolate the soldier's firing errors.

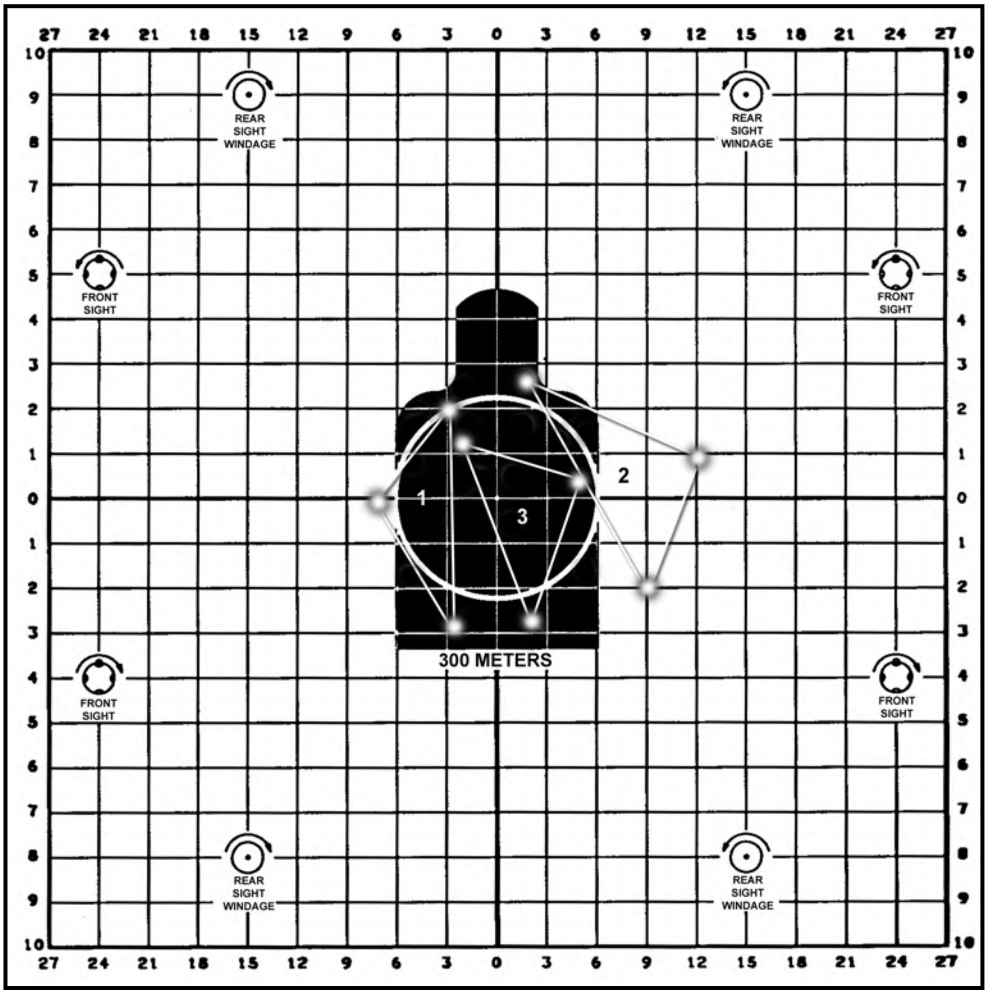


Figure 5-14. Shot groups with inconsistent aiming and major shooting error.

(5) ***Shot Groups with Improper Vertical Placement***. The shot groups shown in Figure 5-15, when viewed as nine shots, reflect proper horizontal placement of shots but unsatisfactory vertical dispersion. This indicates a failure to vertically aim at target center of mass for each shot. The soldier's aiming procedure is checked along with other marksmanship fundamentals.

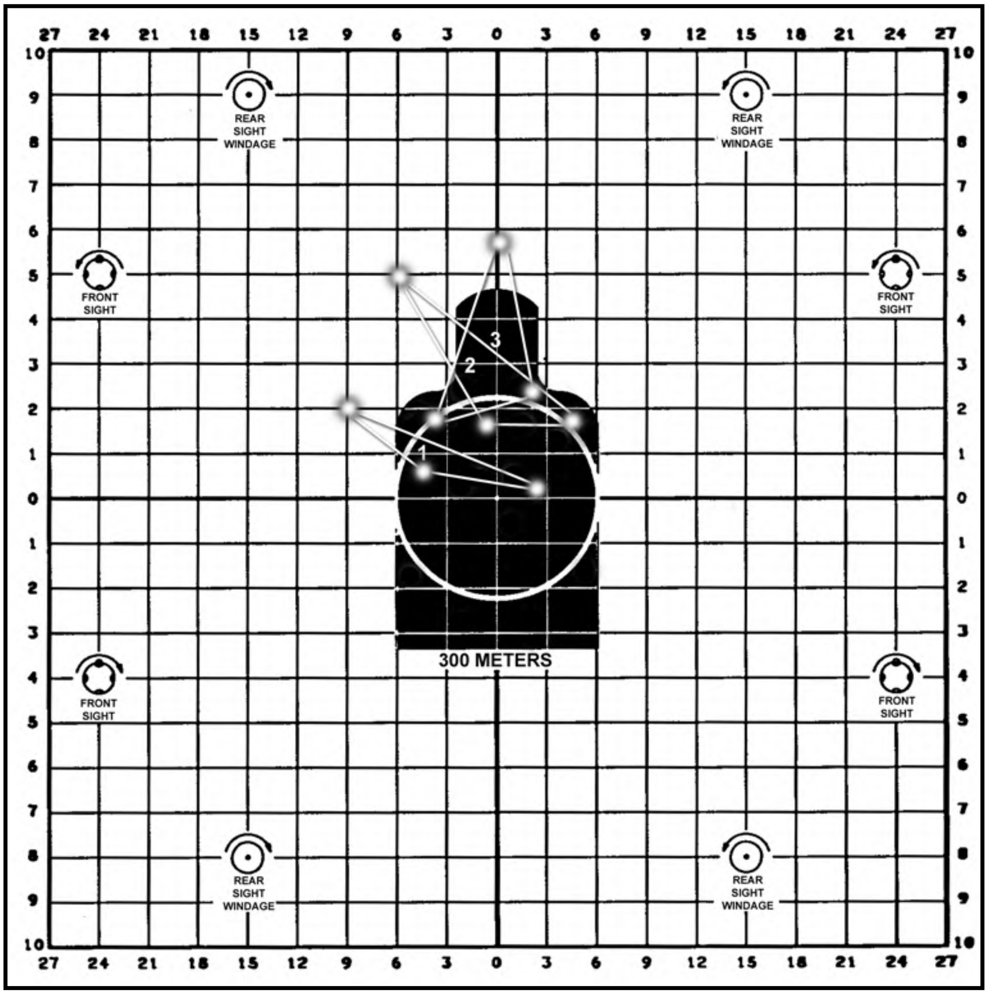


Figure 5-15. Shot groups with improper vertical placement.

(6) ***Improper Shot Groups on the Edge of the Target.*** The shot groups shown in Figure 5-16 are improper groups. A sight change is made to bring the groups closer to the target center. A bold sight change should be made to ensure the shot groups remain on the 25-meter zero target.

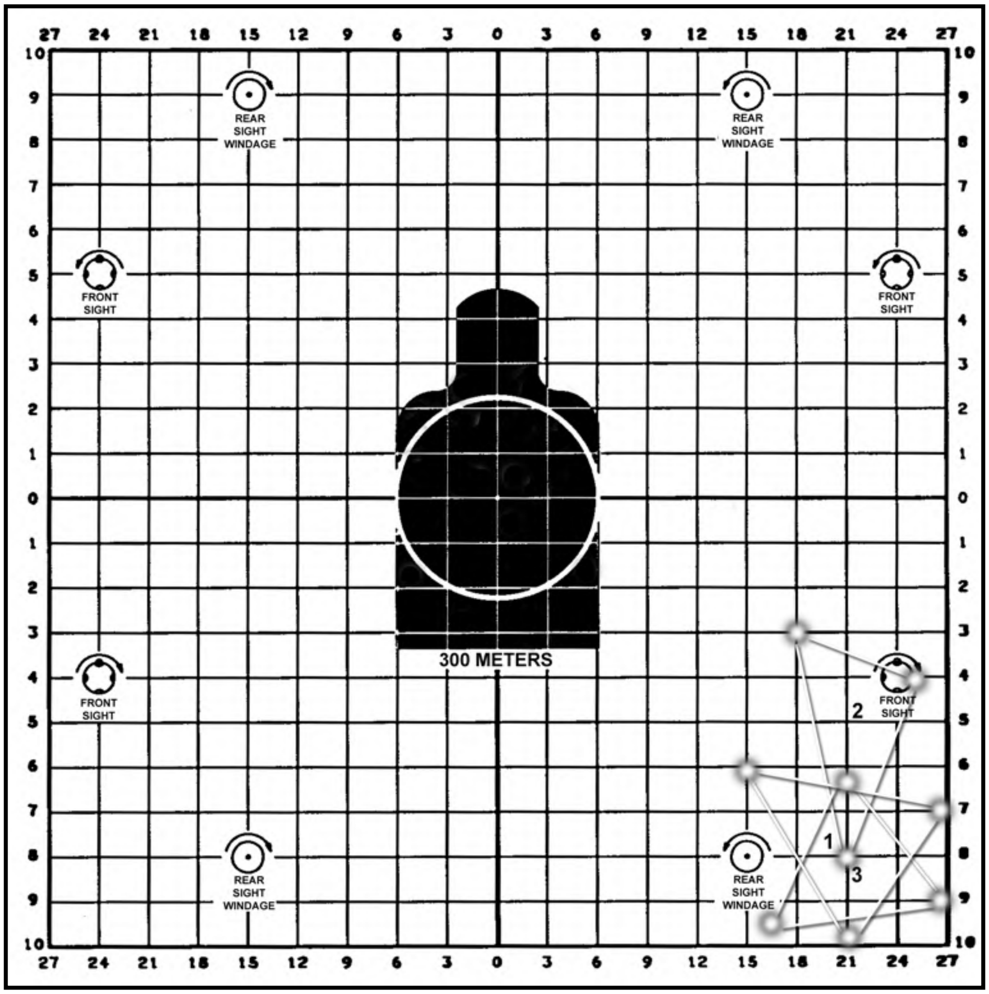


Figure 5-16. Improper shot groups on the edge of the target.

f. **Troubleshooting the Fundamentals.** The imagination is the only limiting factor in troubleshooting the fundamentals as a coach. The following examples can be used to identify errors in soldier's fundamentals.

(1) ***Aiming***. Attach the M16 sighting device and observe while the soldier fires.

(2) ***Breathing.*** Watch the rise and fall of the firer's chest for consistency.

(3) ***Trigger squeeze***. Place your finger over the firer's finger while he fires, feeling for jerking and smooth follow through.

(4) ***Position.*** Observe the following areas for consistency:

- Placement of the tip of the nose is always the same.
- Placement of the trigger finger is always the same.
- Placement of the nonfiring hand is always the same.
- Placement of the legs is always the same.

- Cheek-to-stock position is always the same.
- Positioning of equipment is always the same.

(5) ***Other Potential Problem Areas.*** Ensure—

- Nonfiring eye is not shuttering.
- Equipment is fitted properly.
- Soldier is not flinching when the trigger is pulled.
- Soldier is firing with the dominant eye.
- Soldier is wearing glasses if applicable.
- Soldier is maximizing full use of the supported position.

5-2. ZEROING PROCEDURES

This paragraph provides guidelines for the instructor-trainer to zero M16-/M4-series weapons at 25 meters and at actual range (Figure 5-17). It includes concept, organization, mechanical zero, zero recording, 25-meter sight settings, field-fire sight settings, and troubleshooting of the fundamentals.

Instructional Intent:
Reinforce PMI while adjusting confirmed shot groups center mass of the 4-cm circle with 5 out of 6 consecutive rounds at 25 meters.
Special Instructions:
Ensure M16A1 rear sight is set on the aperture marked L.
Ensure proper rear sight setting to zero (M16A2/3=8/3+1, M16A4=6/3+2, M4=6/3).
Ensure the rear sight aperture is set on 300+1, not 800+1.
Ensure small aperture is being used.
Enforce proper and accurate shot group marking.
Name is clearly marked on the target.
M16A1s are zeroing on the M16A1 zero targets.
M16A2/A3/A4s are zeroing on the M16A2 zero targets.
M4s are zeroing on the M4 zero targets.
Observables:
Coaches are analyzing the firer's fundamentals.
Majority of the round must be inside the circle to be counted.
Two consecutive 3-round groups are shot with 5 of 6 rounds in the 4-cm circle.

Figure 5-17. Zeroing procedures.

a. The purpose of battlesight zeroing is to align the sights with the weapon's barrel given standard issue ammunition. When this is accomplished correctly, the point of aim and point of impact are the same at a given range such as 250 meters for the M16A1 and 300 meters for the M16A2/A3/A4 and M4-series weapons. This sight setting provides the highest hit probability for most combat targets with minimum adjustment to the aiming point.

(1) When standard zeroing procedures are followed, a properly zeroed rifle for one soldier is close to the zero for another soldier. When a straight line is drawn from target center to the tip of the front sight post and through the center of the rear aperture, it makes little difference whose eye is looking along this line. There are many subtle factors that result in differences among individual zeros. The similarity of individual zeros should be emphasized instead of the differences.

(2) Most firers can fire with the same zeroed rifle if they are properly applying marksmanship fundamentals. This information can be useful in three ways. If a soldier is having difficulty zeroing and the problem cannot be diagnosed, having a good firer zero the rifle could find the problem and eliminates the weapon as part of the problem. When a soldier must fire another soldier's rifle without opportunity to verify the zero by firing, for example, picking up another man's rifle on the battlefield, the rifle will be closer to actual zero if the rifle sights are left unchanged. This information is useful in deciding initial sight settings and recording of zeros. All rifles in the arms room, even those not assigned, should have been previously zeroed by the last soldier it was assigned to. Zeroing this newly assigned weapon should start with the sights left where they are.

(3) There is no relationship between the specific sight settings a soldier uses on his rifle to the sight settings he would zero another rifle to. For example, a soldier could zero his assigned rifle 10 clicks left of center, and then zero another rifle and his adjustments could be 10 clicks right of center. This is due to the manufacturing difference from one rifle to another, which makes it essential that each soldier zeros the rifle that he is assigned. Therefore, all newly assigned personnel should be required to fire their rifle for zero as soon as possible after assignment to the unit. The same rule must apply anytime a soldier is assigned a rifle that is returned from direct support (DS) or general support (GS) maintenance, or the zero is in question.

b. All soldiers should successfully group prior to zeroing. If the unit is proficient at grouping, then two shot groups should be fired to confirm proficiency prior to making any sight adjustments during zeroing procedures.

(1) The unit is divided into firing orders. The first order fires while the second order coaches. Firing points are reserved to conduct corrective instruction. When using smaller ranges, the unit should be divided into three or more orders.

(2) Sandbags should be provided at each firing point to accommodate supported firing positions.

(3) Each shot is fired using the same aiming point (center of mass of the target) from a supported firing position.

(4) Each soldier ensures his sights are set for 25-meter zeroing.

(5) The soldier fires a three-round shot group at the 25-meter zero target. The firing line is cleared, and he moves downrange to examine the shot group. The soldier examines the shot group for fundamental errors, triangulates the shot group and puts the number 1 in the center of the shot group.

(6) Initially the soldier should fire two individual shot groups before a sight change is considered. If the initial shot group is not on paper the weapon should be mechanically zeroed before the soldier fires this weapon again.

(7) The soldier returns to the firing line and fires a second three-round shot group.

(8) The firing line is cleared, and he moves downrange to examine the second shot group, triangulate and mark the center of the shot group with the number 2. The soldier groups the two shot groups and marks the center of the two shot groups with an X. If the two shot groups fall within a 4-centimeter circle the firer determines what sight adjustments need to be made, identifies the closest horizontal and vertical lines to the X, and then reads the 25-meter zero target to determine the proper sight adjustments to make. If the two shot groups did not fall within a 4-centimeter circle the soldier continues grouping.

(9) The soldier then annotates any sight adjustments that need to be made to the weapon on the 25-meter zero target and ensures his name is also on the target. If five out of six rounds fell within the 4-centimeter circle the soldier is zeroed and can be removed from the firing line. (The majority of the round must be inside the circle to be counted.)

(10) The unzeroed soldier returns to the firing line and makes sight adjustments.

(11) Steps 1 through 8 are repeated until the soldier places five out of six consecutive rounds inside the 4-centimeter circle. If the soldier is not zeroed in 18 rounds he should be removed from the firing line and given remedial training before attempting to zero again.

(12) Once firing proficiency has been demonstrated from the supported firing position, zeroing exercises can be conducted from the unsupported firing position. For example, 18 rounds are allocated for the zeroing exercise; if the soldier zeroes in 9 rounds, the soldier can fire the remaining 9 rounds from the unsupported firing position.

c. While applying the fundamentals, the soldier consistently aims center mass of the target as shown in (A) of Figure 5-18. The soldier fires two separate three-round shot groups, as shown in (B) of Figure 5-18, and groups them. Based on the location of these two groups the soldier makes the appropriate sight adjustments. After making the correct sight changes, the soldier fires two more separate three-round shot groups to confirm the adjustments have aligned the sights with the center of the target, and the bullets are in the 4-centimeter circle (Figure 5-19.).

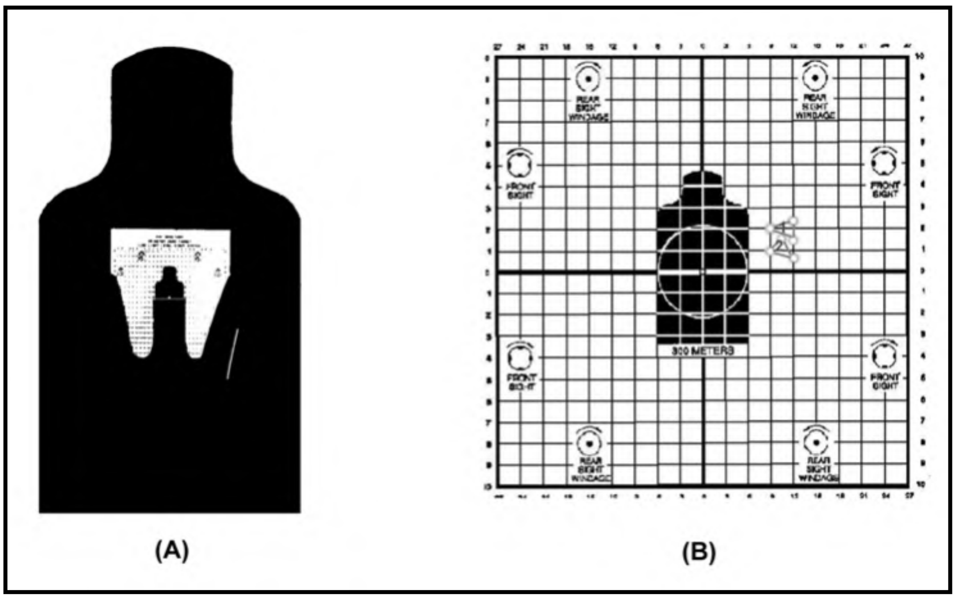


Figure 5-18. Correct aiming (A), initial shot-group results (B).

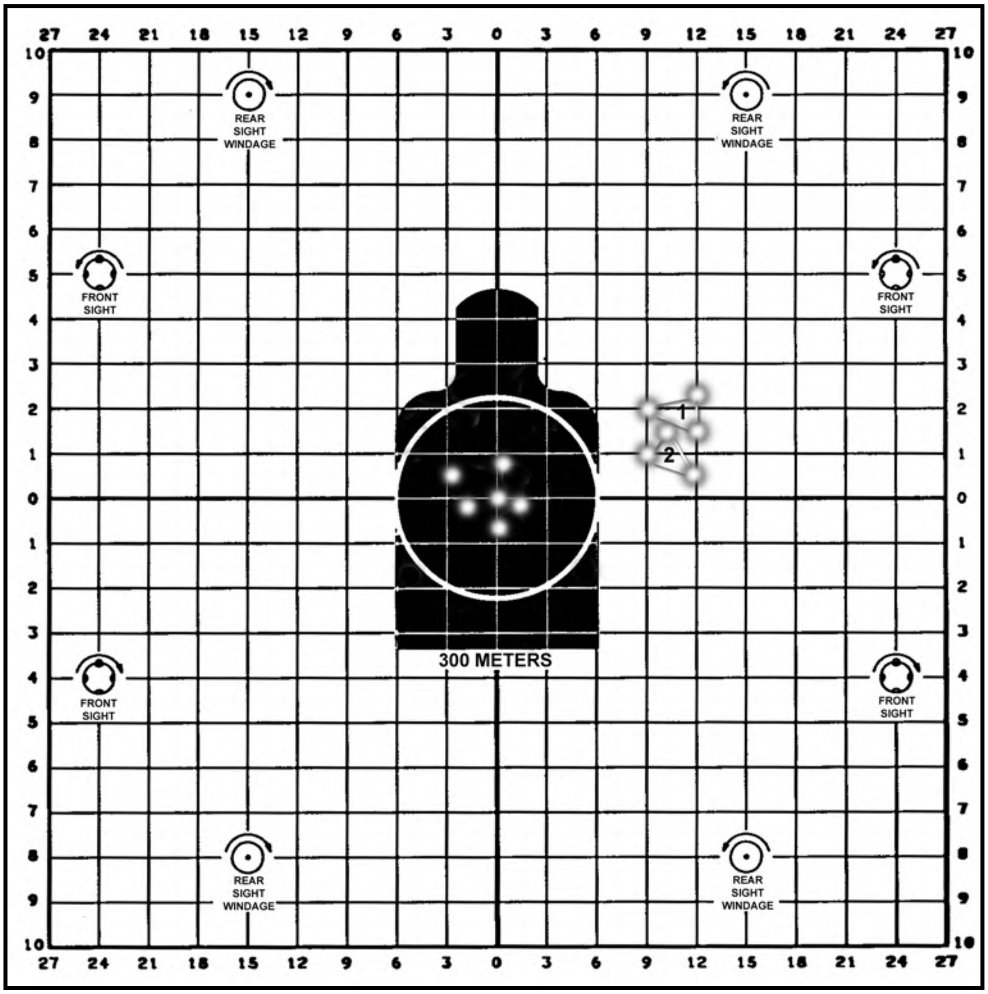


Figure 5-19. Final shot-group results.

5-3. KNOWN-DISTANCE RANGE (WITH OR WITHOUT LOMAH)

This paragraph provides guidelines for the instructor-trainer to conduct a known-distance (KD) range and apply the effects of wind and gravity (Figure 5-20). The three types of KD ranges discussed here are the standard KD range, the KD record fire range, and the modified field-fire range.

NOTE: If the range is equipped with the location of misses and hits (LOMAH) system, a firing order will be used to operate the LOMAH throughout the period of instruction and will be fired last. When using LOMAH, the zero confirmation is part of the program and will be shot as the first scenario. The soldier will shoot six rounds at the 175-meter/200-yard target while aiming center mass of the target. If the shot group falls within the 11-inch circle on the LOMAH monitor, the soldier will continue the programmed scenario, which is identical to the downrange feedback scenario without LOMAH. If the soldier shoots a shot group that is 11 inches or smaller but is clearly not zeroed, then the instructor-trainer should assist the soldier in making sight adjustments based upon the data provided on the LOMAH monitor. If the shot group is not tight (greater than 11 inches), then the soldier should be removed from the firing line and given remedial training on the four fundamentals of marksmanship.

Instructional Intent:
Reinforce PMI while shooting from the prone supported and unsupported firing positions. Build the soldier's confidence that they can hit where they aim at range while applying the effects of wind and gravity.
Special Instructions:
Ensure the effects of wind and gravity are thoroughly explained.
Ensure proper rear sight setting (M16A1=the unmarked aperture, short-range).
Ensure proper rear sight setting (M16A2/3=8/3, M16A4=6/3, M4=6/3).
Ensure the rear sight aperture is set on 300, not 800.
Observables:
Spotters being correctly used to provide feedback.
8 of 10 at 75 or 100 meters (100 yards).
14 of 20 at 175 or 200 meters (200 yards).
5 of 10 at 300 meters (300 yards).

Figure 5-20. Downrange feedback.

a. **Concept of a Known-Distance Range.** A KD range has three primary objectives: fire tight shot groups at a known distance, make sight adjustments at range (not an objective for IET soldiers) while experiencing the effects of wind and gravity, and marksmanship testing. (LOMAH, LMTS, EST, Weaponeer and MACS are training aids discussed in Appendix A that may be used to supplement or substitute this live-fire exercise.) The firing task on a KD range is an intermediate step toward the firing task of a combat soldier. The soldier is provided information concerning the precise hit-or-miss location of every bullet fired. KD firing is conducted with a single, clearly visible target at a known distance, and the soldier can establish a position that provides a natural point of aim on that single target.

(1) On the standard KD range, soldiers fire at the 100-, 200-, and 300-meter targets without any time restraints.

(2) On the KD record fire range, soldiers fire at the 100-, 200-, and 300-meter or yard targets with time restraints.

(3) On the modified field-fire range, soldiers fire at the 100-, 200-, and 300-meter targets on a standard 50- to 300- meter field-fire qualification range. If a qualification range is not available, this exercise may be shot on a standard 75- to 300-meter field-fire range. Targets and target frames must be set up to accommodate this training.

NOTE: On ranges that are built in yards instead of meters the same KD targets will be used. The difference is so small it does not need to be considered.

(4) The KD range does not require the soldier to detect targets, estimate range to targets, scan a sector of fire, respond to surprise targets, respond to short exposure targets, or engage multiple targets.

(5) An advantage of a KD range is the ability to see precisely where each bullet hits. To benefit from this training you must ensure the soldiers can clearly see the results of each firing, whether a group, single shot, or 10-round exercise.

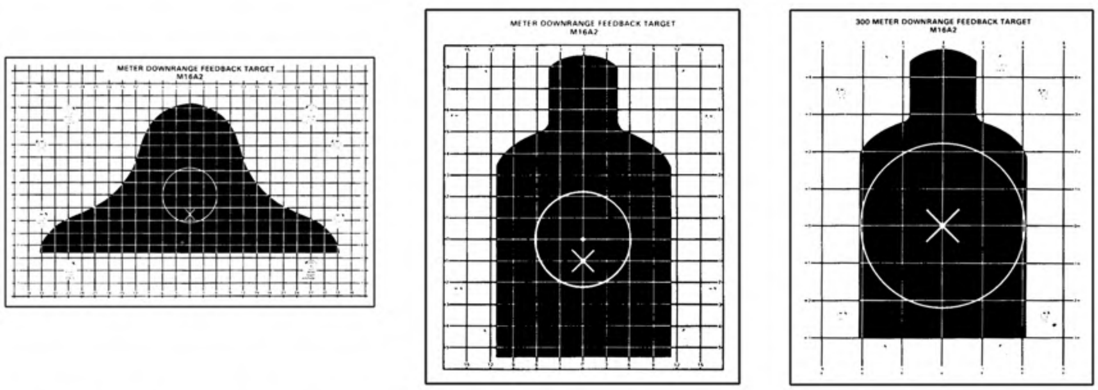
b. **KD Target Description.** Downrange feedback training should include detailed explanations of the targets.

(1) The KD targets are large enough to capture all bullets fired. The standard E-type and F-type silhouettes can be used if the standard KD targets are not available.

(2) The 16-centimeter circle on the 100-meter targets, 32-centimeter circle on the 200-meter targets, and the 48-centimeter circle on the 300-meter targets equate to the 4-centimeter zero target at 25 meters. If the soldier's shot group falls within the 4-centimeter circle at 25 meters they will fall within the circle on the target being shot. If the round falls outside the circle the round will clearly miss the 300-meter target in Figure 5-21.

(3) The X is located in the bottom portion of the circle to show the firer where he must aim so his bullets will hit target center of mass when his rifle is zeroed.

(4) The grid system on the targets in Figure 5-21 equates to the 25-meter zero targets. For example, one click on the front sight post equals one square on the 25-meter zero target and also equals one square on the target being shot. Information similar to that on the zero target has been overprinted to assist in applying sight adjustments.



100-METER FEEDBACK TARGET NSN 6920-01-243-4006	200-METER FEEDBACK TARGET NSN 6920-01-243-4008	300-METER FEEDBACK TARGET NSN 6920-01-243-4007

Figure 5-21. Downrange feedback targets.

c. **Marking the KD Range Targets.** When the initial shot group is fired, target spotters/markers (Figure 5-22, page 5-20) should be placed in each bullet hole, placing the white side on the silhouette and black side off the silhouette. This procedure ensures the firer can see where the rounds impacted. Instructors-trainers can observe the firer's performance and focus their attention on the soldiers having the greatest problems. Soldiers are motivated to fire better since their peers can observe their performance. On the second and subsequent shot groups, the target spotters/markers should be moved and placed in the holes of the new shot group. The old holes must be pasted, using black pastors on black and white pastors on white. Failure to paste all bullet holes makes it difficult to determine one shot group from another.

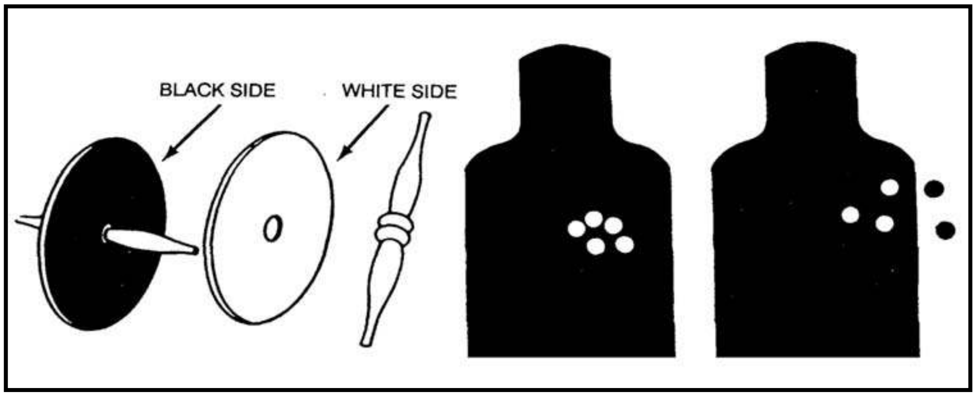


Figure 5-22. Target marking with spotters (markers).

d. **KD Shot-Grouping Analysis.** Figure 5-23 shows two targets that were both shot with three individual rounds (A). On a pop-up target these two firing performances would provide the same information back to the firing line; each target was hit once and missed twice. Once the targets are properly marked with spotters on a KD range it becomes clear why only one round hit either target. The firer on the left is failing to properly apply the four fundamentals correctly, and the firer on the right needs to make an adjustment to his iron sights (assuming that wind was not a factor). The firer on the right would then triangulate the shot group and read the appropriate adjustments from the target. Figure 5-23 also shows another two targets that were both shot with three individual rounds (B). On a pop-up target these two firing performances would appear to be the same. Once properly marked with spotters on a KD range it is obvious that the firer on the left needs more training on the four fundamentals.

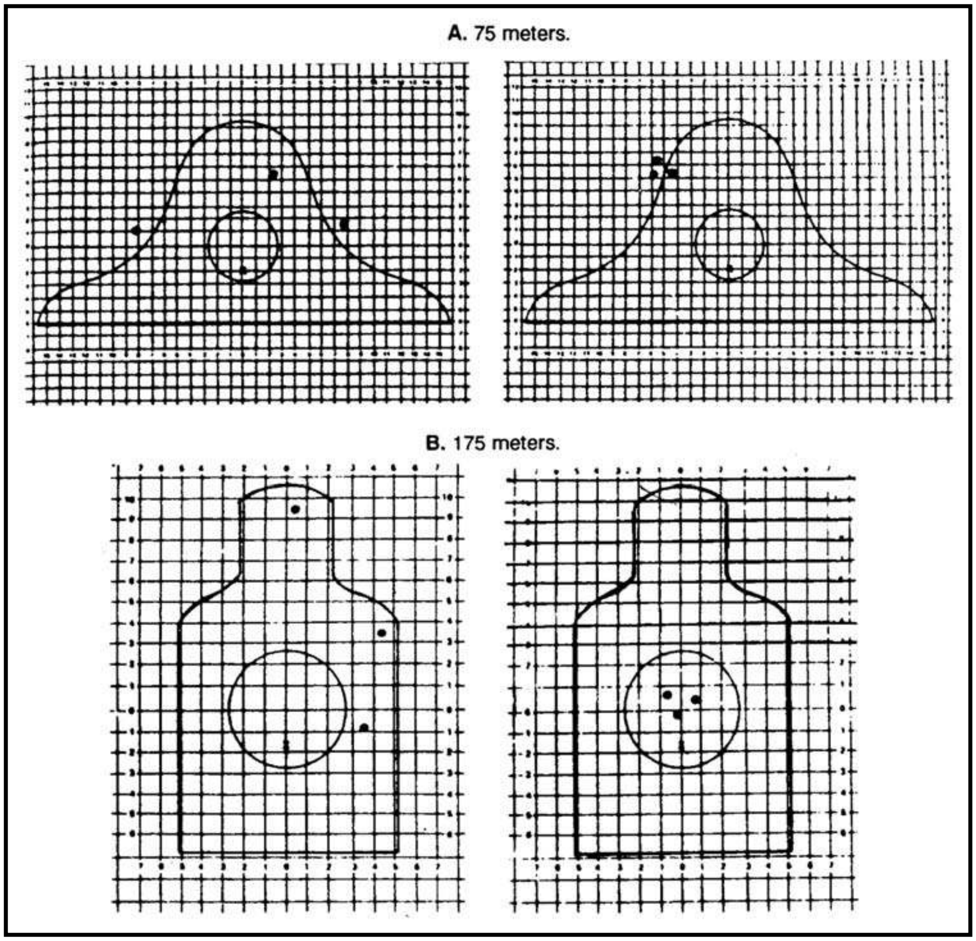


Figure 5-23. Comparison of firing performance.

e. **KD Zeroing.** The 300-meter target can be used at 300 meters to confirm weapon zero or to refine the zero obtained on the 25-meter range. The zero on this target is more valid than the zero obtained on the 25-meter range when the wind is properly compensated for. Soldiers should fire two 5 round shot groups to confirm zero or three-round shot groups to refine their zero. The pit crews should spot targets after each shot group is fired. If there is more than a five mile-per-hour crosswind, KD zeroing should not be attempted.

NOTES:
1. *M16A1.* The unmarked aperture (short-range) is used on the M16A1 for refinement of zero at 300 meters. For target engagements beyond the 300-meter line, the long-range aperture (L) is used.
2. *M16A2/3/4, M4, and M4A1 weapons.* The unmarked aperture is used for zeroing and target engagement at all distances on the KD range. When engaging targets beyond 300 meters the windage knob should be adjusted to the range of the target. 400-meter targets are engaged on the setting 4 flush and 450-meter targets would be set on 4 plus two clicks.
3. Basic training soldiers will only zero on the 25-meter range.

f. **Elevation and Windage Adjustments at Distance.** The elevation and windage rule states that one click of elevation or windage moves the strike of the bullet a specific distance at a specific range. At a range of 25 meters, one click of windage moves the strike of the bullet .33 centimeters and one click of elevation on the front sight moves the strike of the bullet .83 centimeters. To compute the distance (D) one click of elevation (front sight) or windage moves the strike of a bullet at a given range (R), divide the range (expressed in meters) by 25, and multiply by either .33 centimeters for windage or .83 centimeters for elevation.

Windage: D = R ÷ 25m x .33 (D = distance in centimeters).
Elevation: D = R ÷ 25m x .83 (R = distance in centimeters).

(1) ***Windage***. To compute the distance one click of windage moves the strike of the bullet at a range of 300 meters, divide 300 meters by 25 meters and multiply by .33 centimeters.

D = 300m ÷ 25m = 12, 12 x .33 = 3.96 centimeters (round this up to 4.0).

One click of windage moves the strike of the bullet 4 centimeters at 300 meters. (Tables 5-1 and 5-2, page 5-23, show the amount of change in windage of the strike of the bullet at various ranges.)

(2) ***Elevation—Front Sight.*** To compute the distance one click of elevation (front sight) moves the strike of the bullet at a range of 300 meters, divide 300 meters by 25 meters and multiply by .83 centimeters.

D = 300m ÷ 25m = 12, 12 x .83 = 9.96 centimeters (round this up to 10 cm).

One click of elevation on the front sight moves the strike of the bullet 10 centimeters at a range of 300 meters. (Tables 5-1 and 5-2 show the amount of change in elevation of the strike of the bullet at various ranges.)

(3) ***Elevation—Rear Sight.*** The elevation knob adjusts elevation 1.1 inch for each click at 100 meters with each dot and each number representing one click of elevation.

DISTANCE (in meters)	DISTANCE 1 CLICK WILL ADJUST THE POINT OF IMPACT		
	Front Sight Post	Windage Knob	Elevation Wheel
25	.83cm (3/8 in.)	.33cm (1/8 in.)	.5cm (1/4 in.)
50	1.5cm (5/8 in.)	.5cm (1/4 in.)	1.5cm (1/2 in.)
75	2.5cm (1 in.)	1.0cm (3/8 in.)	2.0cm (3/4 in.)
100	3.5cm (1 3/8 in.)	1.5cm (1/2 in.)	2.75cm (1 in.)
150	5.0cm (2 in.)	2.0cm (3/4 in.)	4.0cm (1 1/2 in.)
175	6.0cm (2 3/8 in.)	2.25cm (7/8 in.)	5.0cm (2 in.)
200	6.5cm (2 5/8 in.)	2.5cm (1 in.)	5.5cm (2 1/4 in.)
250	8.5cm (3 3/8 in.)	3.5cm (1 1/4 in.)	7.0cm (2 3/4 in.)
300	10.0cm (4 in.)	4.0cm (1 1/2 in.)	8.5cm (3 1/4 in.)
400	13.5cm (5 3/8 in.)	5.5cm (2 1/4 in.)	11.0cm (4 1/2 in.)
500	17.0cm (6.69 in.)	6.5cm (2 1/2 in.)	14.0cm (5 1/2 in.)
600	20.5cm (8.05 in.)	8.0cm (3 1/8 in.)	16.75cm (6 1/2 in.)
700	24.0cm (9.45 in.)	9.0cm (3 5/8 in.)	19.5cm (7 1/2 in.)
800	27.5cm (10.83 in.)	10.5cm (4 1/8 in.)	22.5cm (8 3/4 in.)
NOTE: All values are rounded off.			

Table 5-1. M16A2/3 and front sight post of an M16A4.

DISTANCE (in meters)	DISTANCE 1 CLICK WILL ADJUST THE POINT OF IMPACT		
	Front Sight Post	Windage Knob	Elevation Wheel
25	1.2 cm (1/2 in.)	.5 cm (1/4 in.)	.5 cm (1/4 in.)
50	2.4 cm (1 in.)	1.5 cm (1/2 in.)	1.5 cm (1/2 in.)
75	3.6 cm (1 1/2 in.)	2.0 cm (3/4 in.)	2.0 cm (3/4 in.)
100	4.8 cm (1 7/8 in.)	2.75 cm (1 in.)	2.75 cm (1 in.)
150	7.2 cm (2 7/8 in.)	4.0 cm (1 1/2 in.)	4.0 cm (1 1/2 in.)
175	8.4 cm (3 3/8 in.)	5.0 cm (2 in.)	4.0 cm (2 in.)
200	9.6 cm (3 3/4 in)	5.5 cm (2 1/4 in.)	5.5 cm (2 1/4 in.)
250	12.0 cm (4 3/4 in.)	7.0 cm (2 3/4 in.)	7.0 cm (2 3/4 in.)
300	14.4 cm (5 3/4 in.)	8.5 cm (3 1/4 in.)	8.5 cm (3 1/4 in.)
400	19.2 cm (7 1/2 in.)	11.0 cm (4 1/2 in.)	11.0 cm (4 1/2 in.)
500	24.0 cm (9 1/2 in.)	14.0 cm (5 1/2 in.)	14.0 cm (5 1/2 in.)
600	28.8 cm (11 1/4 in.)	16.75 cm (6 1/2 in.)	16.75 cm (6 1/2 in.)
NOTE: All values are rounded off.			

Table 5-2. M4/M4A1 and windage of an M16A4.

g. **Conduct of a Standard KD Range.** The standard KD range is conducted with paper targets at 100, 200, and 300 meters (Figure 5-24, page 5-24). Shot groups are fired progressively at the targets. Half the bullets are fired from the supported firing position and the other half from the unsupported firing position. The wind speed and direction must be determined before firing and the firer must know the distance to the target. After each shot group is fired the targets are marked. Based on this feedback, soldiers receive a critique from their instructor-trainer or coach, and apply adjusted aiming points as necessary. The downrange feedback exercise must be conducted within the constraints of time, ammunition, and available ranges. If 30 rounds of ammunition are available for training, firing three-round shot groups 10 times is preferable to firing five-round shot groups 6 times. Once the soldier understands the concept for adjusting the aiming point to compensate for the effects of wind and gravity, he is ready to apply his knowledge on the field-fire range.

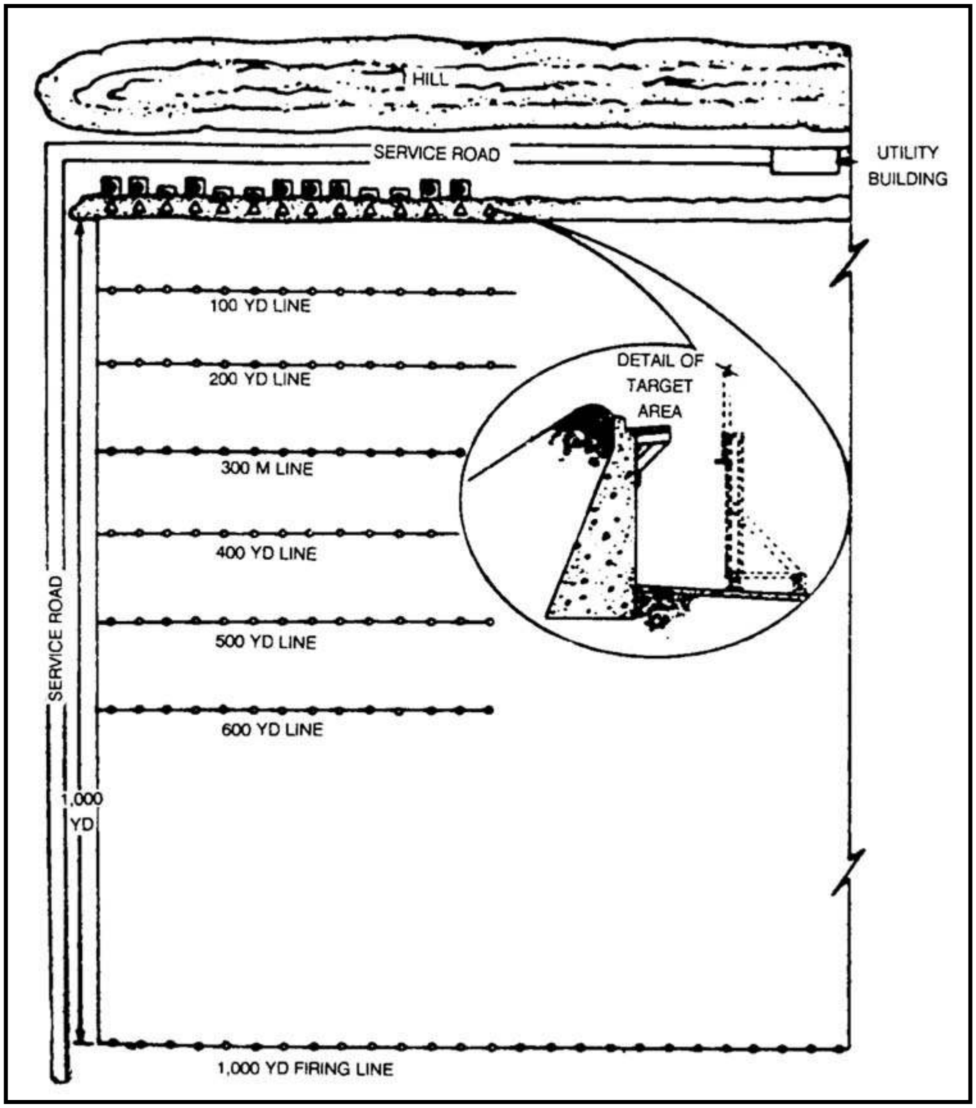


Figure 5-24. Known-distance range.

(1) ***100-Meter Targets.*** Feedback can be provided after each round, each three-round shot group, or each five-round shot group on the 100-meter feedback targets. No time limit is placed on the firer. Soldiers fire from the supported firing position and from the unsupported firing position. The targets are then marked and evaluated. Feedback consists of a critique of performance, adjustments to point of aim, effects of wind and gravity, and shot placement. Target spotters mark the bullet holes so hits can be viewed from the firing line.

NOTE: Basic training soldiers will fire one five-round shot group from the supported and one five-round shot group from the unsupported firing positions. They must hit 8 out of 10.

(2) ***200-Meter Targets.*** Firers engage the 200-meter target using the same downrange procedure as the 100-meter target.

NOTE: Basic training soldiers will fire 10 rounds from the supported and 10 rounds from the unsupported firing positions. They must hit 14 out of 20.

(3) ***300-Meter Targets.*** Firers engage the 300-meter target using the same downrange procedure as the 100-meter target.

NOTE: Basic training soldiers will fire one five-round shot group from the supported and one five-round shot group from the unsupported firing positions. They must hit 8 out of 10.

h. **KD Record Fire Range.** The KD record fire range gives soldiers the chance to engage targets at range with time constraints and feedback. The effects of wind and gravity are demonstrated while firing on the course. Before firing the course, all soldiers confirm the zero of their assigned rifles at 300 meters with six rounds. The six zero rounds are fired in the prone supported position from the 300-meter line before qualification—zero rounds do not count for score. The firers are given two minutes to fire 20 rounds at the 300-meter target from a supported firing position. The firing line is moved to the 200-meter line and firers are given 60 seconds to fire 10 rounds at the 200-meter target from an unsupported firing position. The firing line is moved to the 100-meter line and firers are given 60 seconds to fire 10 rounds at the 100-meter target from an unsupported firing position. Qualification standards for the KD alternate course are:

- Expert: Hits 38 to 40 targets.
- Sharpshooter: Hits 33 to 37 targets.
- Marksman: Hits 26 to 32 targets.
- Unqualified: Hits 25 targets and below.

i. **Modified Field-Fire Range.** A modified field-fire range can be used for downrange feedback. To conduct downrange feedback, minor changes must be made to a standard field-fire range. Target frames, like those used on the 25-meter range, are placed on a standard qualification range at 100, 200, and 300 meters. The standard KD range or the KD record fire range can be conducted on the modified field-fire range.

NOTE: The firing line will have to be cleared, moved to the targets for marking, and returned each time a firing order fires.

j. **Record of Performance.** During the conduct of downrange feedback, a record of performance should be kept for an after-action review. (See Appendix B for a blank reproducible copy of the KD scorecards.) As soldiers complete each phase and achieve the performance standard for that range, they should receive a critique. Instructors-trainers must ensure soldiers do not progress to a greater range until they become proficient at closer ranges. For example, the soldier who is having problems firing a 6-inch group at 100 meters should not be expected to fire an 11-inch group at 200 meters—progressing to greater ranges would only frustrate the soldier.

k. **25-Meter Zero Standard** (Figure 5-25). A standard E-type silhouette is 48.26 centimeters wide; a circle (angle) that is 48.26 centimeters at 300 meters is 4 centimeters at 25 meters. A soldier who can fire all bullets in a 4-centimeter circle at 25-meters and adjusts the sights for zero will hit the target at all ranges out to 300 meters.

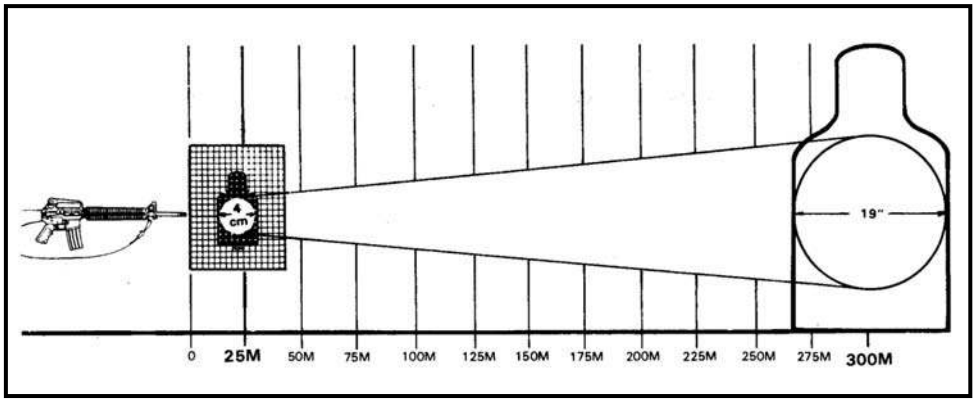


Figure 5-25. The 25-meter zero standard.

5-4. EFFECTS OF WIND AND GRAVITY

Marksmanship instructors-trainers should know how the effects of wind and gravity influence the flight of the bullet, and soldiers should know how to compensate for such bullet displacement. This instruction is appropriate for all marksmanship training and concurrent training.

a. **Effects of Gravity.** Gases created by gunpowder push each round out the end of the barrel. The barrel must be elevated slightly to allow the round to travel farther, creating an arc. The round will travel straight until it slows down and is gradually pulled down to the ground by gravity. Each round fired will be pushed approximately the same distance and will roughly follow the same path. When the firer zeroes his weapon he is aligning his line of sight to cross the path of the round at the distance he wants to zero his weapon. For example, a 300-meter zero means that the line of sight will cross the path of the round at 300 meters. If the firer is going to engage a target at a distance other than 300 meters (excluding 25 meters) the path of the round will hit the target either before or after it crosses the line of sight. If the firer wants his rounds to impact center of mass he will have to adjust his aiming point up or down to account for gravity. The farther the round travels the faster it begins to fall.

b. **Adjusted Aiming Point Based on Gravity.** An adjusted aiming point (Figure 5-26) is intended to increase hit probability when properly presented. However, soldiers can be easily confused, which could result in degraded performance. All soldiers should be taught to aim center mass unless they are confident they know the range to the target. If adjusting the point of aim confuses the soldier he should aim center mass of the target. Using these aiming points places the center of each shot group center mass of the target (assuming a perfect zero and no shooter error). These adjustments are small and should only be applied by competent firers who wish to improve their firing performance. Because the difference between the M16-/M4-series weapons is so small, and to avoid confusion, the same adjusted aiming points should be used regardless of the weapon being fired.

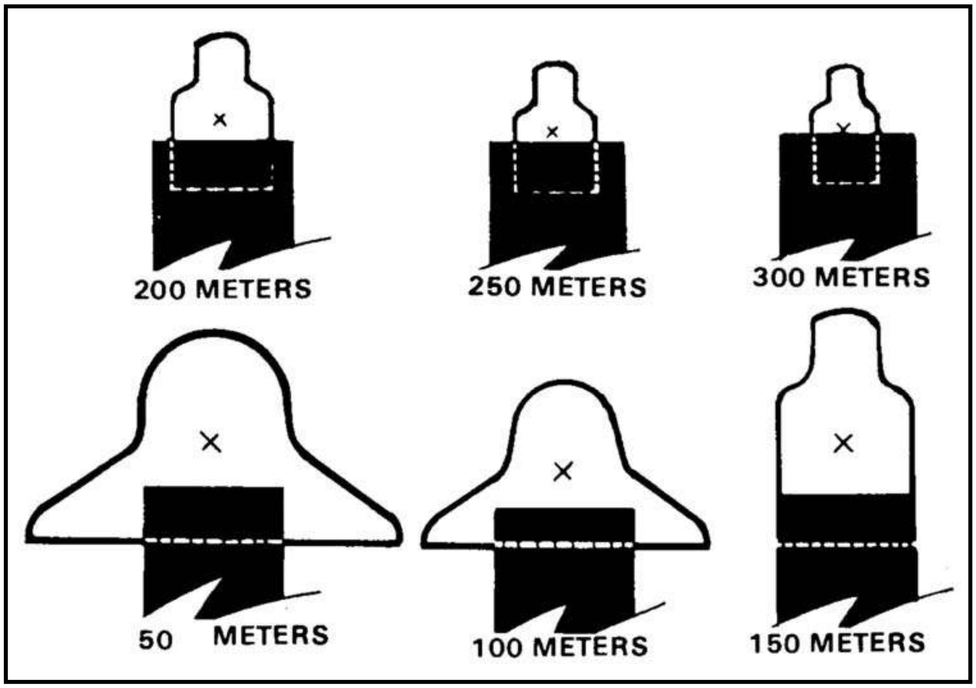


Figure 5-26. M16-/M4-series weapons aiming points.

c. **Effects of Wind.** Wind affects the bullet similar to the way gravity does: the farther the round travels the farther the wind will push the round in the direction the wind is blowing. The faster the wind is blowing the farther the wind will push the bullet.

(1) ***Wind Direction.*** The effects of wind vary depending on changes in wind speed and direction. Wind is classified by the direction it is blowing in relationship to the firer-target line. The clock system is used to indicate wind direction and value (Figure 5-27, page 5-28).

(a) Winds that blow from the left (9 o'clock) or right (3 o'clock) are called full-value winds, because they have the most effect on the bullet.

(b) Winds that blow at an angle from the front or rear are called half-value winds, because they have about one-half the effect on the bullet as full value winds.

(c) Winds that blow straight into the firer's face or winds that blow straight into the target are termed no-value winds, because their effect on the bullet is too small to be concerned with.

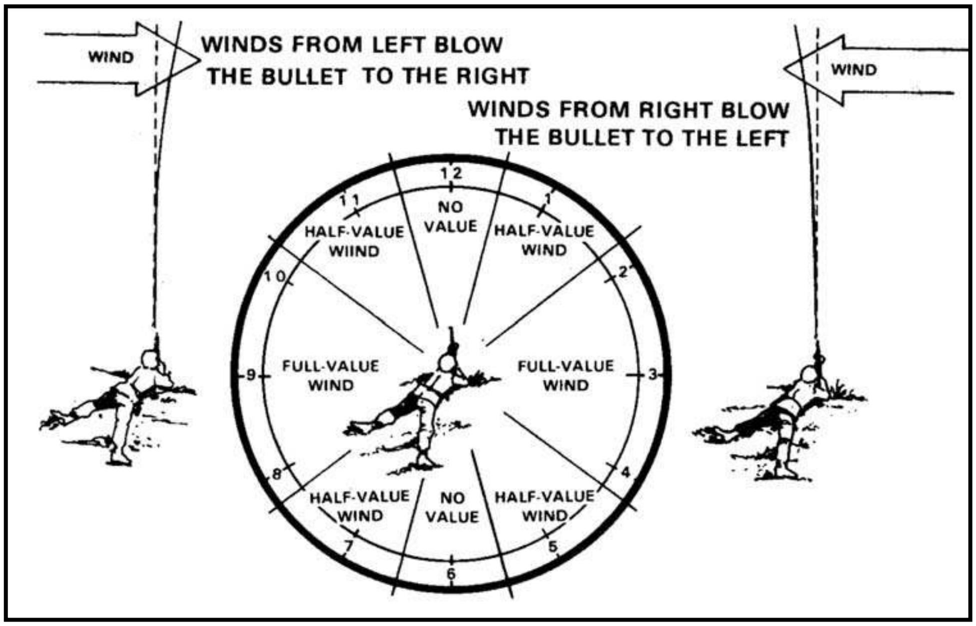


Figure 5-27. Determine wind value using the clock method.

(2) ***Wind Speed.*** Wind is highly variable and sometimes quite different at the firing position than at the target position. Even though the wind is blowing hard at the firing line, trees, brush, or terrain could protect the bullet path. The wind can vary by several miles per hour between the time a measurement is taken and when the bullet is fired. Therefore, training time should not be wasted trying to teach soldiers an exact way to measure wind speed. Soldiers should understand that the wind can blow the bullet off course but they should not overcompensate and miss targets because of applying too much hold-off. A wind gauge can be used for precise measurement of wind velocity. When a gauge is not available, velocity is estimated by one of the following methods.

(a) *Flag Method.* If the firer can observe a flag or any cloth-like material hanging from a pole, he should be able to estimate the angle formed at the juncture of the flag and pole. As shown in Figure 5-28, dividing this angle by the constant number 4 equals the wind velocity in miles per hour.

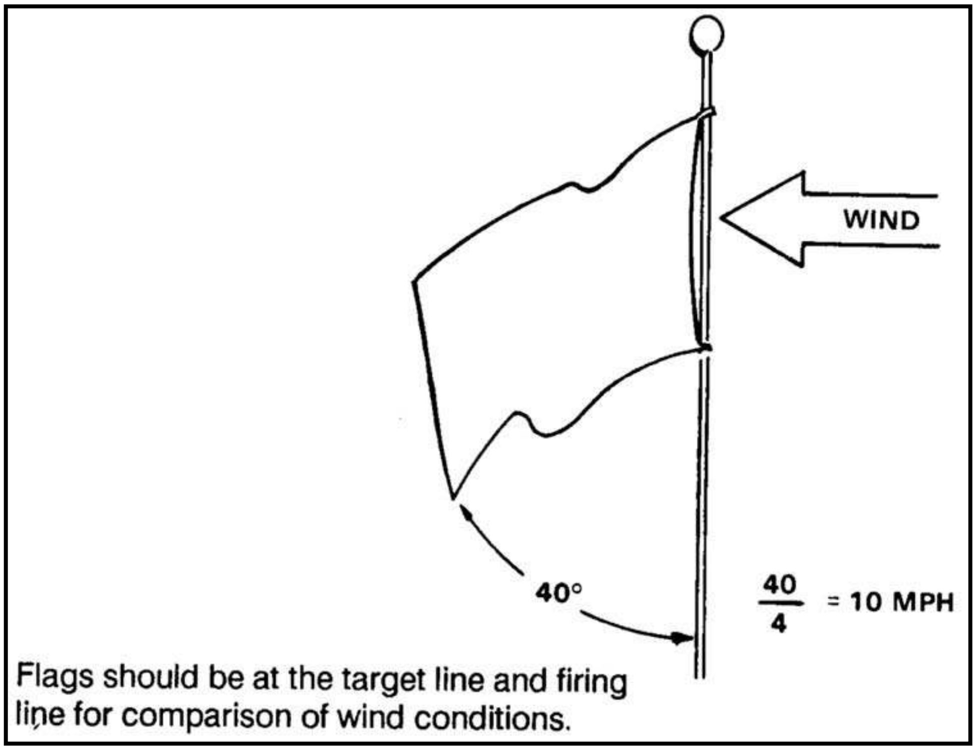


Figure 5-28. Determine wind speed using the flag method.

(b) *Pointing Method.* If a flag is not visible, a piece of paper, leaf or other light material can be dropped from the shoulder. By pointing directly at the spot where it lands, the angle can be estimated. As shown in Figure 5-29, dividing this angle by the number 4 determines the approximate wind speed in miles per hour. This indicates conditions at the firing position, which could be different at the target position.

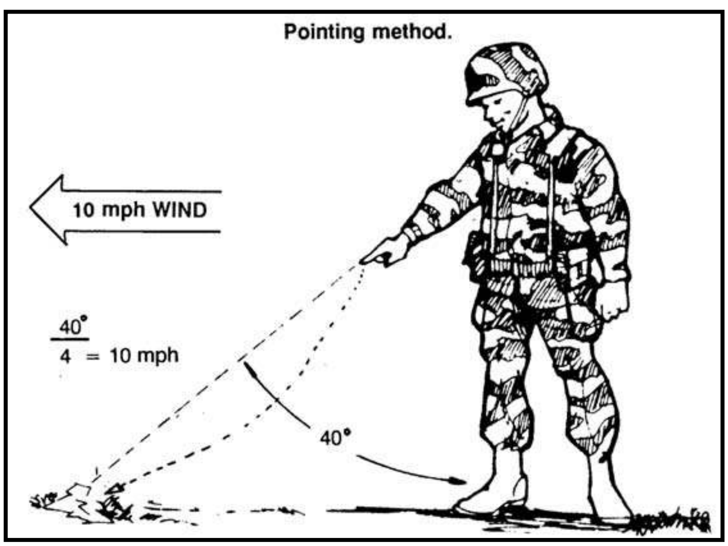


Figure 5-29. Determine wind speed using the pointing method.

(c) *Observation Method.* If the flag or pointing methods cannot be used, the following information can assist in determining wind velocities:

- Winds less than 3 miles per hour can barely be felt by the firer, but the presence of slight wind can be determined by drifting smoke.
- Winds of 3 to 5 miles per hour can be felt lightly over the firer's face.
- Winds of 5 to 8 miles per hour constantly move the leaves of trees.
- Winds of 8 to 12 miles per hour raise dust and loose paper.
- Winds of 12 to 15 miles per hour cause small trees to sway.

d. **Adjusted Aiming Point Based on Wind Speed**. Figure 5-30 illustrates how the effects of wind on the bullet are similar to the effects of gravity—as range increases, the effect of wind increases. A 10-mile-per-hour full-value wind moves an M16A1 (M193) bullet from about 1/2 of an inch at 25 meters to about 15 inches at 300 meters. (Using the data presented in Table 5-3, wind effects for all conditions can be determined.) A wind of greater speed increases bullet movement by a uniform amount—a 15-mile-per-hour wind moves the bullet 3/4 of an inch at 25 meters and about 22.5 inches at 300 meters. A half-value wind would move the strike of the round in a 10-mile-per-hour wind 1/4 of an inch at 25 meters and 7.5 inches at 300 meters. (This chart can be used for M855 ammunition, also.)

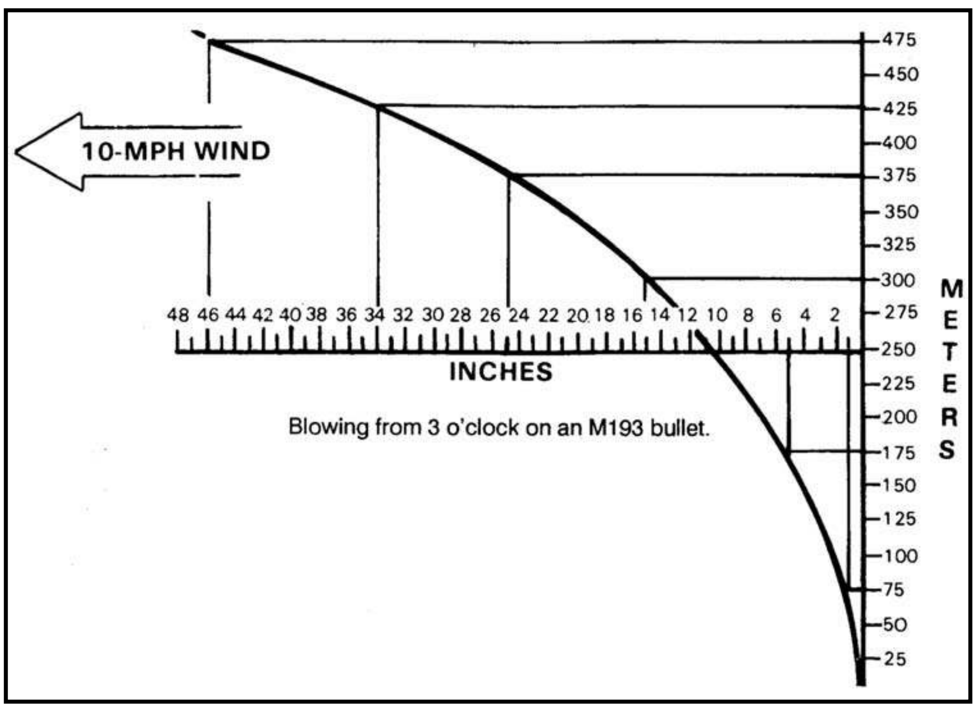


Figure 5-30. Calculate the adjusted aiming point based on wind speed.

WIND SPEED (mph)	RANGE (in meters)								
	25	50	75	100	150	175	200	250	300
	DISTANCE MOVED (in inches)								
5	1/4	3/8	1/2	1	2	2.5	3.5	5	7.5
10	1/2	3/4	1	2	4	5	7	10	15
15	3/4	1-1/8	1.5	3	6	7.5	10.5	15	22.5

***Table 5-3. M193 calculated adjusted aiming point based on wind speed (full value).**

*e. **Drift for 10 MPH Wind Using M855, 5.56 Ammunition.** Table 5-4 illustrates the drift using M855 5.56 NATO ball ammunition fired in a 16A2 rifle with 300 meters battle sight zero.

Drift for 10 MPH Wind Using M855 5.56 NATO Ball Ammunition Fired in 16A2 Rifle With 300 Meters Battle Sight Zero				
Range (meters)	Velocity (fps)	Trajectory (in)	Drop (in)	Drift (in)
0	3,100	-2.5	0.0	0.0
100	2,751	+4.4	-2.3	1.1
200	2,420	+5.8	-10.2	4.9
300	2,115	0.0	-25.3	11.8
400	1,833	-15.0	-49.5	22.4
500	1,569	-42.9	-86.7	38.0
600	1,323	-88.2	-141.3	59.5
700	1,106	-156.1	-220.9	88.4
800	1,010	-267.7	-339.2	124.9

***Table 5-4. Drift for 10 MPH wind using M855 ammunition.**

*f. **Adjusted Aiming Point Based on Gravity and Wind Speed** (Figure 5-31). Wind has a minor effect on the M16 bullet relative to the size of the target at ranges out to 100 meters. When engaging targets in excess of 150 meters in heavy winds, adjusting the aiming point for the wind increases the probability of a hit. Wind effects are uniform in relation to speed—that is, a 5-mile-per-hour wind has one-half the effect of a 10-mile-per-hour wind, and a 20-mile-per-hour wind has twice the effect of a 10-mile-per-hour wind.

(a) Firers must adjust their aiming point into the wind to compensate for the effects of wind. If they miss a distant target and the wind is blowing from the right, they should aim to the right for the next shot. A guide for the initial adjustment is to split the front sight post on the edge of the target facing the wind.

(b) The newly assigned soldier should aim at center mass for the first shot, then adjust for wind when he is confident the wind caused the target miss. Experienced firers should be able to apply the appropriate hold-off for the first shot, but the basic rule must be followed—when in doubt, aim at center mass.

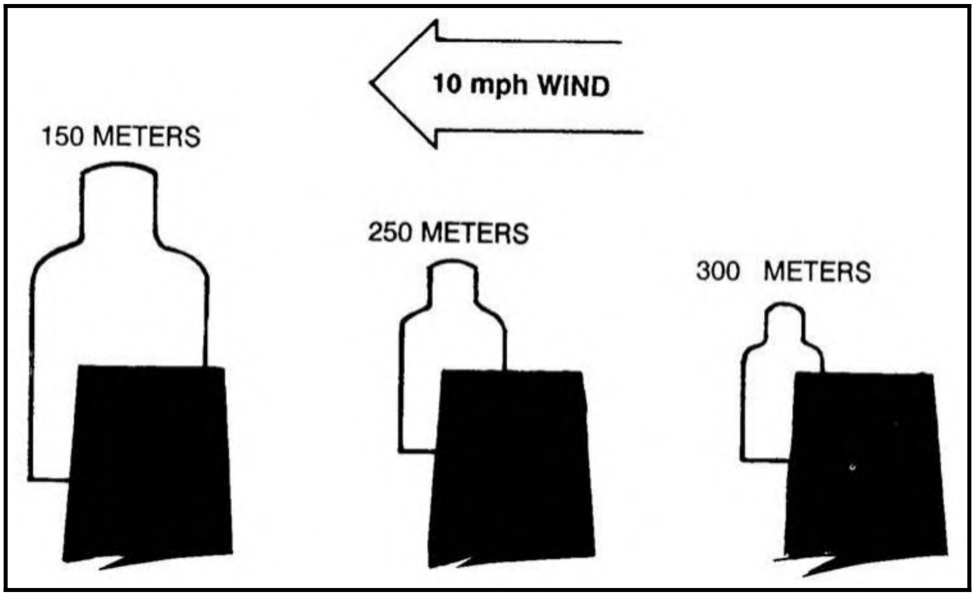


Figure 5-31. M16-/M4-series weapons adjusted aiming point based on wind speed.

5-5. BALLISTICS

Commanders and marksmanship trainers must understand some aspects of ballistics to teach the principles of zeroing and engagement of long-range targets. Ballistics is a science dealing with the motion and flight characteristics of projectiles. The study of ballistics in rifles is divided into three categories: internal, external, and terminal.

- Internal ballistics concerns what happens to the bullet before it leaves the muzzle of the rifle.
- External ballistics deals with factors affecting the flight path of the bullet between the muzzle of the rifle and the target.
- Terminal ballistics deals with what happens to the bullet when it comes in contact with the target.

a. **Internal Ballistics.** The overall dimensions of the combat service 5.56-mm cartridges are the same, which allows cartridges to be fired safely in M16A1 or M16A2 rifles and the M4 carbine. There are internal differences that affect firing accuracy. An ammunition comparison is provided in Figure 5-32.

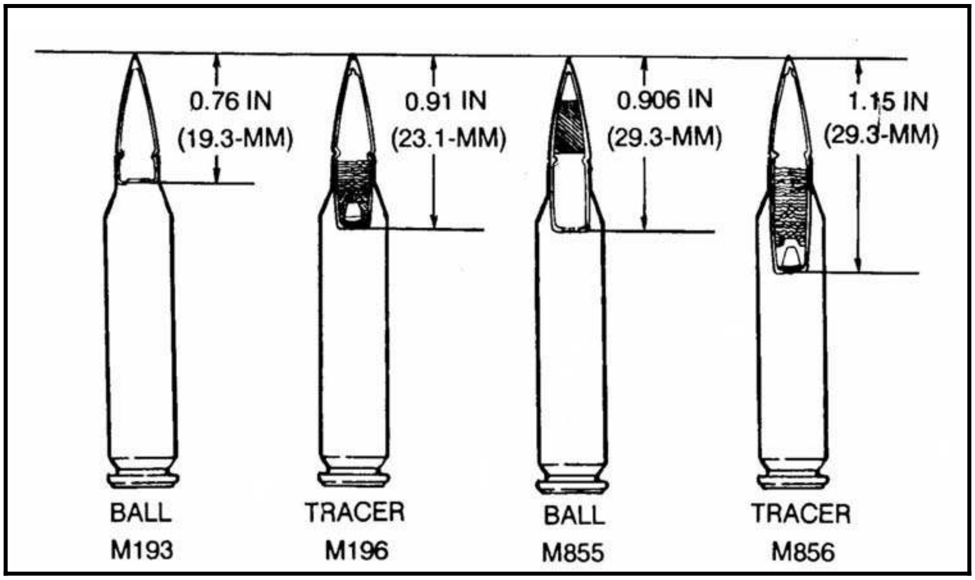


Figure 5-32. Projectile differences.

(1) The increase in projectile length, weight, and configuration of the M855 bullet requires different twists in the barrels, lands, and grooves to stabilize the bullet in flight. The M16A1 has a 1:12 barrel twist (the bullet rotates once for every 12 inches of travel down the barrel). The M16A2/A3/A4 and the M4 carbine has a 1:7 barrel twist (the bullet rotates once for every 7 inches of travel down the barrel).

(2) The M16A1, with its 1:12 twist, does not put enough spin on the heavier M855 bullet to stabilize it in flight, causing erratic performance and inaccuracy for training or full combat usage (30.48- to 35.56-centimeter shot group at 91.4 meters and 72-inch shot group at 274.2 meters) (Figure 5-33). Although firing the M855 cartridge in the M16A1 rifle is safe, it should only be used in a *combat emergency*, and then only for close ranges of 91.4 meters or less.

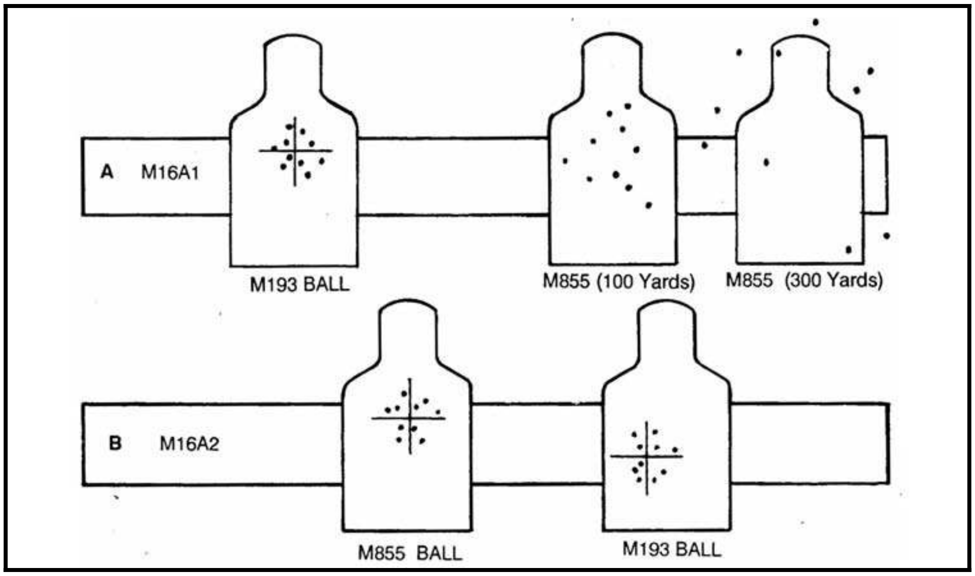


Figure 5-33. Ammunition impact comparison.

(3) The M16A2 rifle with its 1:7 twist fires both types ammunition with little difference in accuracy to a range of 500 meters. The M16A2 and its ammunition are more effective at ranges out to and beyond 500 meters due to a better stabilization of the round.

(4) The two 10-round shot groups in Figure 5-33, A were fired by a skilled marksman at a distance of 274.2 meters using the same M16A1 rifle. The 25.4-centimeter shot group on the left was fired (and zeroed) with M193 ammunition. The 6-foot shot group on the left was fired with M855 ammunition.

(5) Figure 5-33, B shows two 25.4-centimeter shot groups fired by the same skilled marksman at a distance of 274.2 meters using an M16A2 rifle. The shot group on the left was fired (and zeroed) with M855 ammunition. The shot group on the right was fired using M193 ammunition.

*(6) As stated previously M193 and M855 ammunition can be fired from an M16A2-/A4-series weapon. Table 5-5 and Figure 5-34, page 5-34, show the difference between a rifle zeroed with M855 ammunition and then re-zeroed with M193 ammunition at 300 meters. There is practically no difference between the trajectory of the rounds or the impact of the rounds on target.

Range (Meters)	Front Sight Height	Theta		Bullet Drop		Bullet Location	
		M193	M855	M193	M855	M193	M855
0	2.568	0.0021987	0.00235575	0	0	-2.57	-2.57
25	2.568	0.0021987	0.00235575	-0.125	-0.14	-0.53	-0.39
50	2.568	0.0021987	0.00235575	-0.52	-0.58	1.24	1.49
75	2.568	0.0021987	0.00235575	-1.21	-1.33	2.71	3.06
100	2.568	0.0021987	0.00235575	-2.1	-2.4	3.99	4.31
125	2.568	0.0021987	0.00235575	-3.18	-3.82	5.07	5.21
150	2.568	0.0021987	0.00235575	-4.91	-5.61	5.51	5.73
175	2.568	0.0021987	0.00235575	-6.89	-7.78	5.69	5.88
200	2.568	0.0021987	0.00235575	-9.16	-10.4	5.58	5.58
225	2.568	0.0021987	0.00235575	-11.8	-13.4	5.11	4.90
250	2.568	0.0021987	0.00235575	-15.4	-16.9	3.67	3.72
275	2.568	0.0021987	0.00235575	-19.2	-20.8	2.04	2.14
300	2.568	0.0021987	0.00235575	-23.44	-25.3	-0.04	-0.04
325	2.568	0.0021987	0.00235575	-28.3	-30.4	-2.74	-2.83
350	2.568	0.0021987	0.00235575	-33.8	-36.0	-6.07	-6.11
375	2.568	0.0021987	0.00235575	-40.13	-42.3	-10.24	-10.09
400	2.568	0.0021987	0.00235575	-46.78	-49.3	-14.72	-14.77

***Table 5-5. M855 zeroed at 300 meters; M193 re-zeroed at 300 meters.**

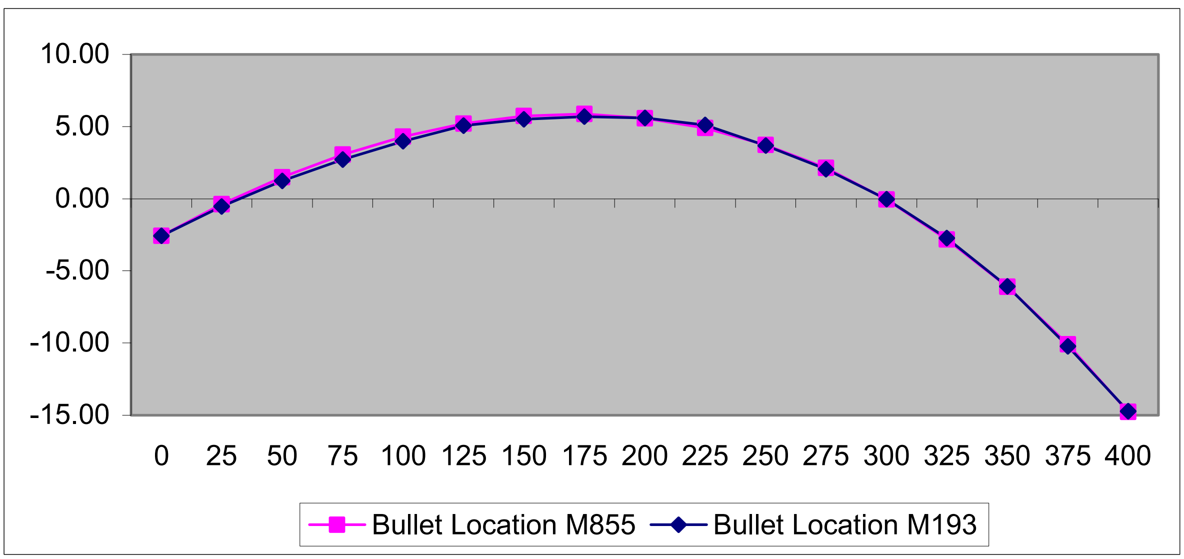


Figure 5-34. M855 zeroed at 300 meters; M193 re-zeroed at 300 meters.

*(a) When zeroing M855 and M193 at 25 meters, the difference in the ammunition becomes apparent as shown in Table 5-6 and Figure 5-35. If firing M193 ammunition from an M16A2 rifle, the rifle should be zeroed with M193 ammunition.

Range (Meters)	Front Sight Height	Theta		Bullet Drop		Bullet Location	
		M193	M855	M193	M855	M193	M855
0	2.568	0.0023383	0.00235575	0	0	-2.57	-2.57
25	2.568	0.0023383	0.00235575	-0.125	-0.14	-0.39	-0.39
50	2.568	0.0023383	0.00235575	-0.52	-0.58	1.51	1.49
75	2.568	0.0023383	0.00235575	-1.21	-1.33	3.13	3.06
100	2.568	0.0023383	0.00235575	-2.1	-2.4	4.54	4.31
125	2.568	0.0023383	0.00235575	-3.18	-3.82	5.76	5.21
150	2.568	0.0023383	0.00235575	-4.91	-5.61	6.33	5.73
175	2.568	0.0023383	0.00235575	-6.89	-7.78	6.65	5.88
200	2.568	0.0023383	0.00235575	-9.16	-10.4	6.68	5.58
225	2.568	0.0023383	0.00235575	-11.8	-13.4	6.35	4.90
250	2.568	0.0023383	0.00235575	-15.4	-16.9	5.05	3.72
275	2.568	0.0023383	0.00235575	-19.2	-20.8	3.55	2.14
300	2.568	0.0023383	0.00235575	-23.44	-25.3	1.61	-0.04
325	2.568	0.0023383	0.00235575	-28.3	-30.4	-0.95	-2.83
350	2.568	0.0023383	0.00235575	-33.8	-36.0	-4.15	-6.11
375	2.568	0.0023383	0.00235575	-40.13	-42.3	-8.18	-10.09
400	2.568	0.0023383	0.00235575	-46.78	-49.3	-12.52	-14.77

***Table 5-6. M855 zeroed at 25 meters; M193 re-zeroed at 25 meters.**

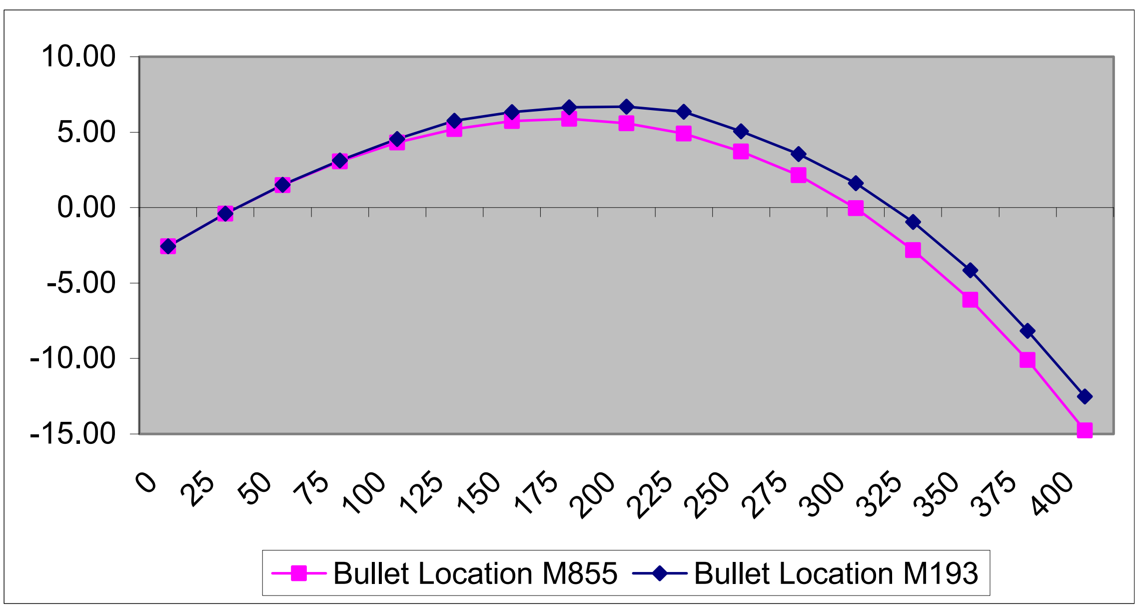


Figure 5-35. M855 zeroed at 25 meters; M193 re-zeroed at 25 meters.

*(b) If an M16A2/A4 rifle has been zeroed at 25 meters using M855 ammunition and M193 ammunition is fired without re-zeroing, then the difference in the impact of the round on target varies between ammunition as shown in Table 5-7 and Figure 5-36.

Range (Meters)	Front Sight Height	Theta		Bullet Drop		Bullet Location	
		M193	M855	M193	M855	M193	M855
0	2.568	0.00235575	0.00235575	0	0	-2.57	-2.57
25	2.568	0.00235575	0.00235575	-0.125	-0.14	-0.37	-0.39
50	2.568	0.00235575	0.00235575	-0.52	-0.58	1.55	1.49
75	2.568	0.00235575	0.00235575	-1.21	-1.33	3.18	3.06
100	2.568	0.00235575	0.00235575	-2.1	-2.4	4.16	4.31
125	2.568	0.00235575	0.00235575	-3.18	-3.82	5.85	5.21
150	2.568	0.00235575	0.00235575	-4.91	-5.61	6.43	5.73
175	2.568	0.00235575	0.00235575	-6.89	-7.78	6.77	5.88
200	2.568	0.00235575	0.00235575	-9.16	-10.4	6.82	5.58
225	2.568	0.00235575	0.00235575	-11.8	-13.4	6.50	4.90
250	2.568	0.00235575	0.00235575	-15.4	-16.9	5.22	3.72
275	2.568	0.00235575	0.00235575	-19.2	-20.8	3.74	2.14
300	2.568	0.00235575	0.00235575	-23.44	-25.3	1.82	-0.04
325	2.568	0.00235575	0.00235575	-28.3	-30.4	-0.73	-2.83
350	2.568	0.00235575	0.00235575	-33.8	-36.0	-3.91	-6.11
375	2.568	0.00235575	0.00235575	-40.13	-42.3	-7.92	-10.09
400	2.568	0.00235575	0.00235575	-46.78	-49.3	-12.25	-14.77

***Table 5-7. M855 zeroed at 25 meters; M193 fired using M855 zero.**

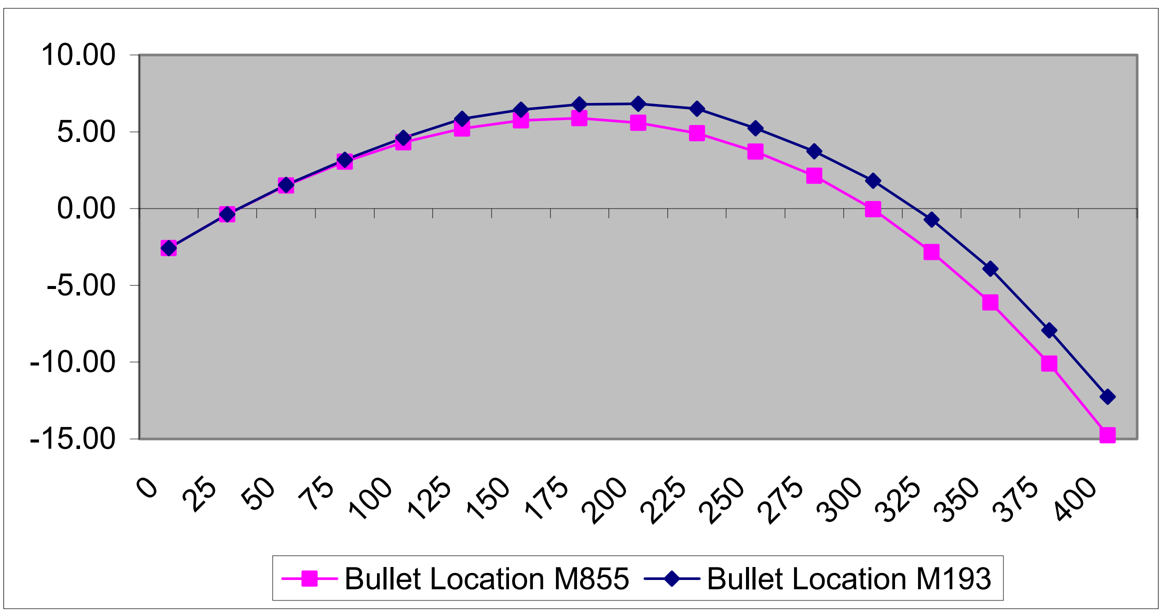


Figure 5-36. M855 zeroed at 25 meters; M193 fired using M855 zero.

NOTE: Both the M193 and M855 ball ammunition can be used in training and accurately function in the M16A2/3/4 and M4 carbine. Do not switch between the types during firing. Do not zero with one type, and then fire the other for any type of training. Due to the different characteristics of each round, zero with the same type ammunition used for training.

(7) A simple rule of thumb that will preclude any problem is to use only the ammunition specifically designed for each rifle (M193 ball ammunition for the M16A1; M855 ball ammunition for the M16A2/3/4).

b. **External Ballistics.** Soldiers must understand the basics of external ballistics so they can make necessary scope adjustments or hold compensations to allow them to hit the target. The external ballistic factors that affect bullet trajectory are:

(1) ***Gravity***. The force of gravity on a bullet is constant regardless of its weight, shape, or velocity. The longer a bullet is in the air or the greater its angle from the vertical, the more effect gravity will have on its trajectory. (See paragraph 5-4 for more information on the effects of gravity.)

(2) ***Muzzle Velocity.*** Muzzle velocity is the speed of a bullet as it leaves the barrel, measured in feet per second. Muzzle velocity diminishes as the bullet gets farther away. The bullet reaches its maximum velocity 76 feet from the end of the rifle and slows down from there until it reaches the target.

(3) ***Air Resistance or Drag***. Air resistance or drag immediately produces a slowing effect on a bullet.

(4) ***Altitude and or Air Density***. The greater the altitude, the thinner the air and the longer the bullet will travel (with a correspondingly flatter trajectory). Each 5,000-foot elevation will raise the strike of the bullet 1/2 to 1 minute of angle.

(5) ***Temperature***. Deviation from standard daytime temperature (59 degrees Fahrenheit/15 degrees Celsius) affects bullet trajectory.

(a) Cold air is denser than warm air meaning the bullet must travel through more tightly packed air particles. This causes the bullet to lose velocity resulting in the impact being *lower* than the intended point of impact. Cooler air also causes lower chamber pressure, which reduces the initial velocity.

(b) Warm or hot temperatures cause the strike of the round to move up.

(6) ***Trajectory.*** When a projectile exits the muzzle of a rifle, it drops from the line of departure, otherwise known as the center-bore line. As the projectile travels downrange, the velocity is decreased by air drag, giving way to the inevitable force of gravity. This effect creates trajectory.

(a) *Line of Sight.* The line of sight is an imaginary straight line extending from the shooter's eye through the telescopic sight, or rear and front sight, to the target.

(b) *Line of Departure***.** The line of departure is an imaginary straight line extending from the center of the barrel to infinity.

(c) *Zero Range.* Zero range is where the projectile intersects the line of sight. It occurs at two points—one on the way up and one on the way down.

(d) *Apex.* Otherwise known as midrange trajectory, the apex is the point where the projectile is at its highest in relation to the line of sight.

(e) *Bullet Path.* The bullet path is the relationship of a projectile and the line of sight at any given range (normally expressed in inches).

(7) ***Wind.*** Although gravity and air drag are the only forces that act on the trajectory, other external factors influence the trajectory relative to the point of aim such as wind, altitude, temperature, humidity, and barometric pressure. Wind is by far the most significant.

(a) Because the bullet is moving through the air, the air moves the bullet. Wind deflection is always in the same direction the wind is moving. A wind blowing from the left will move the bullet to the right. Deflection decreases as the angle of the wind to the line of flight decreases. Reading and correcting for wind effectively takes practice, especially at longer ranges where accuracy in correcting is more critical.

(b) To shoot accurately in the wind, a shooter must know the wind velocity, wind direction, and the value of deflection at the range at which he is shooting. (See paragraph 5-4 for more information on wind direction.)

(8) ***Angles.*** Firing uphill or downhill normally causes the bullet to hit high relative to a horizontal trajectory. If the shooter is firing on an angle up or down at a slanted range of 100 yards, the point of impact will be higher than it would be for a level shot of 100 yards. How high depends on the angle.

(a) Gravity acts on a bullet only during the horizontal component of its flight (the distance from the shooter to the target measured as if they were both at the same level). Since the horizontal component will always be less than the slanted range, gravity will not pull the bullet down as far as it would if the range were level.

(b) The complicating factor in shooting uphill or downhill is that the wind will affect the shot over the entire slant range. The shooter should aim at the target as if it were 25 yards away and correct for wind as if it were 400 yards away. The correct method for shooting uphill or downhill is to adjust elevation based on the horizontal range, and correct for wind deflection based on the slanted range.

c. **Terminal Ballistics.** Bullet penetration depends on the range, velocity, bullet characteristics, and target material. Greater penetration does not always occur at close range with certain materials since the high velocity of the 5.56-mm bullet causes it to disintegrate soon after impact.

d. **Bullet Dispersion at Range.** Instructors-trainers must have a working knowledge of the effects of bullet dispersion and accuracy at various ranges.

(1) ***Minute of Angle.*** A minute of angle (a term used to discuss shot dispersion) is the standard unit of measurement used in adjusting rifle sights and other ballistic-related measurements. It is also used to indicate the accuracy of a rifle. A circle is divided into 360 degrees. Each degree is further divided into 60 minutes; therefore, a circle contains 21,600 minutes. A minute of angle is an angle beginning at the muzzle that would cover 2.54 centimeters at a distance of 91.4 meters (Figure 5-37). When the range is increased to 182.8 meters, the angle covers twice the distance, or 5.08 centimeters. The rule applies as range increases—7.62 centimeters at 274.2 meters, 10.16 centimeters at 365.6 meters, and so on.

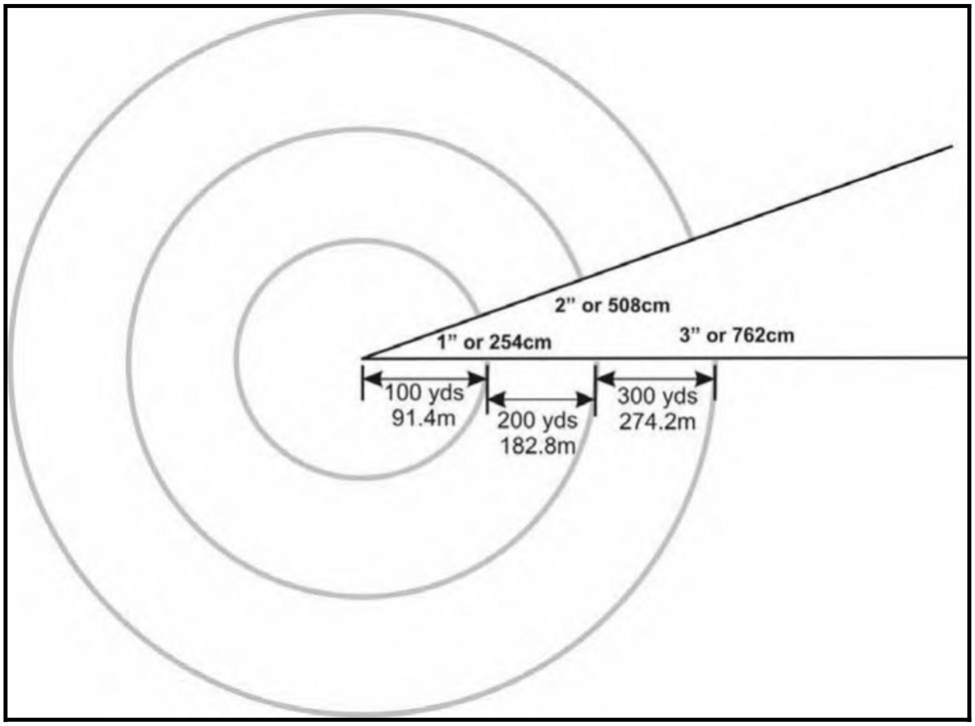


Figure 5-37. Minute of angle.

(2) ***Increase of Shot-Group Size.*** Just as the distance covered by a minute of angle increases each time the range increases, a shot group can be expected to do the same. If there are 2.54 centimeters between bullets on a 25-meter target, there will be an additional 2.54 centimeters of dispersion for each additional 25 meters of range. A 2.54-centimeter group at 25 meters (about 3.5 minute of angle) is equal to a 25.4-centimeter shot group at 250 meters (Figure 5-38).

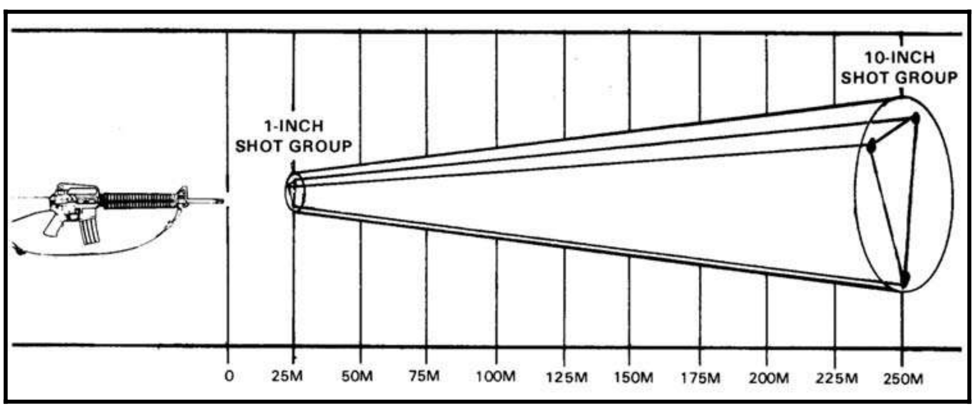


Figure 5-38. Increase in shot-group size as range increases.

CHAPTER 6

FIELD FIRE
(Phase III of Basic Rifle Marksmanship)

Field firing is part of the continued progression in the development of combat shooting skills. This begins the soldier's critical transition from unstressed firing at single, known-distance targets to targets at various ranges for short exposures. It also requires the soldier to practice and refine previously taught skills.

This chapter introduces the necessity and techniques for scanning the range for targets, estimating range, and firing quickly and accurately. (See Figure 6-1 for the current training program.)

NOTE: The TRADOC commander must approve any change to the authorized qualification courses. All questions concerning authorized qualification courses should be forwarded to: Commandant, U.S. Army Infantry School, ATTN: ATSH-INB, Fort Benning, GA 31905.

Instructional Intent:
Reinforce PMI and downrange feedback by detecting and engaging single and multiple timed targets with the M16-/M4-series weapon.
Special Instructions:
Ensure proper rear sight setting (M16A1=the unmarked aperture, short-range).
Ensure proper rear sight setting (M16A2/3=8/3, M16A4 and M4=6/3 flush).
Ensure the rear sight aperture is set on 300, not 800.
Ensure small aperture is being used.
Ensure range consists of targets at 75, 175, and 300 meters.
Observables:
Coaches are analyzing the firer's fundamentals—not used as scorers.
Soldier detects and achieves 22 target hits out of 36 timed target exposures (FF I).
Soldier detects and achieves 27 target hits out of 44 timed target exposures (FF II).
Soldiers that don't achieve 22 out of 36 (FF I) or 27 out of 44 (FF II) receive remedial training prior to refiring.

Figure 6-1. Field Fire I and II.

Section I. TARGET DETECTION

Target detection is the process of locating, marking, prioritizing, and determining the range to combat targets. For most soldiers, finding the target can be a greater problem than hitting it. Target detection must be conducted as part of individual training and tactical exercises and must be integrated into day and night live-fire exercises. (Refer to TC 25-8 for construction of a target detection range.)

6-1. LOCATING TARGETS

The ability to locate a combat target depends upon the observer's position, skill in scanning, maintaining observation over the area, and the type of indicators made by the target. When the firer gets in his position he must search his sector or lane, making quick glances at specific points rather than just sweeping his eyes across the terrain. The eyes are sensitive to slight movements that occur within the area the eyes are focused on. When the firer's eyes are sweeping an area they do not detect the slight movements of a concealed target.

a. **Selection of a Position.** Depending upon the situation, the individual soldier may or may not select his own position. In most defensive situations, the soldier is told where to prepare his position. However, some situations, such as the attack and reorganization on the objective, require the individual to select his own position. A good position is one that offers maximum visibility of the area while affording cover and concealment. As used in this case, "position" is both the observer's location on the ground and the position of his body at that location. Instructors must continuously refer to and emphasize the importance of the observer's position when conducting practical exercises.

b. **Scanning**. When a soldier moves into a new area, he must quickly scan the area for enemy activity that may be of immediate danger to him. This very rapid search lasts approximately 30 seconds and is known as the self-preservation method of search. The soldier makes quick glances at specific points throughout the area rather than just sweeping his eyes across the terrain in one continuous panoramic view.

(1) If the soldier fails to locate the enemy during the initial search, he must then begin a systematic examination known as the 50-meter overlapping strip method of search. Normally, the area nearest the soldier offers the greatest potential danger to him. Therefore, the search should begin with the terrain nearest his position. Beginning at either flank, the soldier should systematically search the terrain to his front in a 180-degree arc, 50 meters in depth. After reaching the opposite flank, he should search over a second 50-meter strip farther out but overlapping the first strip by approximately 10 meters. The soldier continues in this manner until the entire area has been searched.

(2) To take advantage of his peripheral vision, the soldier should focus his eyes on specific points as he searches from one flank to the other. He should make mental notes of prominent terrain features and areas that may offer cover and concealment to the enemy. In this way, he becomes familiar with the terrain as he searches it.

(3) After completing his detailed search, the soldier may be required to maintain observation of the area. To do this, he should use quick glances at various points throughout the entire area, focusing his eyes on specific features. He should always search the area in the same manner to ensure complete coverage of all terrain. Since this quick search may fail to detect the initial movement of an enemy, the observer should periodically repeat a systematic scanning of the area as described above. This systematic search should also be conducted anytime the attention of the observer has been distracted from his area of responsibility.

c. **Target Indicators.** A target indicator is anything a soldier (friendly or enemy) does or fails to do that reveals his position. Since these indicators apply equally to both sides of the battlefield, the soldier must learn target indicators from the standpoint of locating the enemy while preventing the enemy from using the same indicators to locate the soldier. These indicators can be grouped into three general areas for instructional purposes: sound, movement and improper camouflage.

(1) ***Sound***. Sounds, such as footsteps, coughing, or equipment noises, provide only a direction and general location making it difficult to pinpoint a target by sound alone.

However, the fact that a sound has alerted an observer greatly increases the possibility that he will eventually locate the target through other target indicators.

(2) ***Movement***. The degree of difficulty in locating moving targets depends primarily on the speed of movement. Slow, deliberate movements are much more difficult to notice than those that are quick and jerky.

(3) ***Improper Camouflage.*** The lack or improper use of camouflage and or concealment reveals the majority of targets detected on the battlefield. Such things as light reflecting from shiny surfaces or a contrast with the background presenting a clearly defined outline are indicators easily noticed by an alert observer. Three general indicators that may reveal a camouflaged and or concealed target are shine, regularity of outline, and contrast with the background.

(a) *Shine*. Items such as belt buckles or other metal objects reflect light and act as a beacon to the wearer's position. This is as true at night as it is during the day.

(b) *Regularity of Outline*. The human outline and most types of military equipment are familiar outlines to all soldiers. The outlines of rifles, helmets, and vehicles are all easily identified. The reliability of this indicator depends upon the visibility and the experience of the observer. On a clear day most soldiers can easily identify enemy riflemen or equipment if a distinctive outline is presented. At night or during other periods of poor visibility, seeing outlines is not only more difficult, but inexperienced troops will frequently mistake stumps and rocks for enemy soldiers. This is an additional reason for soldiers to become completely familiar with the terrain during periods of good visibility.

(c) *Contrast with the Background*. If a soldier wearing a dark uniform moves into a position in front of a snow bank, the contrast between the white snow and the dark uniform makes him clearly visible. However, if he were wearing a white (or light colored) uniform, he would be more difficult to see. Contrast with the background is among the most difficult of the target indicators for a soldier to avoid. During operations in which the soldier is moving, he is usually exposed to numerous background colors. Since no one kind of personal camouflage blends in with all areas, a moving soldier must be continually aware of the surrounding terrain and vegetation.

6-2. MARKING TARGETS

A soldier observes two enemy riflemen moving into completely concealed positions, one behind a bush and the other into a depression. By selecting a point of aim on the bush, the soldier should hit the enemy rifleman even though he can't see him. If the target cannot be engaged the aiming point also allows for quick and accurate engagement once a target is re-exposed. The enemy rifleman who moved into the depression provides no distinguishable aiming point. The soldier must then select a nearby feature as a reference point and determine its distance and general direction from the depression. A reference point provides a general aiming point on a concealed target. Of the two, an aiming point is usually the more effective means of delivering accurate fire. The difficulty in using reference points to mark targets moving from one location to another depends on the factors listed below.

a. **Number of Targets.** If several targets appear and disappear at approximately the same time, it is very difficult to note the point of disappearance of each.

b. **Exposure Time of Target.** Usually, moving targets are exposed for only a short period of time. Thus, the observer must be alert to note the point of disappearance for all of the targets. In such situations the soldier should mark the location of as many targets as possible before engaging any of them. By doing so, he will know the location of several targets and can engage each of them in rapid succession.

c. **Spacing of Targets.** The greater the interval between targets, the more difficult it is to note the movements of each. When there is considerable distance between targets the observer should accurately locate and mark the one nearest his position and note the general area of the others.

d. **Good and Poor Aiming Points.** Good aiming points are easily distinguishable in the surrounding terrain. Targets disappearing behind good aiming points such as manmade objects, large terrain features, and the like can be easily marked for future reference. Poor aiming points are not easily distinguishable within the surrounding terrain. Targets disappearing behind poor aiming points are difficult to mark accurately and are easily lost. If two targets offer about the same degree of danger to the soldier, but one disappears behind a good aiming point and the other behind a poor aiming point, the soldier should mark the location of the target behind the good aiming point and engage the other target first.

6-3. RANGE DETERMINATION

Range determination is the process of finding the distance between two points. In most situations, one of these points will be the soldier's own position. The other may be a target or prominent feature. The ability to accurately determine range is an important skill needed by the combat rifleman to accomplish his mission. Not only does the accurate determination of range affect his combat marksmanship proficiency, it is also required to report information and adjust artillery and mortar fire. The methods of range estimation used during this period are as follows.

a. **The 100-Meter Unit of Measure Method.** The soldier must be able to visualize a distance of 100 meters on the ground. For ranges up to 500 meters he determines the number of 100-meter increments between the two points. Beyond 500 meters the soldier must select a point halfway to the target, determine the number of 100-meter increments to the halfway point, and then double it to find the range to the target.

(1) During training exercises, the soldier must become familiar with the effect that sloping ground has on the appearance of a 100-meter increment. Ground that slopes upward gives the illusion of greater distance and observers have a tendency to underestimate a 100-meter increment. Ground that slopes downward gives the illusion of shorter distance and the observer tends to overestimate.

(2) Proficiency in the 100-meter unit of measure method requires constant practice. Throughout the training in this technique, comparisons should be made continually between the range as determined by the soldier and the actual range as determined by pacing or other more accurate means of measurement. The best training technique is to require the soldier to pace the range after he has visually determined it. In this way he discovers the actual range for himself, which makes a much greater impression than if he is simply told the correct range.

(3) The greatest limitation of the 100-meter unit of measure method is that its accuracy is directly related to the amount of terrain visible to the observer. This is

particularly true at longer ranges. If a target appears at a range of 500 meters or more and the observer can see only a portion of the ground between himself and the target, it becomes very difficult to use the 100-meter unit of measure method of range determination with any degree of accuracy.

b. **Appearance of Objects Method.** The appearance of objects method is a means of determining range by the size and other characteristic details of the object observed. This is a common method of determining distances and is used by most people in their everyday living. For example, a motorist attempting to pass another car must judge the distance of oncoming vehicles based on his knowledge of how vehicles appear at various distances. Of course, in this example, the motorist is not interested in precise distances, but only that he has sufficient road space to safely pass the car in front of him. Suppose, however, the motorist knows that at a distance of one mile, an oncoming vehicle appears to be 1 inch wide and 2 inches high. Then, any time he sees other oncoming vehicles that fit these dimensions, he knows they are about one mile away. The rifleman can use this same technique to determine ranges on the battlefield. If he knows the characteristics, size and detail of personnel and equipment at known ranges, then he can compare these characteristics to similar objects at unknown ranges. When the characteristics match, so then do the ranges.

(1) To use the appearance of objects method with any degree of accuracy, the soldier must be thoroughly familiar with the characteristic details of objects as they appear at various ranges. For example, the soldier should study the appearance of a man standing at a range of 100 meters. He fixes the man's appearance firmly in his mind, carefully noting details of size and the characteristics of uniform and equipment. Next, he studies the same man in a kneeling position and then in a prone position. By comparing the appearance of soldiers in these positions at known ranges from 100 to 500 meters, the soldier can establish a series of mental images that will help him determine range on unfamiliar terrain.

(2) Training should also be conducted in the appearance of other familiar objects such as weapons or vehicles. Because the successful use of this method depends upon visibility, anything that limits the visibility (such as weather, smoke, or darkness) will also limit the effectiveness of this method.

c. **Front Sight Post Method.** Using the front sight post as a scale is another method of estimating range. Generally, if a man-sized target is 1/2 the width of the front sight post, then the target is approximately 300 meters away. If the target is 1/4 the width of the front sight post, then the target is approximately 600 meters away. This method can be used for a quick on-the-spot estimation and engagement.

Section II. FIELD-FIRE TRAINING
(Single Timed Targets and Multiple Timed Targets)

Field-fire training provides the transition from unstressed slow firing at known-distance or feedback targets to engaging pop-up silhouettes from 50 to 300 meters. Two basic types of field-firing exercises are single-target and multiple-target engagements, which use 75-, 175-, and 300-meter targets. Once the soldier has developed the unstressed firing skills necessary to hit single KD targets, he must learn to quickly detect and engage combat-type targets at various ranges. Pop-up targets are used to add stress and simulate the short exposure times of combat targets. Therefore, the soldier must detect, acquire, and engage the target before the exposure ends. During field-fire training, the firer learns to quickly detect targets, apply SPORTS, and apply the four fundamentals simultaneously.

6-4. CONDUCT OF FIELD-FIRE RANGE

The field-fire ranges consist of F-type silhouettes at 75 meters and E-type silhouettes at 175 and 300 meters.

a. The field-fire range is fired from the supported firing position and the prone unsupported firing position. Initial training starts with single exposed targets and increased time for target exposures (Field Fire I). As soldiers become proficient, multiple target engagements are introduced with shorter exposure times (Field Fire II).

NOTE: There are two types of electronic pop-up targets used on a field-fire range: those that rise from the back to the upright position and those that rise from the side to the upright position. When using targets that rise from the side, soldiers should be instructed to wait until the target is fully raised before engaging the target. If the target is engaged as it is rising, the computer will not register it as a hit even though the target may fall.

b. Soldiers who miss most targets should be removed from the firing line for remedial training if their problem cannot be corrected. A soldier who fires at a 300-meter target 10 times and misses it 10 times is obviously not learning but, instead, is losing confidence in his ability. The typical soldier should hit the 300-meter target at least 7 out of 10 times.

c. Peer coaches should assist soldiers in observing the strike of rounds and identifying firing problems. If the target is missed and the coach cannot observe the bullet strike, the coach should instruct the soldier to aim lower for the next shot, expecting to see the strike of the bullet in the ground. With this information, the coach can instruct the soldier where to aim to hit the target.

d. Live-fire training can be organized in several ways. A unit is divided into two or more firing orders based on the number of personnel to be trained. The first order is the firer, the second order is the coach and (if required) the third order is the scorer. At the conclusion of each exercise, positions rotate until all orders have fired. Standard field-fire scenarios have been developed to provide several target exposures. Although they are recommended for initial entry training, local commanders can develop any variety of more challenging target sequences. Ammunition is allocated based on one round for each target.

e. During live fire, the soldier's hit-and-miss performance is recorded to facilitate the instructor-trainer's critiques or to indicate where more training is needed. The recorded performance is also used to determine which soldiers require closer supervision or remedial training. Two methods used to record firing performance are manually marked scorecards and automated computer printouts.

(1) ***Manual Recording.*** When manual recording is used, the unit provides soldiers for recording information on either DA Form 3601-R (Single Target Field Firing Scorecard)

or DA Form 5241-R (Single and Multiple Targets Field Firing Scorecard). (See Appendix B for blank reproducible copies of these forms).

(2) ***Automated Recording.*** When firing exercises are conducted using the family of automated field-fire ranges, a computer printout is provided for each firing order. At the conclusion of each firing order, the range NCOIC completes the printout and ensures the soldier identification is matched with each firing point. He adds the soldier's name or roster number to the top of each lane/firing point data column. Based on a one-round allocation for each target exposure, data should be collected on hits, misses, no-fires, and repeated shots to assist the instructor-trainer in assessing firing proficiency.

6-5. FIELD-FIRE STANDARDS

Field Fire I and II are part of the continued progression in the development of combat shooting skills. This begins the soldier's critical transition from unstressed firing at single known distance targets during downrange feedback, to targets at various ranges for short exposures. It also requires the soldier to practice and refine those skills that have been previously taught. This section introduces the need and techniques for scanning the range for targets, and quick accurate firing.

a. **Field Fire I (Single Timed Target).** Field Fire I is broken down into three firing tables. Figure 6-2 shows the number of target exposures, target ranges, and exposure times for each firing table. Firing tables 1 and 2 are fired from a supported firing position, and firing table 3 is fired from the prone unsupported firing position.

FIRING TABLE 1			FIRING TABLE 2			FIRING TABLE 3		
ROUND	RANGE (M)	TIME (SEC)	ROUND	RANGE (M)	TIME (SEC)	ROUND	RANGE (M)	TIME (SEC)
1	75	6	1	75	6	1	75	7
2	75	6	2	175	8	2	175	9
3	75	6	3	300	10	3	300	11
4	75	6	4	175	8	4	175	9
5	75	6	5	75	6	5	75	7
6	175	8	6	300	10	6	300	11
7	175	8	7	300	10	7	300	11
8	175	8	8	75	6	8	75	7
9	175	8	9	175	8	9	175	9
10	175	8	10	175	8	10	175	9
11	175	8	11	300	10	11	300	11
12	175	8	12	175	8	12	175	9
13	300	10	13	75	6	13	75	7
14	300	10	14	300	10	14	300	11
15	300	10	15	175	8	15	175	9
16	300	10	16	75	6	16	75	7
17	300	10	17	300	10	17	300	11
18	300	10	18	75	8	18	75	7

Figure 6-2. Field Fire I firing tables.

(1) Firing table 1, consisting of 18 targets, helps the firer practice shooting skills and develop a sense of timing and a rhythm required to make the transition from KD to field fire. This builds confidence prior to firing the exercises in firing tables 2 and 3, and identifies soldiers who are having difficulty and need reinforcement.

(2) Every firer is given 54 rounds of 5.56-ball ammunition with 18 rounds loaded into each of three separate magazines (one magazine per firing table). During firing tables 2 and 3, each soldier must demonstrate his ability to apply the fundamentals of marksmanship during the integrated act of firing by successfully detecting and engaging single timed targets. Each soldier must achieve 22 hits out of 36 timed target exposures.

b. **Field Fire II (Multiple or Single Timed Targets).** Field Fire II consists of three firing tables. Figure 6-3 shows the number of target exposures, target distance, and exposure times for each firing table. Firing tables 1 and 2 are fired from a supported firing position and firing table 3 is fired from the prone unsupported firing position.

FIRING TABLE 1			FIRING TABLE 2			FIRING TABLE 3		
ROUND	RANGE (M)	TIME (SEC)	ROUND	RANGE (M)	TIME (SEC)	ROUND	RANGE (M)	TIME (SEC)
1	175	5	1	175	7	1	75	6
2	175	7	2	75	10	2	175	8
3	75	11	3	300	-	3	75	13
4	300		4	75	9	4	300	
5	75	9	5	175	-	5	75	11
6	175		6	300	9	6	175	
7	75	10	7	75	9	7	75	12
8	300		8	175	-	8	300	
9	175	11	9	175	11	9	175	13
10	300		10	300	-	10	300	
			11	75	9	11	75	11
			12	175	-	12	175	
			13	175	11	13	175	8
			14	300	-	14	75	6
			15	75	5	15	75	11
			16	175	11	16	175	
			17	300	-	17	75	12
			18	75	9	18	300	
			19	175	-	19	75	11
			20	75	10	20	175	
			21	300	-	21	175	13
			22	175	7	22	300	

Figure 6-3. Field Fire II firing tables.

(1) Firing table 1, consisting of 10 targets, helps the firer practice shooting skills and develop a sense of timing and a rhythm required to make the transition from single timed targets to multiple or single timed fleeting combat targets. This builds confidence prior to firing the exercises in firing tables 2 and 3, and identifies soldiers who are having difficulty and need reinforcement.

(2) Every firer is given 54 rounds of 5.56-ball ammunition with 10 rounds loaded into one magazine (for firing table 1) and 22 rounds loaded into each of two separate magazines (for firing tables 2 and 3). During firing of tables 2 and 3, each soldier must demonstrate his ability to apply the fundamentals of marksmanship during the integrated act of firing by successfully detecting and engaging multiple and or single timed targets. Each soldier must achieve 27 hits out of 44 timed target exposures.

Section III. RECORD QUALIFICATION

Qualification ratings and first-time GO rates are important during record fire, if properly used. They provide goals for the soldier and aid the commander in identifying the quality of his training. This should be considered in the assignment of priorities, instructor personnel, and obtaining valuable training resources. The objective of record firing is to access and confirm the individual proficiency of firers and the effectiveness of the training program.

6-6. PRACTICE RECORD FIRE I AND II

Although the soldier receives a practice rating based on the number of target hits, practice record fire should also be considered a valuable training exercise. When practice record fire is correctly conducted, all soldiers gain valuable experience and become more confident in engaging combat targets (Figure 6-4).

Instructional Intent:
Reinforce PMI and KD firing and apply the techniques of target detection by engaging a more difficult course of fire, with increased time stress with single and multiple pop-up targets.
Special Instructions:
Ensure proper rear sight setting (M16A1=the unmarked aperture, short-range)
Ensure proper rear sight setting (M16A2/3=8/3, M16A4 and M4=6/3 flush).
Ensure the rear sight aperture is set on 300, not 800.
Ensure small aperture is being used.
Peer coaching is stressed (Practice Record Fire I)
Observables:
Soldiers are applying all aspects of BRM.
Soldiers hit 23 out of 40 target exposures.
Soldiers that do not meet the standard receive remedial training before re-firing.
Practice record fire should be conducted on a different range than record fire.

Figure 6-4. Practice record fire.

* a. **Concept**. During Practice Record Fire I and II, each firer receives 40 target exposures at ranges from 50 to 300 meters, and 40 rounds of 5.56-mm ammunition. Twenty rounds are fired from the prone supported firing position (or at the unit commander's discretion), the foxhole supported firing position. Ten rounds are fired from the prone unsupported firing position. Another ten rounds are fired from the kneeling firing position. Each soldier must hit a minimum of 23 out of 40 target exposures. The soldier must thoroughly understand and apply the fundamentals of marksmanship so he can accurately detect and engage combat targets on the battlefield. Coaching or assistance to firers is permitted only during Practice Record Fire I. If a firer consistently misses targets or experiences problems with target detection and range estimation, coaches should point out the shooting error to help correct it. Target detection is accomplished with a dry-fire scenario before engaging targets.

NOTES: 1. If possible, Practice Record Fire I and II should be fired on different ranges. Soldiers firing Practice Record Fire II on the same range as Practice Record Fire I must fire on a different lane.

2. Practice Record Fire I and II should closely resemble all aspects of actual qualification. Practice Record Fire I allows peer coaching and the use of dummy ammunition. Practice Record Fire II does not allow peer coaching and dummy ammunition will not be used.

* b. **Conduct of a Practice Record Fire Range.** The uniform for practice record fire is helmet, LBE/LBV, and Interceptor body armor with all SAPI plates. No other armor is required. During practice record fire, soldiers fire at 40 single or multiple target exposures. They are issued one 20-round magazine to be fired from the prone supported firing position or (at the unit commander's discretion), *the foxhole supported firing position. A 10-round magazine is fired from the prone unsupported firing position. Another 10-round magazine is fired from the kneeling unsupported firing position. Based on the total number of hits achieved in each table, soldiers are critiqued on the practice record fire score. Exposure times are three to seven seconds at ranges of 50 to 300 meters. Since it requires one to two seconds for the manually activated target mechanism to raise the target, timing begins when the target is fully exposed rather than when the tower operator activates the target switch. When practice record fire is conducted on the new family of automated record fire ranges, these factors are included in the computer program.

(1) ***Alibi Firing.*** Alibi firing should be conducted at the end of each firing table IAW tower operator commands. Alibis are provided during practice record fire for three reasons: malfunction of the rifle, malfunction of the target mechanism, or faulty ammunition.

(2) ***Range Training Areas.*** Three range training areas are as follows:

(a) *Orientation Area.* This area is located so firers cannot see the firing area. Practice record fire orientation includes conduct of fire, instructions on safety, and range operations (procedures in ready and retired areas).

(b) *Ready Area.* This area is near the firing range and located so firers cannot see targets on the range. The firer blackens the rifle sights, lubricates the rifle, and checks for defects that might cause malfunctions.

(c) *Retired Area.* This area is about 100 meters behind the ready area. Soldiers completing practice record fire move to the retired area to clean their rifles and be critiqued on their firing performance.

(3) ***Record of Performance.*** Practice record fire is conducted IAW DA Form 3595-R (Record Fire Scorecard). (See the back of the book after the index for a blank reproducible copy.)

6-7. PRACTICE RECORD FIRE STANDARDS

Accurate performance data are critical. The firer's score is recorded using the practice record fire scorecard, or automated by using a computer printout provided on the automated range. Based on the data recorded, an after-action review can be performed by range and firing position to discuss firing performance. A firer who fails to qualify on his first try should refire the practice record fire range after his problem has been diagnosed and remedial training provided. The following is a practice qualification rating:

- Marksman: Hits 23 to 29 targets.
- Sharpshooter: Hits 30 to 35 targets.
- Expert: Hits 36 to 40 targets.

6-8. RECORD FIRE

The intent of record fire is to facilitate the commander's evaluation of several individual tasks and integrated marksmanship skill performances, and to provide unit readiness indicators (Figure 6-5). The qualification standards are specifically related to a prescribed procedure for the conduct of record fire. Individual performance must be evaluated IAW three components:

- What test was used (standard, known-distance, or scaled)?
- How was the test administered?
- How were individual and unit performances distributed (23 to 40 or 26 to 40 for alternate), and at which target ranges?

Instructional Intent:
Reinforce all phases of BRM.
Allow soldiers to practice and refine critical marksmanship skills.
Measure the soldier's complete understanding of BRM.
Special Instructions:
Ensure proper rear sight setting (M16A1=the unmarked aperture, short-range).
Ensure proper rear sight setting to zero (M16A2/3=8/3, M16A4=6/3, M4=6/3).
Ensure the rear sight aperture is set on 300, not 800.
Ensure small aperture is being used.
Ensure that all targets are operational.
*Ensure each soldier has one 20-round magazine, and two 10-round magazines.
Observables:
Soldiers are applying all aspects of BRM.
Soldiers hit 23 out of 40 target exposures.
Soldiers that do not meet the standard receive remedial training before refiring.

Figure 6-5. Record fire.

a. **Concept**. Since all soldiers must fire the record fire course at least once a year for qualification, the course can provide excellent firing performance evaluations. It also provides excellent diagnostic information for instructor-trainers who are concerned with scheduling training to overcome the most serious firing weaknesses. The standard course should be used for all soldiers. There are times when a qualification exercise must be conducted on an alternate course.

(1) The following information concerning the development of the record fire course is provided to assist in understanding how standards were established.

(2) Testing and development indicates the soldier should hit at least 39 of 40 targets if he applies the marksmanship fundamentals correctly (assuming target mechanisms have been checked and are functioning). This probability of hit (PH) is

provided as a guide considering the capability of the typical rifle, ammunition, and soldier firing a standard course (Table 6-1).

RANGE (METERS)	PH	NUMBER OF TARGETS
50	1.0	05
100	1.0	09
150	1.0	10
200	.99	08
250	.95	05
300	.90	03

Table 6-1. Probability of hits.

(3) When the IET BRM POI or an adequate unit training program is conducted, the following PH can be expected (Table 6-2).

RANGE	TARGETS	LOW PH	AVERAGE PH	HIGH PH
50	5	.80	.95	.98
100	9	.70	.90	.95
150	10	.65	.90	.95
200	8	.45	.70	.90
250	5	.35	.60	.85
300	3	.25	.50	.80
		23 hits	32 hits	37 hits

Table 6-2. Results from an adequate unit training program.

(4) The first task on a standard record fire course is to ensure all targets function properly. When in doubt, a lane should be fired to ensure a bullet strike will activate each target. Sometimes slapping a target with a cleaning rod can cause it to activate, but a bullet will not. When it is hot, plastic targets may allow the 5.56-mm bullet to pass through without causing sufficient vibration to activate the mechanism, resulting in a requirement to change targets more often, to use double targets, or to use different silhouettes for a positive indication of hits.

* b. **Conduct of Record Fire Range.** The record fire course provides for the engagement of one 20-round exercise, and two10-round exercises. Twenty single or multiple targets are engaged from the prone supported or (at the unit commander's discretion) the foxhole supported firing position; 10 targets are engaged from the prone unsupported position; and 10 targets are engaged from the kneeling position. Once firing begins, no cross-loading of ammunition is allowed. The uniform for qualification is helmet, LBE/LBV, and Interceptor body armor with all SAPI plates. No other armor is required.

* (1) **Table 1**. **Prone Supported Firing Position** (or at the unit commander's discretion) **Foxhole Supported Firing Position**. The firer is given one 20-round magazine to engage 20 targets at various ranges

* (2) **Table 2**. **Prone Unsupported Firing Position**. The firer is given one 10-round magazine to engage 10 targets at various ranges.

* (3) **Table 3**. **Kneeling Unsupported Firing Position**. The firer is given one 10-round magazine to engage 10 targets at various ranges.

(4) Credit for targets hit should not be given when rounds are "saved" from difficult targets to be used on easier targets. (Example: not firing at the 300-meter target so an additional round can be fired at the 150-meter target.) When double targets are exposed, the soldier should fire two rounds. If the first target is missed, he may fire at that same target with the second round.

(5) Engage the target that poses the greatest threat first (normally assumed to be the closer target). No scoring distinction is made between near targets and far targets or the sequence in which they are engaged. Credit is not given if unused ammunition from one 20-round table is added to a magazine provided for the next table.

(6) Soldiers who fail to qualify on the first attempt should be given appropriate remedial training and allowed to refire in a few days. When a soldier refires the course, he remains unqualified with a score of 22 target hits or less. A rating of marksman is awarded for a score of 23 to 40 target hits. When automated scoring procedures are available that allow the performance of the soldier to be stored and retrieved before a weapon malfunction, his performance is added to the score of his first attempt after weapon repair and refire. If a soldier's weapon becomes inoperable and his performance before a malfunction precludes qualification, he is considered unqualified and must refire.

(7) Alibi firing is reserved for soldiers who encounter a malfunctioning target, ammunition, or rifle. A soldier will not be issued more than 20 rounds for Table 1, 10 rounds for Table 2, or 10 rounds for Table 3. Soldiers who fire 20 rounds, despite a target malfunction, will not be issued additional alibi rounds. There are no alibis for soldier-induced weapon malfunctions or for targets missed during application of immediate action. These procedures must be strictly adhered to when a malfunction occurs.

NOTE: The ammunition procedures, allocation, and alibi procedures for practice record fire and record fire are conducted the same. The only exception is that coaching is authorized for practice record fire.

(a) The soldier must apply immediate action and continue to fire the exercise. After firing, the soldier notifies the NCOIC to determine if the ammunition was faulty or if the target malfunctioned.

(b) The NCOIC verifies the malfunction. The soldier is permitted to fire at that target(s) with the exact number of rounds equal to the target malfunctions. For example, the soldier had two confirmed target malfunctions at 250 meters. Although he may have had five rounds left from the overall exercise. The soldier would be given only two rounds to engage the two 250-meter target exposures, if repaired, or the next closer target. He would not be allowed to fire all remaining five rounds at the two 250-meter target exposures.

(c) The NCOIC or scorer monitoring the lane must verify the target malfunction. The soldier continues to fire the exercise. On a computerized range, the tower operator confirms which target and how many malfunctions occurred.

(d) Inoperable weapons are uncorrectable malfunctions such as a broken firing pin, jam caused by double feed not caused by the soldier, failure to extract due to broken extractor, or round in the bore. The soldier must apply correct immediate action to eliminate the stoppages. If the stoppage is determined to be correctable for example, the soldier did not apply correct immediate action and as a result the soldier did not engage the required number of targets, he is at fault.

(e) Qualified weapons personnel or the NCOIC must verify weapon malfunctions before the soldier can refire the course. Soldiers who erroneously claim a malfunction on the firing line are considered unqualified and refire as a second-time firer.

(f) On-site observation, detailed analysis and evaluation of individual results, and unit performance identify weaknesses. Training can then focus on combat tasks, skills, or other factors that address these weaknesses. For example, rifles that are not serviceable could be the cause of poor zeroes or failures to fire and, therefore, failures to qualify. Some soldiers may not qualify because of a lack of understanding of immediate-action procedures or maintenance of the rifle and magazine. Soldiers who miss targets are not applying the four fundamentals or are not accurately zeroing the rifle. Soldiers who do not fire at exposed targets during qualification may indicate:

- Failure to scan the designated area.
- Lack of ability to detect targets.
- Lack of ability to shift from one target to another.
- Failure to manage ammunition.
- A stoppage.

* (8) The record fire range is fired IAW DA Form 3595-R (Record Fire Scorecard). (See Appendix B for a completed scorecard example.)

c. **Qualification Standards.** To achieve the lowest possible individual qualification rating, a soldier must achieve a minimum score of 23 target hits on a standard record fire range. The following are the qualification ratings:

- Expert: Hits 36 to 40 targets.
- Sharpshooter: Hits 30 to 35 targets.
- Marksman: Hits 23 to 29 targets.

6-9. ALTERNATE QUALIFICATION COURSES

Units should conduct rifle qualification on a standard record fire range. Convenience and comfort should not be the prime consideration when choosing a range. The KD alternate course is used by all components of the Regular Army, US Army Reserve, and Army National Guard when a standard record fire range is not available. The 25-meter alternate course is used when neither a standard record fire or KD range is available for rifle qualification. Units are permitted to use the 15-meter scaled alternate course only if a 25-meter range is not available.

***NOTE:** The uniform for the alternate qualification course is helmet, LBE/LBV, and Interceptor body armor with all SAPI plates. No other armor is required.

NOTE: The official records of personnel who are using an alternate qualification course are noted to distinguish alternate qualification ratings from standard record fire course ratings. For example, official personnel records are annotated as follows:
JONES, John Q. 000-00-0000 Expert 36 (RF)
JONES, John Q. 000-00-0000 Expert 38 (KDAC)
JONES, John Q. 000-00-0000 Expert 38 (AC)

a. **25-Meter Alternate Course.** The 25-meter alternate course provides a way for units to test a soldier's rifle marksmanship proficiency.

(1) A soldier undergoing rifle qualification should first confirm the zero on his rifle before engaging the alternate course. The zero may be confirmed with the 25-meter battlesight zero procedure of six sighter rounds, which are fired in the prone supported position. Sighter rounds do not count for score. Training or sustainment ammunition is used for sighter rounds if a zeroing exercise is not conducted the day of record fire.

(2) Firing at scaled silhouettes gives the soldier the chance to engage targets with time limits and feedback. Engaging targets at 25 meters precludes any training value received on target detection or the effects of wind and gravity, which is learned when firing at longer distances. Rifle qualification requirements are scheduled on the 25-meter alternate course when a standard record fire or KD range is not available. The alternate course is an eight-hour course of instruction with four hours for 25-meter zeroing and four hours for record fire.

NOTE: If zeroing/grouping exercises are not performed on the day of record fire, six rounds of training/sustainment ammunition will be fired for 25-meter zero confirmation prior to conducting the qualification course.

* b. **Conduct of Fire.**

* (1) **Table 1. Prone Supported or Foxhole Supported Firing Position.** The firer is given one 20-round magazine to engage 10 silhouettes on the target. Table includes two rounds for each silhouette from the prone supported position. Firing must be completed within 120 seconds. No more than two hits for each silhouette are scored.

***NOTE:** The foxhole supported firing position may be substituted for the prone supported position at the unit commander's discretion.

* (2) **Table 2. Prone Unsupported Firing Position.** The firer is given one 10-round magazine to engage 10 silhouettes on the same target sheet. Table includes one round for each silhouette from the prone unsupported position. Firing must be completed within 60 seconds. No more than one hit for each target will be scored from the prone unsupported position.

* (3) **Table 3. Kneeling Position.** The firer is given a final 10-round magazine to engage 10 silhouettes on the same target sheet. Table includes one round for each silhouette from the kneeling position. Firing must be completed within 60 seconds. No more than one hit for each target is scored from the kneeling position.

***NOTE:** Firers should engage targets on the sheet left to right, from the nearest to the farthest away target (50m, 100m left, 100m center, 100m right, 150m left, 150m right, 200m left, 200m right, 250m, and 300m last). This "guideline" for target engagement is intended to ensure firers do not forget which targets they engaged during qualification. It also alleviates the possibility of shooting each target more than the prescribed amount of times.

* (4) The time between each firing position is not specified, but enough time should be allotted to allow the firer to clear his weapon, quickly change firing positions, and reload before the beginning of the next firing table. The RSO will ensure enough time is given between each change in firing positions to facilitate the timely flow of the record fire qualification table.

* c. **Scoring.** The same target sheet is used for every 40-round qualification table a firer completes.

(1) One hit is awarded for each round that strikes within or touches some part of the silhouette. A maximum of four hits for each silhouette on the same target sheet are scored.

* (2) Scorecard DA FORM 5790-R will be used to score alternate course record fire qualifications. The NSN for the scaled silhouette target are: 25m, NSN # 6920-01-167-1398, and 15m, NSN # 6920-01-1396. The alternate course will be used only when standard record fire and known distance ranges are unavailable.

d. **Qualification Standards.** The chief range officer briefs all soldiers on the proper scoring procedures. The firing line safety crew—

- Performs as scorers.
- Informs the chief range officer of crossfires.
- Informs the chief range officer of allowable alibis.
- Accurately counts hits and misses. A hit is any bullet hole that is either completely in or touches some part of the scaled silhouette. If a bullet hole does not touch some part of the scaled silhouette, it is counted as a miss. Ricochets are counted as hits or misses.
- *Counts only four hits for each silhouette for score.
- Completes the scorecard.
- Assists the soldier with target repair.
- Totals, signs, and returns the completed scorecard to the chief range officer.

(1) Qualification ratings for the alternate course follow:

- Expert: Hits 38 to 40 targets.
- Sharpshooter: Hits 33 to 37 targets.
- Marksman: Hits 26 to 32 targets.
- Unqualified: Hits 25 and below.

* (2) These courses are fired IAW DA Form 5790-R (Record Firing Scorecard-Scaled Target Alternate Course). (See Appendix B for an example of a completed scorecard.)

CHAPTER 7

ADVANCED RIFLE MARKSMANSHIP (Phase IV of Basic Rifle Marksmanship)

*The procedures and techniques for implementing the Army rifle marksmanship training program are based on all soldiers understanding common firing principles, being proficient marksmen, and being confident in applying their firing skills in combat. During preliminary marksmanship instruction, instructors-trainers emphasize initial learning by reviewing, reinforcing, and practicing the basics. This chapter concentrates on advanced techniques and procedures the soldier will need to participate in collective training during unit live-fire training exercises. Areas discussed in this chapter include advanced firing positions; combat *firing techniques; chemical, biological, radiological, and nuclear (CBRN) firing; unassisted night fire; moving target engagement; short-range marksmanship (SRM) training; and squad designated marksman (SDM) training.*

NOTE: The unit METL and STRAC allocation will determine which ARM tasks will be trained.

Section I. ADVANCED FIRING POSITIONS

After mastering the four marksmanship fundamentals in the basic firing positions, the next step is to master the four fundamentals while firing from a variety of advanced firing positions. The following paragraphs demonstrate the most common firing positions a soldier may be required to fire from. The firer's position may change but the application of the remaining three fundamentals applied from a stable position never changes. Ultimately, any firing position that aids the firer in applying the fundamentals is acceptable, as long as it is applied consistently each time it is used to avoid changing the firer's sight picture.

7-1. ALTERNATE PRONE FIRING POSITION

This position is an alternative to both prone supported and unsupported firing positions (Figure 7-1). The firer can assume a comfortable position while maintaining the same relationship between his body and the axis of the rifle. This position relaxes the stomach muscles and allows the firer to breathe naturally.

Figure 7-1. Alternate prone firing position.

7-2. KNEELING SUPPORTED FIRING POSITION

This position allows the soldier to obtain the height necessary to observe many target areas, taking advantage of available cover (Figure 7-2). Solid cover that can support any part of the body or rifle assists in firing accuracy.

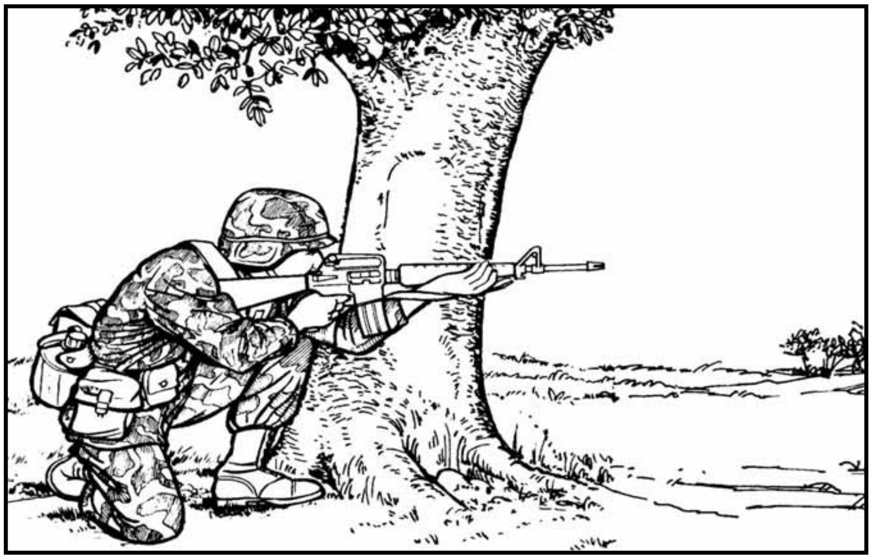


Figure 7-2. Kneeling supported firing position.

7-3. KNEELING UNSUPPORTED FIRING POSITION

This position is assumed quickly, places the Soldier high enough to see over small brush, and provides a stable firing position (Figure 7-3). The nonfiring elbow should be pushed forward of the knee so the upper arm is resting on a flat portion of the knee to provide stability. The trailing foot should be placed in a comfortable position.

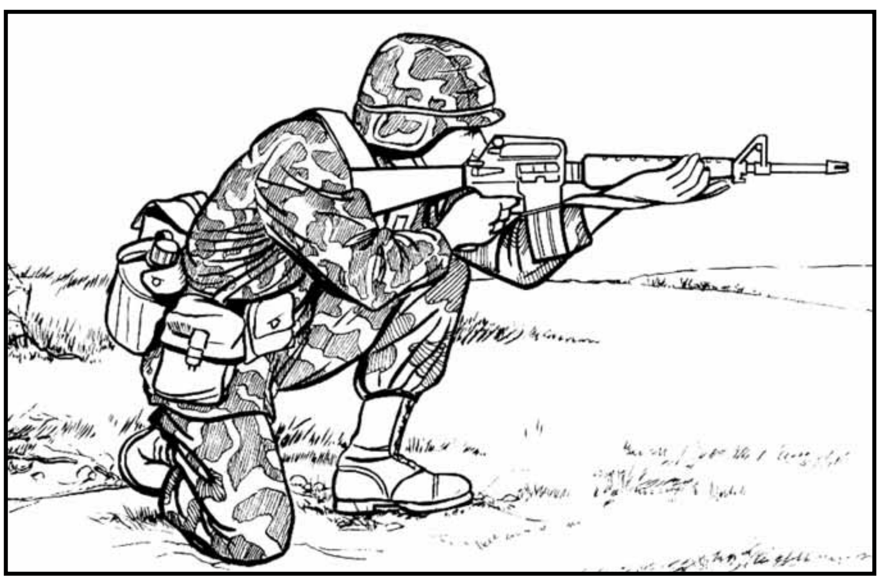


Figure 7-3. Kneeling unsupported firing position.

7-4. STANDING FIRING POSITION

To assume the standing firing position, the soldier faces his target, executes a facing movement to his firing side, and spreads his feet a comfortable distance apart (Figure 7-4). With his firing hand on the pistol grip and his nonfiring hand on either the upper handguard or the bottom of the magazine, the soldier places the butt of the rifle in the pocket formed by his firing shoulder so the sights are level with his eyes. The weight of the rifle is supported by the firing shoulder pocket and nonfiring hand. The soldier shifts his feet until he is aiming naturally at the target and his weight is evenly distributed on both feet. The standing position provides the least stability but could be needed for observing the target area since it can be assumed quickly while moving. Support for any portion of the body or rifle improves stability. More stability can be obtained by adjusting the ammunition pouch to support the nonfiring elbow, allowing the rifle magazine to rest in the nonfiring hand.

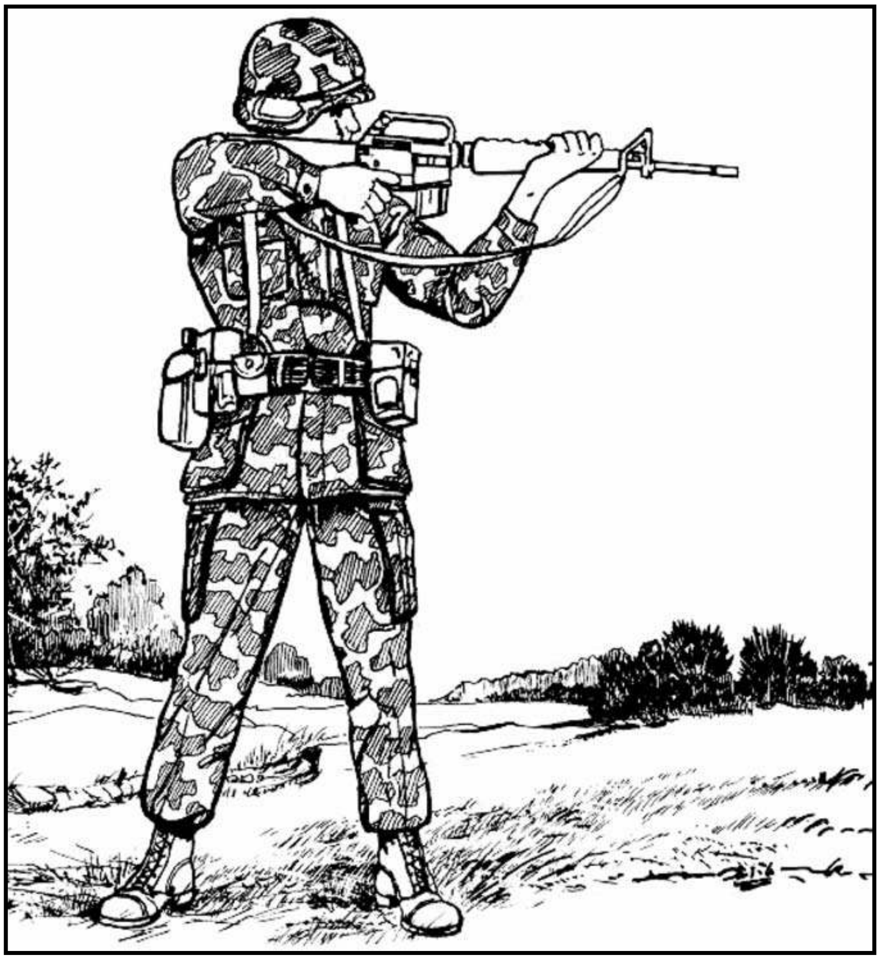


Figure 7-4. Standing firing position.

7-5. MODIFIED SUPPORTED FIRING POSITION

Once the basic firing skills have been mastered during initial training, the soldier should be encouraged to modify positions, to take advantage of available cover, to use anything that helps to steady the rifle, or to make any change that allows him to hit more combat targets. The modified prone firing position uses sandbags to support the handguard and frees the nonfiring hand to be used on any part of the rifle to hold it steady (Figure 7-5).

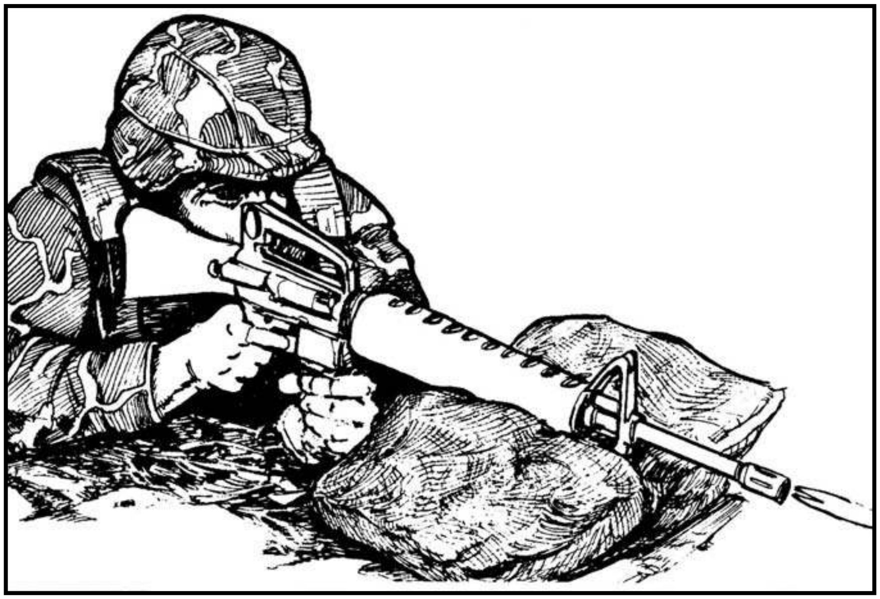


Figure 7-5. Modified supported firing position.

7-6. URBAN OPERATIONS FIRING POSITIONS

Although the same principles of rifle marksmanship apply, the selection and use of firing positions during urban operations (UO) requires some special considerations. Firing from around corners could require the soldier to fire from the opposite shoulder to avoid exposing himself to enemy fire.

a. The requirement for long-range observation can dictate that positions be occupied that are high above ground. Figure 7-6 shows a soldier firing over rooftops, exposing only the parts of his body necessary to engage a target.

b. Figure 7-7 shows a soldier firing around obstacles. Figure 7-8 (page 7-6) highlights the requirements for cover and rifle support and the need to stay in the shadows when firing from windows while making sure the muzzle of the rifle does not protrude out of the opening.

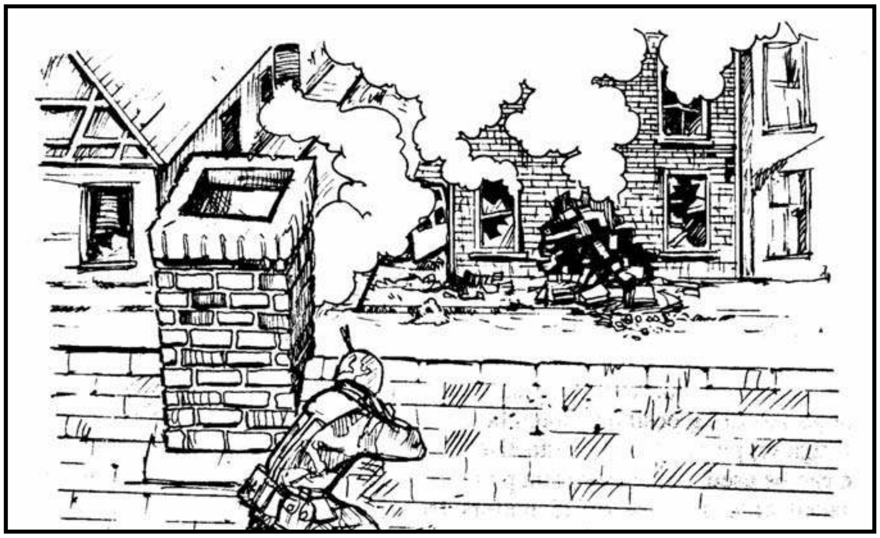


Figure 7-6. Firing over rooftops.

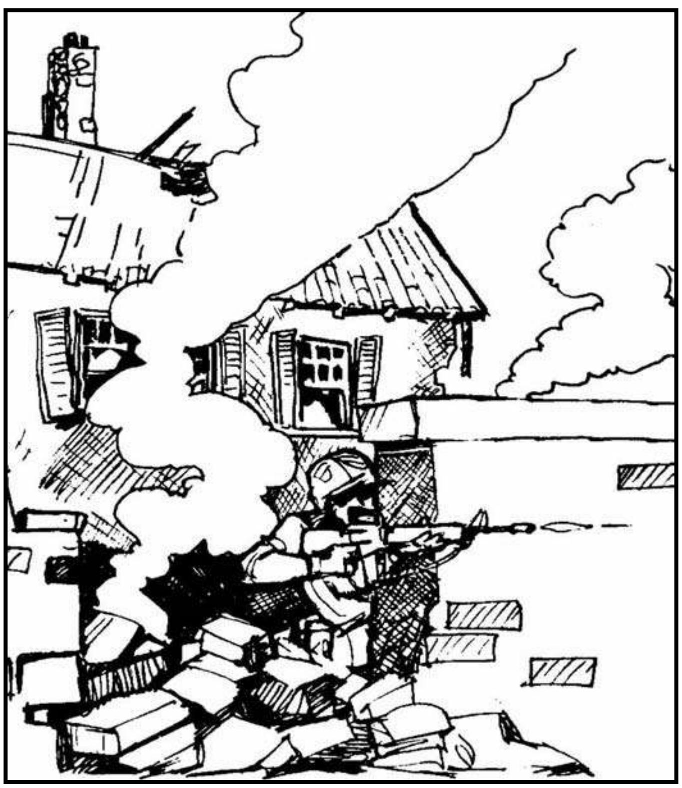


Figure 7-7. Firing around obstacles.

Figure 7-8. Firing from windows.

c. With minor modifications, the dry-fire exercises taught during preliminary marksmanship instruction can effectively train and evaluate a soldier's ability to apply the fundamentals while in advanced firing positions. Repetitive training (muscle memory) will make the soldier knowledgeable in the types of corrections needed to keep the same point of aim consistently in all of the different firing positions. This increases first time target hits and soldier survivability.

7-7. MODIFIED AUTOMATIC AND BURST FIRE POSITION

Maximum use of available artificial support is necessary during automatic or burst fire. The rifle should be gripped more firmly and pulled into the shoulder more securely than when firing in the semiautomatic mode. This support and increased grip help offset the progressive displacement of weapon-target alignment caused by recoil. To provide maximum stability, prone and supported positions are best when firing the M16-/M4-series weapon in the automatic or burst fire mode. (If the weapon is equipped with the RAS, the use of the vertical pistol grip can further increase the control the soldier has over the weapon.) Figure 7-9 demonstrates three variations that can be used when firing in automatic or burst fire. The first modification shown involves forming a 5-inch loop with the sling at the upper sling swivel, grasping this loop with the nonfiring hand, and pulling down and to the rear while firing. The second modification involves grasping the small of the stock with the nonfiring hand and applying pressure down and to the rear while firing. The third modification shown is the modified machinegun position when a bipod is not available. Sandbags may be used to support the rifle. The nonfiring hand may be positioned on the rifle wherever it provides the most stability and flexibility. The goal is to maintain weapon stability and minimize recoil.

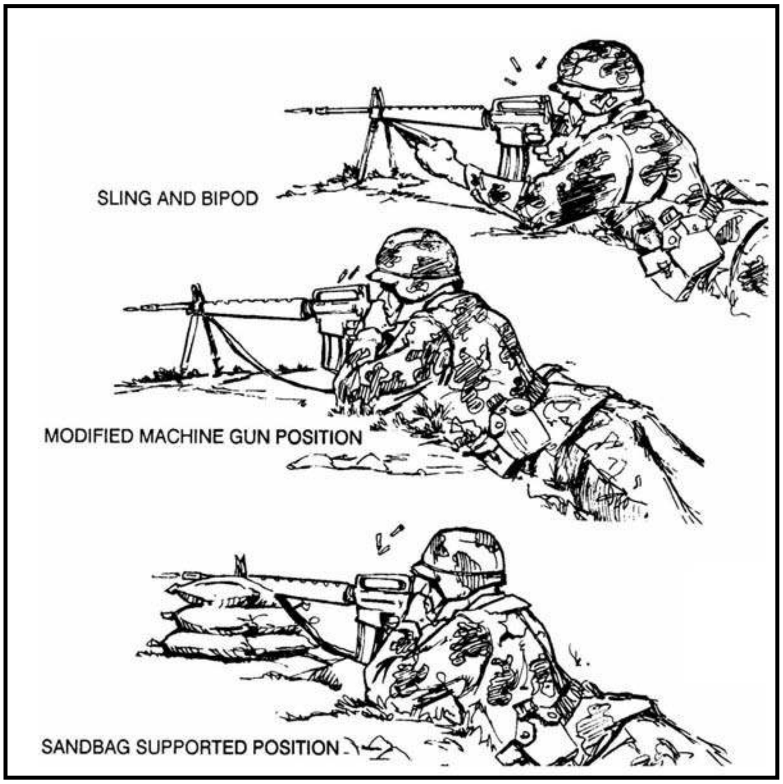


Figure 7-9. Modified automatic and burst fire positions.

Section II. COMBAT FIRE TECHNIQUES

The test of a soldier's training is applying the fundamentals of marksmanship and firing skills in combat. The marksmanship skills mastered during training, practice, and record fire exercises must be applied to many combat situations (attack, assault, ambush, UO). Although these situations present problems, only two modifications of the basic techniques and fundamentals are necessary: changes to the rate of fire and alterations in weapon-target alignment. The necessary changes are significant and must be thoroughly taught and practiced before discussing live-fire exercises.

7-8. RAPID SEMIAUTOMATIC FIRE

The most important firing technique during modern, fast moving combat is rapid semiautomatic fire. Rapid-fire techniques are the key to hitting the short exposure, multiple, or moving targets described previously. If properly applied, rapid semiautomatic fire delivers a large volume of effective fire into a target area. The soldier intentionally fires a quick series of shots into the target area to assure a high probability of a hit. (Figure 7-10, page 7-8 shows the current training program for rapid semiautomatic fire.)

Instructional Intent:
Soldiers learn to engage targets using rapid semiautomatic fire and practice rapid magazine changes.
Special Instructions:
Ensure M16A1 rear sight is set on the unmarked aperture.
Ensure M16A2/A3/A4 and M4 series weapon's rear sight is set on the 0-2 aperture.
Use a 25-meter alternate course C qualification target.
Ensure soldier is in a proper supported firing position.
Soldier is given four 5-round magazines of 5.56ammunition.
Soldier fires one round at each of the 10 silhouettes on the alternate course C qualification target.
Soldier does a rapid magazine change after each magazine is fired.
Soldier uses rapid semiautomatic fire to engage targets.
The first iteration of 10 rounds is fired in a time limit of 40 seconds.
The second iteration of 10 rounds is fired in a time limit of 30 seconds.
Each target is inspected and posted after each iteration.
Observables:
Coaches are analyzing the firer's fundamentals continuously.
Each soldier must obtain 14 silhouette target hits.

Figure 7-10. Rapid semiautomatic fire training program.

a. **Effectiveness of Rapid Fire.** When a soldier uses rapid semiautomatic fire properly, he sacrifices some accuracy to deliver a greater volume of effective fire to hit more targets. It is surprising how devastatingly accurate rapid fire can be. At ranges beyond 25 meters, rapid semiautomatic fire is superior to automatic fire in all measures (shots per target, trigger pulls per hit, and even time to hit). The decrease in accuracy when firing faster is reduced with proper training and repeated practice.

b. **Control of Rapid Semiautomatic Fire.** With proper training, the soldier can properly select the appropriate mode of fire; semiautomatic fire, rapid semiautomatic fire, or automatic/burst. Leaders must assure proper fire discipline at all times. Even in training, unaimed fire must never be tolerated, especially unaimed automatic fire.

c. **Modifications for Rapid Fire.** Increases in speed and volume should be sought only after the soldier has demonstrated expertise and accuracy during slow semiautomatic fire. The rapid application of the four fundamentals will result in a well-aimed shot every one or two seconds. This technique of fire allows a unit to place the most effective volume of fire in a target area while conserving ammunition. It is the most accurate means of delivering suppressive fire. Trainers must consider the impact of the increased rate of fire on the soldier's ability to properly apply the fundamentals of marksmanship and other combat firing skills. These fundamentals and skills include:

(1) ***Marksmanship Fundamentals.*** The four fundamentals are used when firing in the rapid semiautomatic mode. The following differences apply:

(a) *Steady Position.* Good support improves accuracy and reduces recovery time between shots. A somewhat tighter grip on the hand guard assists in recovery time and in rapidly shifting or distributing fire to subsequent targets. When possible, the rifle should pivot at the point where the non-firing hand meets the support. The soldier should avoid changing the position of the non-firing hand on the support, because it is awkward and time consuming when rapidly firing a series of shots.

(b) *Aiming.* Sighting and stock weld do not change during rapid semiautomatic fire. The firer's head remains on the stock for every shot, his firing eye is aligned with the rear aperture, and his focus is on the front sight post. In slow fire, the soldier seeks a stable sight picture. In the fast moving situations requiring rapid semiautomatic fire, the soldier must accept target movement, and unsteady sight picture, and keep firing into the target area until the target is down or there is no chance of a hit. Every shot must be aimed.

(c) *Breath Control.* Breath control must be modified because the soldier does not have time to take a complete breath between shots. He must hold his breath at some point in the firing process and take shallow breaths between shots.

(d) *Trigger Squeeze.* To maintain the desired rate of fire, the soldier has only a short period to squeeze the trigger (one well-aimed shot every one or two seconds). The firer must cause the rifle to fire in a period of about one-half of a second or less and still not anticipate the precise instant of firing. It is important that initial trigger pressure be applied as soon as a target is identified and while the front sight post is being brought to the desired point of aim. When the front sight post reaches the point of aim, final pressure must be applied to cause the rifle to fire almost at once. This added pressure, or final trigger squeeze, must be applied without disturbing the lay of the rifle. Repeated dry-fire training, using the Weaponeer device, and live-fire practice ensure the soldier can squeeze the trigger and maintain a rapid rate of fire consistently and accurately.

NOTE: The soldier can increase the firing rate by firing, then releasing just enough pressure on the trigger to reset the sear, then immediately fire the next shot. This technique eliminates some of the time used in fully releasing the pressure on the trigger. It allows the firer to rapidly deliver subsequent rounds. Training and practice sessions are required for soldiers to become proficient in the technique of rapid trigger squeeze.

(2) ***Immediate Action.*** To maintain an increased rate of suppressive fire, immediate action must be applied quickly. The firer must identify the problem and correct the stoppage immediately. Repeated dry-fire practice, using blanks or dummy rounds, followed by live-fire training and evaluation ensures that soldiers can rapidly apply immediate action while other soldiers initiate fire.

d. **Rapid-Fire Training.** Soldiers should be well trained in all aspects of slow semiautomatic firing before attempting any rapid-fire training. Those who display a lack of knowledge of the fundamental skills of marksmanship should not advance to rapid semiautomatic training until these skills are learned and mastered. Initial training should focus on the modifications to the fundamentals and other basic combat skills necessary during rapid semiautomatic firing.

(1) ***Dry-Fire Exercises.*** Repeated dry-fire exercises are the most efficient means available to ensure soldiers can apply modifications to the fundamentals. Multiple dry-fire exercises are needed, emphasizing a rapid shift in position and point of aim, followed by breath control and fast trigger squeeze. Blanks or dummy rounds may be used to train rapid magazine changes and the application of immediate action. The soldier should display knowledge and skill during these dry-fire exercises before attempting live fire.

(2) ***Live-Fire Exercises.*** There are two types of live-fire exercises.

(a) *Individual.* Emphasis is on each soldier maintaining a heavy volume of accurate fire. Weapon downtime (during immediate action and rapid magazine changes) is kept to a minimum. Firing should begin at shorter ranges, progressing to longer ranges as soldiers display increased proficiency. Exposure or engagement times are shortened and the number of rounds increased to simulate the need for a heavy volume of fire. Downrange feedback is necessary to determine accuracy of fire.

(b) *Collective.* Rapid semiautomatic fire should be the primary means of delivering fire during a collective live-fire exercise (LFX). It is the most accurate technique of placing a large volume of fire on poorly defined targets or target areas. Emphasis should be on staggered rapid magazine changes, maintaining a continuous volume of fire, and conserving ammunition.

7-9. AUTOMATIC OR BURST FIRE

Automatic or burst fire delivers the maximum amount of rounds to a target area. It should be trained only after the soldier has demonstrated expertise during slow and rapid semiautomatic fire. Automatic or burst fire involves the rapid application of the four fundamentals while delivering from one to three rounds per second into a designated area. This technique of fire allows a unit to place the most fire in a target area (when conserving ammunition is not a consideration). It is a specialized technique of delivering suppressive fire and may not apply to most combat engagements. The M16A1/A3 and M4A1 rifle has a full automatic setting. (The M16A2/A4 and M4 use a three-round burst capability.) Soldiers must be taught the advantages and disadvantages of automatic firing so they know when it should be used. Without this knowledge in a life-threatening situation the soldier will tend to switch to the automatic or burst mode, which can be effective in some situations. It is vital for the unit to train and practice the appropriate use of automatic or burst fire. (Figure 7-11 shows the current training program for automatic or burst fire.)

Instructional Intent:
Soldiers learn the advantages and disadvantages of automatic or burst fire.
Special Instructions:
Ensure M16A1 rear sight is set on the unmarked aperture.
Ensure M16A2/A3/A4 and M4 series weapon's rear sight is set on the 0-2 aperture.
Use a 25-meter alternate course C qualification target.
Ensure soldier is in a proper modified automatic/burst firing position.
Soldier is given two 15-round magazines of 5.56mm ammunition.
Soldier fires one 3-round burst at each of the 10 silhouettes on the alternate course C qualification target.
Soldier does a rapid magazine change after each magazine is emptied.
Observables:
Soldier obtains five target hits.
Soldier demonstrates control of the weapon in the automatic/burst role.

Figure 7-11. Automatic or burst fire training program.

a. **Effectiveness of Automatic or Burst Fire.** Automatic or burst fire is inherently less accurate than semiautomatic fire. The first full-automatic shot fired may be on target, but recoil and a high-cyclic rate of fire often combine to place subsequent rounds far from the desired point of impact. Even controlled (three-round burst) automatic or burst fire may place only one round on the target. Because of these inaccuracies, it is difficult to evaluate the effectiveness of automatic or burst fire, and even more difficult to establish absolute guidelines for its use.

(1) Closely spaced multiple targets, appearing at the same time at 50 meters or closer, may be engaged effectively with automatic or burst fire. More widely spaced targets appearing at greater distances should be engaged with semiautomatic fire.

(2) The M16-series rifles and the M4-series should normally be employed in the semiautomatic mode. Depending on the tactical situation, the following conditions would be factors against the use of automatic or burst fire:

- Ammunition is in short supply or resupply may be difficult.
- Single targets are being engaged.
- Widely spaced multiple targets are being engaged.
- The distance to the target is beyond 50 meters.
- The effect of bullets on the target cannot be observed.
- Artificial support is not available.
- Targets may be effectively engaged using semiautomatic fire.

(3) In some combat situations, the use of automatic or burst fire can improve survivability and enhance mission accomplishment. Clearing buildings, final assaults, FPF, and ambushes may require limited use of automatic or burst fire. Depending on the tactical situation, the following conditions may favor the use of automatic or burst fire:

- Enough available ammunition. Problems are not anticipated with resupply.
- Closely spaced multiple targets appear at 50 meters or less.
- Maximum fire is immediately required at an area target.
- Tracers or some other means can be used to observe the effect of bullets on the target.
- Leaders can maintain adequate control over weapons firing on automatic.
- Good artificial support is available.
- The initial sound of gunfire disperses closely spaced targets.

(4) Trainers must ensure soldiers understand the capabilities and limitations of automatic or burst fire. They must know when it should and should not be used.

b. **Modifications for the Automatic or Burst Fire Position.** Trainers must consider the impact of the greatly increased rate of fire on the soldier's ability to properly apply the fundamentals of marksmanship and other combat firing skills. These fundamentals and skills include:

(1) ***Immediate Action.*** To maintain automatic or burst fire, immediate action must be applied quickly. The firer must identify the problem and correct it immediately. Repeated dry-fire practice, using blanks or dummy rounds, followed by live-fire training and evaluation, ensures soldiers can rapidly apply immediate action.

(2) ***Marksmanship Fundamentals.*** The four fundamentals are used when firing in the automatic mode. The following differences apply:

(a) *Steady Position.* Maximum use of available artificial support is necessary during automatic or burst fire. The rifle should be gripped more firmly and pulled into the shoulder more securely than when firing in the semiautomatic mode. This support and increased grip help offset the progressive displacement of weapon-target alignment caused by recoil. To provide maximum stability, prone and supported firing positions are best (see Figure 7-9, page 7-8). One possible modification involves forming a 5-inch loop with the sling at the upper sling swivel, grasping this loop with the nonfiring hand, and pulling down and to the rear while firing. Another modification involves grasping the small of the stock with the nonfiring hand and applying pressure down and to the rear while firing. If a bipod is not available, sandbags may be used to support the rifle. The nonfiring hand may be positioned on the rifle wherever it provides the most stability and flexibility. The goal is to maintain weapon stability and minimize recoil.

NOTE: If the weapon is equipped with the RAS, using the vertical pistol grip can further increase the control the soldier has over the weapon.

(b) *Aiming.* The aiming process does not change during automatic or burst fire. The firer's head remains on the stock, his firing eye stays aligned with the rear sight aperture, and his focus is on the front sight post. Although recoil may disrupt this process, the firer must try to apply the aiming techniques throughout recoil.

(c) *Breath Control.* Breath control must be modified because the firer will not have the time to breathe between shots. He must hold his breath for each burst and adapt his breathing cycle, taking breaths between bursts.

(d) *Trigger Squeeze.* Training and repeated dry-fire practice will aid the soldier in applying proper trigger squeeze during automatic firing. Live-fire exercises will enable him to improve this skill.

- M16A1. Trigger squeeze is applied in the normal manner up to the instant the rifle fires. Because three-round bursts are the most effective rate of fire, pressure on the trigger should be released as quickly as possible. The index finger should remain on the trigger, but a quick release of pressure is necessary to prevent an excessive number of rounds from being fired in one burst. With much dry-fire practice, the soldier can become proficient at delivering three-round bursts with the squeeze-release technique.
- M16A2/3/4 and M4-series weapons. Trigger squeeze is applied in the normal manner up to the instant the rifle fires. Using the burst-mode, the firer holds the trigger to the rear until three rounds are fired. He then releases pressure on the trigger until it resets, then reapplies pressure for the next three-round burst.

NOTES:
1. The trigger is not slapped or jerked. It is squeezed and pressure is quickly released.
2. Depending on the position of the burst cam when the selector is moved to the burst mode, the rifle may fire one, two, or three rounds when the trigger is held to the rear the first time. If the rifle fires only one or two rounds, the firer must quickly release pressure on the trigger and squeeze again, holding it to the rear until a three-round burst is completed.

c. **Magazine Changes.** Rapid magazine changes are vital in maintaining automatic or burst fire.

d. **Training of Automatic or Burst Fire Techniques.** Initial training should focus on the modifications to the fundamentals and other basic combat skills necessary during automatic firing. Repeated dry-fire exercises are the most efficient means available to ensure soldiers can apply these modifications. Multiple dry-fire exercises are needed, emphasizing a stable position and point of aim, followed by breath control and the appropriate trigger squeeze. Blanks or dummy rounds may be used to train trigger squeeze, rapid magazine changes, and application of immediate action. The soldier should display knowledge and skill during these exercises before attempting live fire.

NOTE: Soldiers should be well trained in all aspects of slow semiautomatic firing before attempting any automatic training. Those who display a lack of knowledge of fundamental skills should not advance to automatic or burst fire training until these skills are learned.

7-10. SUPPRESSIVE FIRE

In many tactical situations, combat rifle fire will be directed to suppress enemy personnel or weapons positions. Suppressive fire is rifle fire precisely aimed at a definite point or area target. Some situations may require a soldier to place suppressive fire into a wide area such as a wood line, hedgerow, or small building while, at other times, the target may be a bunker or window. Suppressive fire is used to control the enemy and the area he occupies. It is employed to kill the enemy or to prevent him from observing the battlefield or effectively using his weapons. When a sustained volume of accurate suppressive fire is placed on enemy locations to contain him, it can be effective even though he cannot be seen. Effectively pinning the enemy down behind cover reduces his ability to deliver fire and allows friendly forces to move. (Figure 7-12 shows the current training program for suppressive fire.)

Instructional Intent:
Soldier learns to suppress targets using suppressive fire.
Special Instructions:
Ensure M16A1 rear sight is set on the unmarked aperture.
Ensure M16A2/A3/A4 and M4 series weapon's rear sight is set on the 0-2 aperture.
Ensure the 25-meter scaled landscape target is used.
Soldier is given two 9-round magazines and one 12-round magazine of 5.56mm-ball ammunition.
Ensure soldier is in a proper supported firing position.
Soldier fires 9 rounds at the "open window" area of the target using rapid semiautomatic fire with the first 9-round magazine.
Soldier fires 12 rounds at the "fence or hedgerow" area of the target using rapid semiautomatic fire with the 12-round magazine.
Soldier fires three 3-round bursts at the "tank turret" area of the target using the automatic/burst mode of the weapon with the second 9-round magazine.
Observables:
Soldier achieves 5 hits out of 9 inside the "open window" area within 18 seconds.
Soldier achieves 10 hits out of 12 inside the dotted lines surrounding the "fence or hedgerow" area within 24 seconds.
Soldier achieves 3 hits out of nine inside the "tank turret" area within 24 seconds.

Figure 7-12. Suppressive fire training program.

a. **Nature of the Target.** Many soldiers have difficulty delivering effective suppressive fire when they cannot see a definite target. They must fire at likely locations or in a general area where the enemy is known to exist. Even though definite targets cannot be seen, most suppressive fire should be well aimed. Figure 7-13 shows a landscape target suitable for suppressive fire training. When this type of target is used, trainers must develop a firing program to include areas of engagement and designated target areas be credited as sustained effective suppressive fire. At 25 meters, this target provides the firer an area to suppress without definite targets to engage.

Figure 7-13. Landscape target.

b. **Point of Aim.** Suppressive fire should be well-aimed, sustained, semiautomatic fire. Although lacking a definite target, the soldier must be taught to control and accurately deliver fire within the limits of the suppressed area. The sights are used as when engaging a point-type target with the front sight post placed so each shot impacts within the desired area (window, firing portal, tree line).

c. **Rate of Fire.** During most phases of live fire (grouping, zeroing, qualifying), shots are delivered using the slow semiautomatic rate of fire (one round every 3 to 10 seconds). During training, this allows a slow and precise application of the fundamentals. Successful suppressive fire requires that a faster but sustained rate of fire be used. Firing full automatic or bursts (13 rounds per second) for a few seconds may sometimes be necessary to gain initial fire superiority. Rapid semiautomatic fire (one round every one or two seconds) allows the firer to sustain a large volume of accurate fire while conserving ammunition. The tactical situation dictates the most useful rate of fire, but the following must be considered:

(1) ***Applying Fundamentals.*** As the stress of combat increases, some soldiers may fail to apply the fundamentals of marksmanship. This factor contributes to soldiers firing less accurately and without obtaining the intended results. While some modifications are appropriate, the basic fundamentals should be applied and emphasized regardless of the rate of fire or combat stress. Strategies to enhance marksmanship skills during combat stress include shooting prone as opposed to standing, and providing a high carbohydrate and or moderate sodium diet. Factors that contribute to combat stress are:

(a) *Environmental*. Environmental stressors have been shown to degrade marksmanship accuracy up to 20 percent. Such stressors include heat and altitude.

(b) *Operational*. Operational stressors have been shown to degrade marksmanship accuracy from 17 percent to 136 percent. Such stressors include MOPP gear; tasks that require carrying rucksacks, litter patients, and other equipment on the body; and sleep deprivation.

(2) ***Making Rapid Magazine Changes.*** One of the keys to sustained suppressive fire is reloading the rifle rapidly. Rapid magazine changes must be correctly taught and practiced during dry-fire and live-fire exercises until the soldier becomes proficient. Small-unit training exercises must be conducted so soldiers who are providing suppressive fire practice magazine changes that are staggered. Firing is, therefore, controlled and coordinated so that a continuous volume of accurate suppressive fire is delivered to the target area.

(3) ***Conserving Ammunition.*** Automatic or burst fire should be used sparingly and only to gain initial fire superiority. Depending on the tactical situation, the rate of fire should be adjusted so that a minimum number of rounds are expended. Accurate fire conserves ammunition, while preventing the enemy from placing effective fire on friendly positions.

7-11. QUICK FIRE

The two main techniques of directing fire with a rifle are to aim using the sights and to use weapon alignment, instinct, bullet strike, or tracers to direct the fire. The preferred technique is to use the sights, but sometimes quick reflex action is required. Quick fire is a technique used to deliver fast, effective fire on surprise personnel targets at close ranges (25 meters or less). Quick-fire procedures have also been referred to as instinctive firing or quick kill. (Figure 7-14 shows the current training program for quick fire.)

Instructional Intent:
Soldiers learn how to engage targets using the quick-fire techniques.
Special Instructions:
Ensure M16A1 rear sight is set on the unmarked aperture.
Ensure M16A2/A3/A4 and M4-series weapon's rear sight is set on the 0-2 aperture.
Soldier is given two 10-round magazines.
Soldier engages 10 target exposures of 2 seconds each at 15 meters using the first 10-round magazine.
Soldier moves to the 25- meter line and engages 10 target exposures of 2 seconds each at 25 meters using the second 10-round magazine.
Observables:
Soldier achieves 7 target hits out of 10 target exposures at 15 meters.
Soldier achieves 5 target hits out of 10 target exposures at 25 meters.

Figure 7-14. Quick fire training program.

NOTE: Quick fire will only be conducted by soldiers in basic training. Short-range marksmanship will be conducted at unit level.

a. **Effectiveness of Quick Fire**. Quick-fire techniques are appropriate for soldiers, who are presented with close, suddenly appearing, surprise enemy targets; or when close engagement is imminent. Fire may be delivered in the SEMIAUTO or AUTOMATIC/BURST mode. For example, a point man in a patrol may carry the weapon on AUTOMATIC/BURST. This may also be required when clearing a room or bunker. Initial training should be in the SAFE mode. Two techniques of delivering quick fire are:

(1) ***Aimed.*** When presented with a target, the soldier brings the rifle up to his shoulder and quickly fires a single shot. His firing eye looks through or just over the rear sight aperture. He uses the front sight post to aim at the target (Figure 7-15). Using this technique, a target at 25 meters or less may be accurately engaged in one second or less.

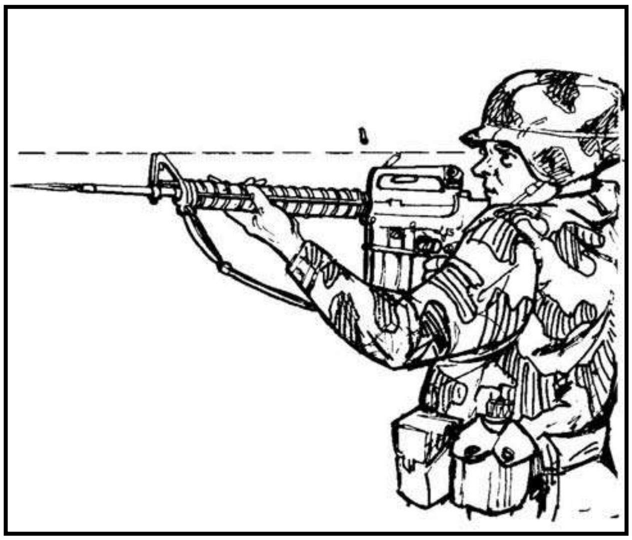


Figure 7-15. Aimed quick fire.

(2) ***Pointed***. When presented with a target, the soldier keeps the rifle at his side and quickly fires a single shot or burst. He keeps both eyes open and uses his instinct and peripheral vision to line up the rifle with the target (Figure 7-16). Using this technique, a target at 15 meters or less may be engaged in less than one second.

Figure 7-16. Pointed quick fire.

(a) The difference in speed of delivery between these two techniques is small. Pointed quick fire can be used to fire a shot about one-tenth of a second faster than aimed quick fire. The difference in accuracy, however, is more pronounced. A soldier well trained in pointed quick fire can hit an E-type silhouette target at 15 meters, although the shot may strike anywhere on the target. A soldier well trained in aimed quick fire can hit an E-type silhouette target at 25 meters, with the shot or burst striking 5 inches from the center of mass. This variance of target hit for this type of engagement reinforces the need for well-aimed shots.

(b) The key to the successful employment of either technique is practice. Both pointed and aimed quick fire must be repeatedly practiced during dry-fire training. Live-fire exercises provide further skill enhancement and illustrate the difference in accuracy between the two techniques. Tactical considerations dictate which technique is most effective in a given situation, and when single shot versus burst fire is used.

(c) Pointed and aimed quick fire should be used only when a target cannot be engaged fast enough using the sights in a normal manner. These techniques should be limited to targets appearing at 25 meters or less. Modern short-range combat (SRC) techniques emphasize carrying the rifle with the butt high, so the rifle sights can be brought into display as quickly as firing a hasty unaimed shot. In extremely dangerous moments, special reaction teams (SRTs) commonly advance with weapons shouldered, aiming as they advance.

b. **Four Fundamental Modifications for Quick-Fire Techniques.** Quick-fire techniques require major modifications to the four fundamentals of marksmanship. These modifications represent a significant departure from the normal applications of the four fundamentals. Initial training in these differences, followed by repeated dry-fire exercises, will be necessary to prepare the soldier for live fire.

(1) ***Steady Position.*** The quickness of shot delivery prevents the soldier from assuming a stable firing position. He must fire from his present position when the target

appears. If the soldier is moving, he must stop. Adjustments for stability and support cannot be made before the round is fired.

(a) *Aimed*. The butt of the rifle is pulled into the pocket of the shoulder as the cheek comes in contact with the stock. Both hands firmly grip the rifle, applying rearward pressure. The firing eye looks through or just over the rear sight aperture. The firer's sight is placed on the target.

(b) *Pointed*. The rifle is pulled into the soldier's side and both hands firmly grip the rifle, applying rearward pressure.

(2) ***Aiming***. This fundamental must be highly modified because the soldier may not have time to look through the rear sight, find the front sight, and align it with the target.

(a) *Aimed*. The soldier's initial focus is on the target. As the rifle is brought up, the firing eye looks through or just over the rear sight aperture at the target. Using his peripheral vision, the soldier locates the front sight post and brings it to the center of the target. When the front sight post is in focus, the shot is fired. Focus remains on the front sight post throughout the aiming process.

(b) *Pointed*. The soldier's focus is placed on the center or slightly below the center of the target as the rifle is aligned with it and is fired. The soldier's instinctive pointing ability and peripheral vision are used to aid proper alignment.

NOTE: Using either aiming technique, bullets may tend to impact above the desired location. Repeated live-fire practice is necessary to determine the best aim point on the target or the best focus. Such practice should begin with the soldier using a center of mass aim.

(3) ***Breath Control.*** This fundamental has little application to the first shot of quick fire. The round must be fired before a conscious decision can be made about breathing. If subsequent shots are necessary, breathing must not interfere with the necessity of firing quickly. When possible, use short, shallow breaths.

(4) ***Trigger Squeeze.*** Initial pressure is applied as weapon alignment is moved toward the target. Trigger squeeze is exerted so when weapon-target alignment is achieved, the round is fired at once. The soldier requires much training and practice to perfect this rapid squeezing of the trigger.

*Section III. CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR FIRING

All soldiers must effectively fire their weapons to accomplish combat missions in a *chemical, biological, radiological, and nuclear (CBRN) environment. With proper training and practice, soldiers gain confidence in their ability to effectively hit targets in full Mission Oriented Protective Posture (MOPP) equipment. MOPP firing proficiency must be part of every unit's training program. Figure 7-17, page 7-19 shows the current training program for CBRN firing.

Instructional Intent:
The primary objective of CBRN fire is to develop the soldier's confidence and ability to engage targets while in any level of MOPP.
Special Instructions:
Ensure M16A1 rear sight is set on the unmarked aperture.
Ensure M16A2/A3/A4 and M4 series weapon's rear sight is set on the 0-2 aperture.
Ensure soldiers have insert lenses, if required, before firing.
Ensure soldiers have proper seal on the mask to prevent fogging and loss of visibility.
Soldiers are issued 20 rounds of ammunition to be loaded 10/10 in two magazines.
Soldier engages 20 targets each at 50 meters. Target exposures consist of 10 from the right and 10 from the left from the foxhole supported firing position using Table 1 of the Record Fire Qualification firing table (DA Form 3595-R).
This is a GO/NO GO exercise.
Observables:
Soldier obtains 11 hits out of 20 target exposures.

***Figure 7-17. CBRN fire training program.**

7-12. MOPP EQUIPMENT FIRE TRAINING

*Firing weapons is only part of overall CBRN training. Soldiers must first be familiar *with CBRN equipment, its use, and proper wear before they progress to learning the techniques of MOPP firing. Trainers must consider the impact of MOPP equipment (hood or mask, gloves, overgarments) on the soldier's ability to properly apply the fundamentals of marksmanship and combat firing skills.

a. **Operation and Function Modification.** Handling the rifle, performing operation and function checks, loading and unloading, and cleaning are affected by MOPP equipment. Movements are slowed, tasks take longer to complete and often require more effort. Vision is impaired, and care is needed to avoid damaging MOPP equipment and possible exposure to lethal agents. Because of the great differences between MOPP Level 0 and MOPP Level 4, soldiers must be trained in *all* aspects of operation and maintenance of the weapon while practicing at the highest MOPP level. Only through repeated training and practice can the soldier be expected to perform tasks efficiently.

b. **Immediate Action.** Under normal conditions a soldier should be able to clear a stoppage in 3 to 5 seconds. Under increased MOPP levels, however, this may take as long as 10 seconds to successfully complete. Dry-fire practice under these conditions is necessary to reduce time and streamline actions. Mask (with or without hood) and gloves must be worn. Care must be taken not to snag or damage the gloves or dislodge the hood or mask during movements. Applying immediate action to a variety of stoppages during dry fire must be practiced using dummy or blank ammunition until such actions can be performed by instinct.

(1) Vision is limited to what can be seen through the mask lenses or faceplate. Peripheral vision is severely restricted. The lenses or faceplate may be scratched or partly fogged, further restricting vision.

NOTE: Soldiers requiring corrective lenses must be issued insert lenses before training.

(2) Scanning movement may be restricted by the hood or mask. Any of these factors could adversely affect the soldier's ability to quickly and accurately detect targets. Additional skill practice should be conducted.

c. **Marksmanship Fundamentals.** Although the four marksmanship fundamentals remain valid during MOPP firing, some modifications may be needed to accommodate the equipment.

(1) ***Steady Position.*** Due to the added bulk of the over garment, firing positions may need adjustment for stability and comfort. Dry and live firing while standing, crouching, or squatting may be necessary to reduce bodily contact with contaminated ground or foliage. A consistent spot or stock weld is difficult to maintain due to the shape of the protective mask. This requires the firer to hold his head in an awkward position to place the eye behind the sight.

(2) ***Aiming***. Wearing a protective mask may force firers to rotate (cant) the rifle to see through the rear aperture. The weapon should be rotated the least amount possible to see through and line up the sights. The center tip of the front sight post should be placed on the ideal aiming point. This ideal aiming procedure (Figure 7-18, page 7-21) should be the initial procedure taught and practiced.

(a) If this cannot be achieved, a canted sight picture may be practiced. The normal amount of cant needed by most firers to properly see through the sights has a limited influence on rounds fired at ranges between 75 meters or less.

(b) Rifle ballistics causes the strike of the bullet to impact low in the direction of the cant (when a cant is used) at longer ranges. Due to this shift in bullet strike and the many individual differences in sight alignment when wearing a protective mask, it is important to conduct downrange feedback training at ranges beyond 75 meters on known-distance ranges. This allows soldiers to determine what aiming adjustments are needed to achieve center target hits. Figure 7-19, page 7-21, shows what might be expected for a right-handed firer engaging a target at 175 meters with a certain amount of cant, and the adjustment in point of aim needed to move the bullet strike to the center of the target. Figure 7-20, page 7-22 shows what might be expected for a right-handed firer engaging a 300-meter target. The adjustments in point of aim for left-handed firers are the opposite of those shown in Figures 7-19 and 7-20.

(c) Although bullet strike is displaced when using a cant, individual differences are such that center-of-mass aiming should be used until the individual knows what aiming adjustment is needed. When distant targets are missed, a right-handed firer should usually adjust his point of aim to the right and high; a left-handed firer should adjust to the left and high. Then, the aiming rules are clear.

(d) All targets should initially be engaged by aiming center mass, regardless of cant. When targets are missed while using a cant, firers should adjust the point of aim higher and opposite the direction of the cant. Actual displacement of the aiming point must be determined by using downrange feedback targets at ranges beyond 75 meters.

(3) ***Breath Control.*** Breathing is restricted and more difficult while wearing the protective mask. Physical exertion can produce labored breathing and make settling down into a normal breathing rhythm much more difficult. More physical effort is needed to move around when encumbered by MOPP equipment, which can increase the breath rate. All these factors make holding and controlling the breath to produce a well-aimed shot

more energy and time consuming. Emphasis must be placed on rapid target engagement during the limited amount of time a firer can control his breath.

(4) ***Trigger Squeeze.*** Grasping the pistol grip and squeezing the trigger with the index finger is altered when the firer is wearing MOPP gloves. The action of the trigger finger is restricted, and the fit of the glove may require the release of the swing-down trigger guard. Because the trigger feels different, control differs from that used in barehanded firing. This difference cannot be accurately predicted. Dry-fire training using dime-washer exercises is necessary to ensure the firer knows the changes he will encounter during live fire.

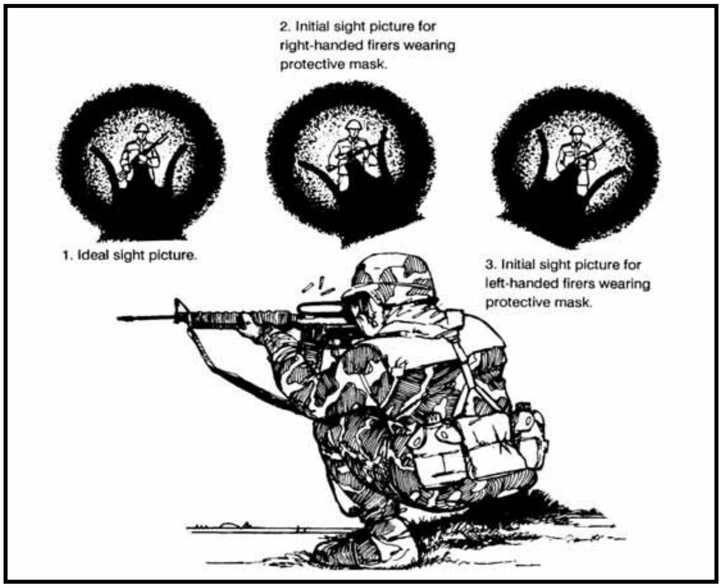


Figure 7-18. Sight picture when canting the rifle while wearing a protective mask (75-meter target).

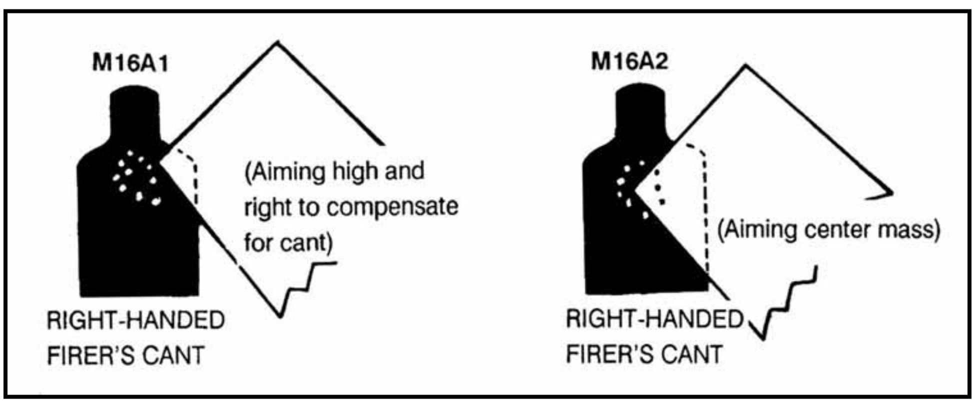


Figure 7-19. Engagement of 175-meter target.

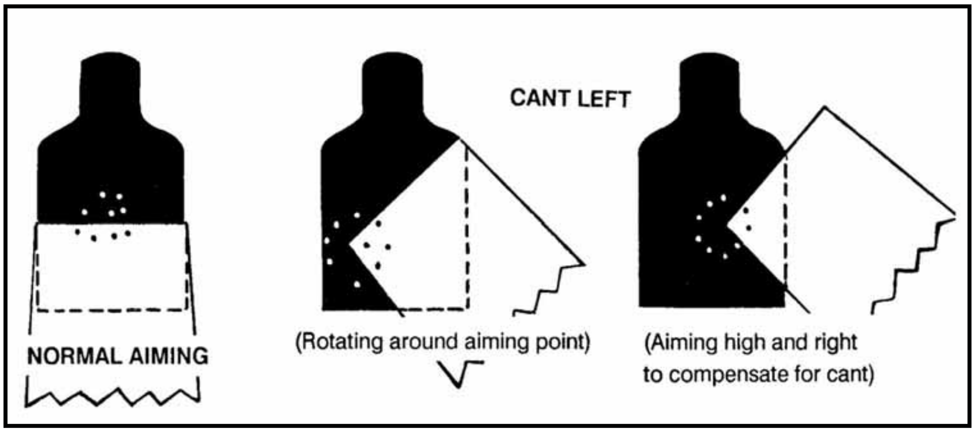


Figure 7-20. Engagement of 300-meter target.

*7-13. CBRN DRY-FIRE AND LIVE-FIRE EXERCISES

Repeated dry-fire training and live-fire exercises are the most efficient means to prepare the soldier for successful target engagements at any range while in MOPP Level 4 during MILES exercises and in live-fire training. The soldier must follow these procedures and applications to be combat effective in a CBRN environment.

* a. **CBRN Dry-Fire Exercises.** As with all marksmanship training, the soldier must start at the basics in order to become proficient at CBRN fire. Modified fundamentals can be taught anywhere and are done before the soldier does a live-fire exercise. The dry-fire exercises, which are used during CBRN training, are the same ones that are used during initial rifle marksmanship (dime-washer exercise, target box, SPORTS, and Weaponeer). The soldier must conduct dry-fire exercises in MOPP Level 4 so he can train at the highest degraded level and adjust his shooting technique to increase his marksmanship ability in a CBRN environment. The instructor-trainer can be imaginative in his modifications of the dry-fire exercises to challenge the soldier and improve his marksmanship skills while making the training interesting.

* b. **CBRN 50-Meter Live-Fire Exercise.** The basic CBRN live-fire exercise allows all soldiers to gain confidence in their abilities to effectively engage targets in a CBRN environment. Practice and proficiency firing can be conducted on any range. Practice can also be accomplished by the use of MILES equipment during force on force training. When a Remote Electronic Target System (RETS) range is used for this exercise the two 50-meter mechanisms are used. For the CBRN live-fire exercise, the soldier will perform the following scenario after the command of "GAS – GAS – GAS" is given.

(1) Each soldier will be issued 20 rounds of ammunition to be loaded 10/10 in two magazines.

(2) Each soldier engages 20 targets, each at 50 meters. Target exposures consist of 10 from the right and 10 from the left from the foxhole supported firing position using Table I of the Record Fire Qualification firing table (DA Form 3595-R).

(3) At the commander's discretion, Table II of the Record Fire Qualification firing table (DA Form 3595-R) may be used as an alternate course of fire. This table allows the soldier to engage targets from 50 to 300 meters.

(4) Each soldier must achieve 11 hits out of 20 target exposures. This is a GO/NO GO exercise.

* c. **CBRN Alternate Fire Exercise.** The CBRN alternate fire course uses the 25-meter scaled silhouette timed-fire target. The benefits of using the 25-meter scaled silhouette is that it can be used on any 25-meter range, the target provides feedback to the firer on where the strike of the round impacts the target, and it increases the soldier's knowledge and skill in delivering accurate well-aimed fire using the modified CBRN fundamentals. It is conducted in the same manner as the 25-meter alternate course.

(1) Each soldier will be in MOPP Level 4 conditions.

(2) Each soldier will be issued 20 rounds of ammunition to be loaded 10/10 in two magazines.

(3) Each soldier will engage each silhouette with two rounds from the foxhole supported position using Table I of the Scaled Target Alternate Course (DA Form 5790-R).

(4) Each soldier must achieve 11 hits out of 20 target exposures. This is a GO/NO GO exercise.

* d. **CBRN Downrange Feedback.** The purpose of the CBRN downrange feedback is to give the soldier confidence, knowledge, and skills required to consistently deliver accurate, well-aimed fire against combat targets out to 300 meters in MOPP Level 4 equipment while using the modified fundamentals associated with CBRN firing. On a KD range, the soldier will perform the following scenario:

(1) The soldier will be issued six magazines. The first and second magazine will have 5 rounds each, the third magazine and fourth will have 10 rounds each, and the fifth and sixth magazine will have 5 rounds each.

(2) The soldier engages the 75-meter (100-yard) target with one 5-round magazine from the foxhole, standing, crouching, or squatting supported position and again engages the 75-meter target from the foxhole, standing, crouching, or squatting supported position with the second 5-round magazine.

(3) The soldier engages the 175-meter (200-yard) target with one 10-round magazine from the foxhole, standing, crouching, or squatting supported firing position and again engages the 175-meter target from the foxhole, standing, crouching, or squatting supported firing position with the second 10-round magazine.

(4) The soldier engages the 300-meter target with one 5-round magazine from the foxhole, standing, crouching, or squatting supported firing position and again engages the 300-meter target from the foxhole, standing, crouching, or squatting supported firing position using the last 5-round magazine.

(5) The soldier must obtain 8 hits out of 10 shots on the 75-meter target; 14 hits out of 20 shots on the 175-meter target; and 5 hits out of 10 shots on the 300-meter target.

NOTES:
1. The KD range scorecard is used for the CBRN KD range.
2. The ammunition allocated for advanced skill training can be used for the CBRN downrange feedback scenario.

Section IV. NIGHT FIRE TRAINING

All units must be able to fight during limited visibility. All soldiers must know how to employ their weapons during such time. Soldiers must experience the various conditions of night combat from total darkness to the many types of artificial illumination. All units must include basic, unassisted night fire training annually in their unit marksmanship programs. Combat units should conduct tactical night fire training at least quarterly. This tactical training should include MILES, during force-on-force training, as well as live-fire training. The many effects darkness has on night firing are discussed in this section. This section will provide units guidance on training soldiers to be effective in total darkness without using iron sights and using iron sights during limited visibility. (Figure 7-21 shows the current training program for unassisted night fire training.) (See Appendix H for more detailed information on night fighting.)

Instructional Intent:
The primary training objective of unassisted night fire is to develop the soldier's confidence in his ability to hit targets when he cannot see through his rifle sights and does not have night vision capability.
Special Instructions:
Ensure M16A1 rear sight is set on the unmarked aperture.
Ensure M16A2/A3/A4 and M4 series weapon's rear sight is set on the 0-2 aperture.
Soldier is given two 15-round magazines with tracer/ball ammunition (10 rounds ball/5 rounds tracer) in each magazine.
Based on the commander's METL, soldier engages the 50-meter F-type silhouette target from the prone supported position or foxhole supported fighting position with one magazine.
Soldier engages the 50-meter F-type silhouette target from the prone unsupported fighting position or kneeling position with the second magazine.
This is a GO/NO GO exercise.
Observables:
Soldier achieves 7hits out of 30 target exposures.

Figure 7-21. Unassisted night fire training program.

7-14. UNASSISTED NIGHT FIRE TRAINING

Trainers must consider the impact of limited visibility on the soldier's ability to properly apply the fundamentals of marksmanship and combat firing skills. During limited visibility, a firer cannot generally use his sights in most situations and without artificial illumination the sights block his field of vision. These fundamentals and skills include:

a. **Operation and Maintenance of the Weapon.** Handling the weapon, performing operation and function checks, loading and unloading, and maintenance are all affected by nighttime conditions. Movements are slower, tasks take longer to complete, vision is impaired, and equipment is more easily misplaced or lost. Because combat conditions and enforcement of noise and light discipline restrict the use of illumination, soldiers must be trained to operate, service, and clean their weapons in total darkness. Although initial practice of these tasks should occur during daylight to facilitate control and error correction, repeated practice during actual nighttime conditions should be integrated with other training. Only through repeated practice and training can the soldier be expected to perform all tasks efficiently.

b. **Immediate Action.** Under normal conditions, a soldier should clear a stoppage in three to five seconds. After dark this task usually takes longer. Identifying the problem may be difficult and frustrating for the soldier. A hands-only technique of identifying a stoppage must be taught and practiced. Clearing the stoppage using few or no visual indicators must also be included. The firer must practice applying immediate action with his eyes closed. Dry-fire practice (applying SPORTS) using dummy or blank rounds under these conditions is necessary to reduce time and build confidence. Training should be practiced first during daylight for better control and error correction by the trainer. Once the soldier is confident in applying immediate action in darkness, he can perform such actions rapidly on the firing line.

c. **Marksmanship Fundamentals.** The four marksmanship fundamentals apply to night firing. Some modifications are needed depending on the conditions. The firer must still place effective fire on the targets or target areas that have been detected.

(1) ***Steady Position.*** When the firer is firing unassisted, changes in his head position and or stock weld will be necessary, especially when using weapon-target alignment techniques. His head is positioned high so that he is aligning his weapon on the target and looking just over the iron sights. His cheek should remain in contact with the stock. Repeated dry-fire practice, followed by live-fire training, is necessary to learn and refine these modifications and still achieve the steadiest position.

(2) ***Aiming***. Modifications to the aiming process vary. When firing unassisted, the firer's off-center vision is used instead of pinpoint focus. Both eyes are open to gather the maximum available light, and are focused down range.

(3) ***Breathing***. This fundamental is not affected by unassisted night fire conditions.

(4) ***Trigger Squeeze.*** This fundamental is not affected by unassisted night fire conditions. The objective is to not disrupt alignment of the weapon with the target.

d. **Unassisted Night Firing Positions.** The recommended firing position for use during limited visibility is the supported firing position. This position, when used during limited visibility, differs slightly from the supported position taught in earlier periods of instruction because the firer cannot use his sights during limited visibility; in fact, the sights block his field of vision. To effectively engage targets during limited visibility, the firer assumes a supported firing position, establishes a raised stock weld (looks 2 to 3 inches above the sights level with the barrel), points the weapon at the target, and fires in the semiautomatic mode. To obtain optimum results, the firer should keep his eyes open, and his head, arms, and rifle should move as one unit.

e. **Unassisted Night Fire.** The firer must detect and engage targets without artificial illumination or night vision devices. Potential target areas are scanned. When the target is detected, the firer should engage it using a modified quick-fire position. The firer should take a few seconds to improve weapon-target alignment by pointing slightly low to compensate for the usual tendency to fire high (Figure 7-22). Tracer ammunition may provide feedback on the line of trajectory and facilitate any adjustments in weapon-target alignment.

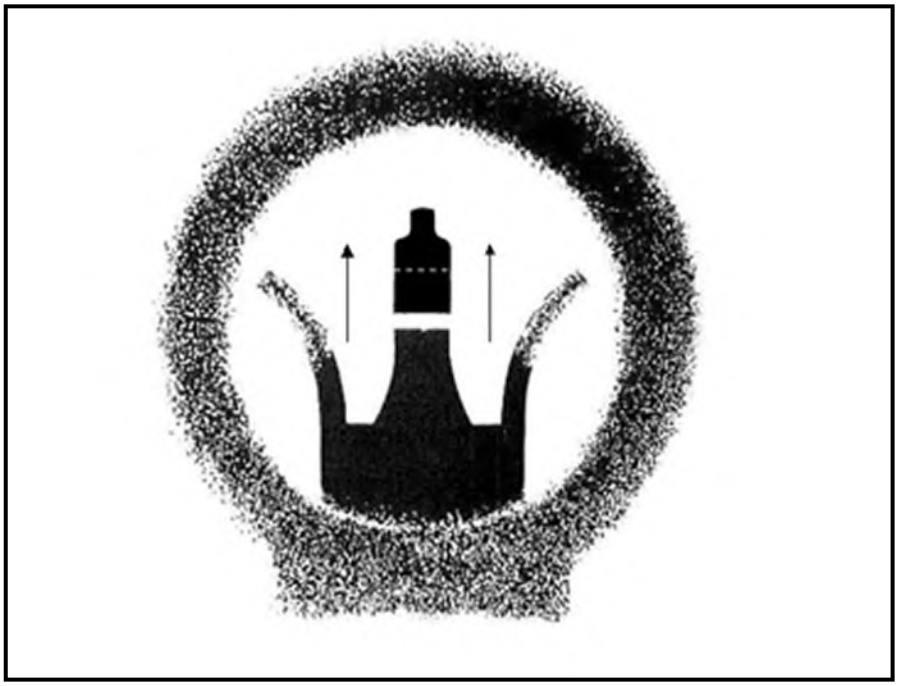


Figure 7-22. Lower weapon-target alignment.

7-15. UNASSISTED NIGHT FIRE TARGET DETECTION

Trying to detect a target during the day is difficult enough but at night it becomes even more so. In order for an individual to see targets at night, he must apply the three principles of night vision.

a. **Dark Adaptation.** This process conditions the eyes to see under low levels of illumination. The eyes of the average person take about 30 minutes to acquire 98 percent night vision in a completely darkened area. Moving from illuminated to darker areas will decrease night vision until the eyes have adjusted to the surrounding area again.

b. **Off-Center Vision.** During the daytime when an individual looks at an object, he looks directly at it. However, if he did this at night he would only see the object for a few seconds. In order to see this object for any length of time, he must look 6 to 10 degrees from this object (Figures 7-23 and 7-24, page 7-26) while concentrating his attention on the object. This allows the light sensitive area of the eye, which can detect faint light sources or reflection, to be used.

c. **Scanning**. The act of scanning relates to the short, abrupt, irregular movement of the firer's eyes every 4 to 10 seconds around an object or area. Be aware that scanning ranges vary according to levels of darkness.

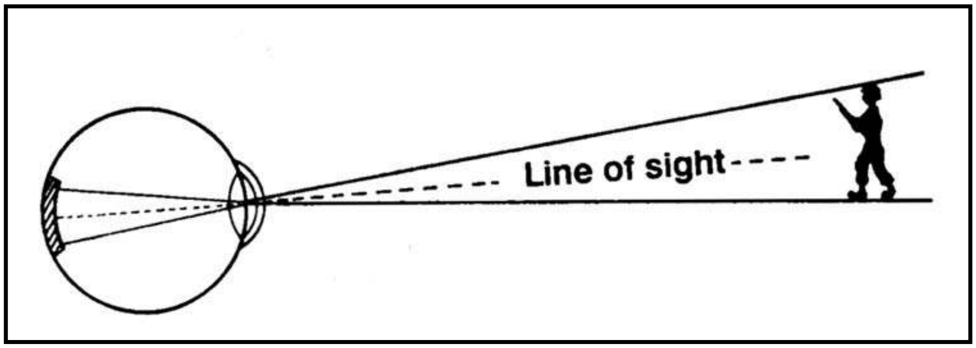


Figure 7-23. Daytime field of view using pinpoint focus.

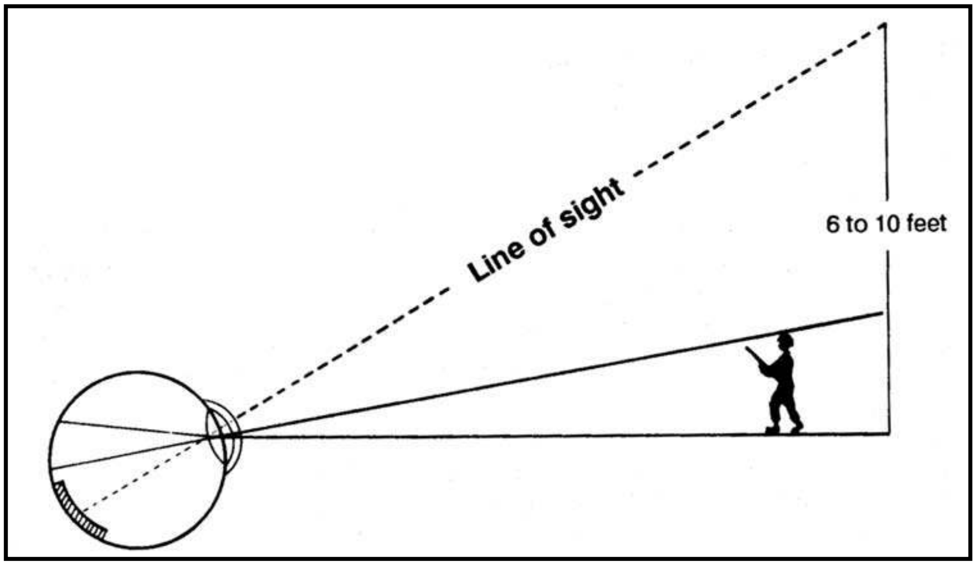


Figure 7-24. Nighttime field of view using off-center vision

7-16. TRAINING WITH ARTIFICIAL ILLUMINATION

The soldier should be able to fire his weapon effectively in total darkness, in bright sunlight, and under all conditions between these two extremes. Provide a variety of night and limited visibility conditions when marksmanship training is scheduled. The battlefield may be illuminated by ground flares, hand held flares, M203 flares, mortar and artillery illumination, aerial flares, searchlights, exploding rounds, burning vehicles, and so forth. The battlefield may be obscured by smoke, fog, and various environmental conditions. The well-trained soldier should have experienced a number of these conditions and be confident that he can effectively employ his weapon when required. (Figure 7-25 shows the current training program for artificial illumination training.)

Instructional Intent:
The primary training objective of unassisted night fire with the aid of artificial illumination is to develop the soldier's confidence in his ability to locate, mark, prioritize and engage targets at night using artificial illumination.
Special Instructions:
Ensure M16A1 rear sight is set on the unmarked aperture.
Ensure M16A2/A3/A4 and M4 series weapon's rear sight is set on the 0-2 aperture.
Soldier is given two 15-round magazines of tracer ball ammunition (10 rounds ball/ 5 rounds tracer).
Soldier detects 20 target exposures but engages only 15 target exposures from the foxhole supported fighting position with the first 15-round magazine.
Soldier detects 20 target exposures but engages only 15 target exposures from the prone unsupported fighting position with the second 15-round magazine.
This is a GO/NO GO exercise.
Observables:
Soldier achieves 15 hits out of 40 target exposures with only 30 rounds of ammunition.

Figure 7-25. Artificial illumination training program.

a. When artificial illumination is used, the eyes lose most of their night adaptation and off-center vision is no longer useful. Aiming is accomplished as it is during the day. Artificial illumination allows the firer to use the iron sights as he does during the day using the 0-2 rear sight aperture.

b. Engaging targets under artificial illumination allows for better target detection and long-range accuracy than the unassisted technique. When the light is gone, time must be spent in regaining night vision and adaptation. Only when the level drops enough so that the target cannot be seen through the iron sights should the firer resume short-range scanning, looking just over the sights.

c. To preserve night vision while artificial illumination is being used, the soldier closes his firing eye and scans his sector for enemy targets with his nonfiring eye. This allows the soldier to have night vision in at least one eye after the artificial illumination has burned out to keep scanning his sector for enemy targets. However, keeping one eye closed to preserve its night vision results in a drastically altered sense of perception when both eyes are opened following illumination burnout. Repeated dry-fire training and target detection practice are the keys to successful engagement of targets out to 250 meters or more during live-fire under artificial illumination.

7-17. UNASSISTED NIGHT DRY-FIRE AND LIVE-FIRE EXERCISES

Repeated dry-fire training, target detection, and live-fire exercises are the most efficient means to ensure the soldier can successfully engage short-range targets. The soldier must adhere to the following procedures and applications to be effective in combat.

a. **Night Dry-Fire Exercises.** These exercises are the same as the day dry-fire exercises (load, SPORTS, rapid magazine change, and clear). Repeated training and dry-fire practice are the most effective means available to ensure all soldiers can function efficiently after dark. Dry-fire exercises should be conducted before the first live round is fired.

b. **Unassisted Night Live-Fire Exercises.** The basic unassisted live-fire exercise allows all soldiers to apply night fire principals and to gain confidence in their ability to effectively engage targets out to 50 meters. Practice and proficiency firing can be conducted on any range equipped with mechanical lifters and muzzle flash simulators (Figure 7-26). The muzzle flash simulator provides the firer with a momentary indication that a target is presenting itself for engagement. Practice can also be accomplished using MILES equipment. When a RETS range is used for this exercise the two 50-meter mechanisms are used. For the unassisted night live-fire exercise, the soldier will perform the following scenario:

(1) Each soldier will be issued two 15-round magazines with tracer and ball combination.

* (2) Based on the commander's METL, the soldier engages the F-type silhouette target at 50 meters while in the prone supported or foxhole supported firing position. The soldier uses one magazine of 15 rounds (10 rounds ball; 5 rounds tracer). The soldier will detect and engage 15 target exposures at 50 meters.

* (3) The F-type silhouette target is engaged at 50 meters from the prone unsupported position or kneeling position. The soldier uses a second magazine of 15 rounds (10 rounds ball; 5 rounds tracer). The soldier will detect and engage 15 target exposures at 50 meters.

(4) Each soldier must achieve 7 hits out of 30 target exposures.

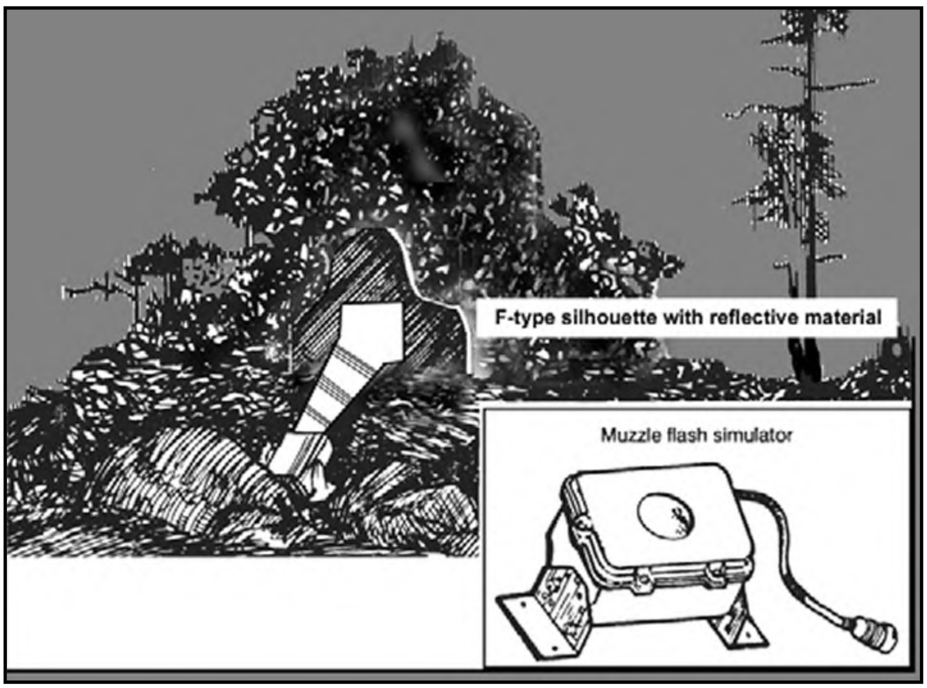


Figure 7-26. Night-fire target.

(5) When the automated range is used, the soldier's performance is recorded in the tower. If automatic scoring is not available, a coach can observe and score the number of target hits the firer achieves using NVDs.

c. **Unassisted Night Live-Fire Exercise with Artificial Illumination.** The unassisted live-fire exercise with artificial illumination allows all soldiers to apply night fire principals and to gain confidence in their abilities to effectively detect and engage targets out to 150 meters and beyond with artificial illumination using the night record fire scenario:

(1) Each soldier will be issued two 15-round magazines with the appropriate tracer and ball combination.

(2) During night, each soldier will detect and or engage 20 E-type silhouette target exposures from 50 to 250 meters with one magazine of 15 rounds (10 rounds ball; 5 rounds tracer) while in the foxhole supported firing position.

(3) During night, each soldier will detect and or engage 20 E-type silhouette target exposures from 50 to 250 meters with the second magazine of 15 rounds (10 rounds ball; 5 rounds tracer) while in the prone unsupported firing position.

(4) Each soldier must achieve 15 hits out of 40 target exposures with only 30 rounds.

(5) It is important for the soldier to understand that all of the exposed targets do not have to be engaged by fire. The soldier may hone his target detection skills on the distant targets and engage them only when he is confident of achieving a hit. This allows the soldier to understand his limitations, his skill level, and skills that he needs to work on to improve his nighttime marksmanship ability. (Refer to Appendix F for more information on the night record fire table.)

Section V. MOVING TARGET ENGAGEMENT

In combat situations, enemy soldiers do not stand still. The enemy moves by rushes from one covered or concealed position to another. While making the rush, the enemy soldier presents a rapidly moving target. However, for a brief time as he begins, movement is slow since many steps are needed to gain speed. Many steps are needed to slow down at the new position. A moving target is open to aimed fire both times. (Figure 7-27 shows the current training program for moving target engagement training.)

Instructional Intent:
Soldier learns to detect and engage moving and stationary targets with the M16/M4 series weapon.
Special Instructions:
Ensure M16A1 rear sight is set on the unmarked aperture.
Ensure M16A2/A3/A4 and M4 series weapon's rear sight is set on the 0-2 aperture.
Ensure soldiers get into a proper semi-supported firing position.
Ensure soldiers understand and apply lead guidance rules.
Soldier is given two magazines with 25 rounds each of 5.56-mm ball ammunition.
Soldier engages 34 moving target exposures at ranges from 35 to 185 meters, 16 stationary target exposures at ranges from 50 to 300 meters.
This is a GO/NO GO exercise.
Observables:
Soldier achieves at least 18 target hits out of 50 target exposures.

Figure 7-27. Moving target engagement training program.

7-18. MOVING TARGET FUNDAMENTALS

The fundamentals needed to hit moving targets are similar to those needed to hit stationary targets. The main skill is to engage moving targets with the least changes to procedures. Soldiers in combat do not know if their next target will be stationary or moving, they must fire immediately at whatever target occurs.

a. The fundamentals for engaging stationary targets (steady position, aiming, breath control, and trigger squeeze) are also used to engage moving targets. Considering the environment and the variables of the rifle and ammunition, the well-trained soldier should be able to hit 300-meter stationary silhouette targets. When the target has lateral movement, hits at 150 meters may be 7 out of 10 times, which is a good performance. Therefore, twice as much variability, twice as much dispersion, and a few more erratic shots are expected when soldiers are trained to hit moving targets.

(1) ***Steady Position.*** When firing from a firing position, the firer should be in the standard supported position and flexible enough to track any target in his sector. When a target is moving directly at the firer, directly away, or at a slight angle, the target is engaged without changing the firing position. When targets have lateral movement, only minor changes are needed to allow effective target engagement. Most moving targets are missed in the horizontal plane (firing in front of or behind the target) and not in the vertical plane (firing too low or too high). A smooth track is needed on the target, even if the support arm must be lifted. Other adjustments include the following:

(a) *Nonfiring Hand.* The grip of the nonfiring hand may need to be increased and more pressure applied to the rear. This helps to maintain positive control of the rifle and steady it for rapid trigger action.

(b) *Nonfiring Elbow.* The nonfiring elbow is lifted from the support position only to maintain a smooth track.

(c) *Firing Hand.* Rearward pressure may be applied to the pistol grip to steady the rifle during trigger squeeze.

(d) *Firing Elbow.* The firing elbow is lifted from support only to help maintain a smooth track.

NOTE: The rifle pocket in the shoulder and the stock weld are the same as for stationary targets.

(2) ***Aiming***. The trailing edge of the front sight post is at target center.

(3) ***Breath Control.*** Breathing is locked at the moment of trigger squeeze.

(4) ***Trigger Squeeze.*** Rearward pressure on the handguard and pistol grip is applied to hold the rifle steady while pressure is applied to the trigger. The trigger is squeezed fast (almost a controlled jerk). Heavy pressure is applied on the trigger (at least half the pressure it takes to make the rifle fire) before squeezing.

b. The procedures used to engage moving targets vary as the angle and speed of the target vary. For example, when a target is moving directly at the firer, the same procedures are used as would be used if the target were stationary. However, if it is a close, fast-moving target at a 90-degree angle, the rifle and entire upper body of the firer must be free from support so the target can be tracked.

7-19. SINGLE-LEAD RULE FOR MOVING TARGETS

For the firer to apply precise lead rules he must accurately estimate speed, angle, and range to the target during the enemy soldier's brief exposure. The single-lead rule (place the trailing edge of the front sight post at target center) places effective fire on most high-priority combat targets. At 100 meters, the rule begins to break down for targets moving at slight and large angles.

a. **Lead Requirements.** To effectively engage moving targets on the battlefield, soldiers must understand lead requirements. Figure 7-28 shows the amount of lead required to hit a 300-meter target moving 8 miles per hour at a 90-degree angle. Aiming directly at the target would result in missing it. When an enemy soldier is running 8 miles per hour, 90 degrees to the firer, and at a range of 300 meters, he covers 4 1/2 feet while the bullet is traveling toward him. To get a hit, the firer must aim and fire at position D when the enemy is at position A. This indicates the need for target lead and for marksmanship trainers to know bullet speed and how it relates to the range, angle, and speed of the target. Soldiers must understand that targets moving fast and laterally must be led by some distance if they are to be hit.

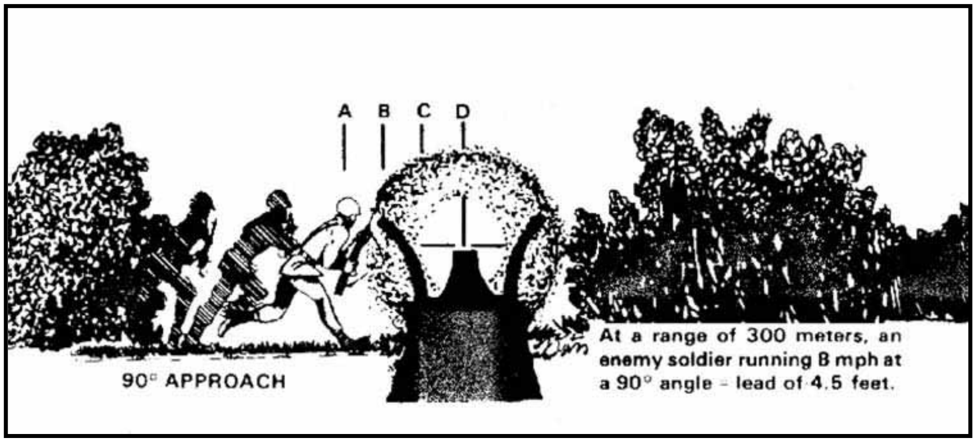


Figure 7-28. Lead requirement based on distance and approach angle.

(1) To hit a target moving laterally, the firer places the trailing edge of the front sight post at target center. (The sight-target relationship is shown in Figure 7-29, page 7-32.) The single-lead rule automatically increases the lead as the range to the target increases. (Figure 7-30, page 7-32, shows how this works, with the front sight post covering about 1.6 inches at 15 meters and about 16 inches at 150 meters.) Since the center of the front sight post is the actual aiming point, placing the trailing edge of the front sight post at target center provides a .8-inch lead on a 15-meter target and an 8-inch lead on a target at 150 meters.

(2) This rule provides a dead-center hit on a 15-meter target moving at 7 miles per hour at a 25-degree angle because the target moves .8 inches between the time the rifle is fired and the bullet arrives at the target. A 150-meter target moving at 7 miles per hour at a 25-degree angle moves 8 inches between the time the weapon is fired and the bullet arrives. This rule provides for hits on the majority of high priority combat targets.

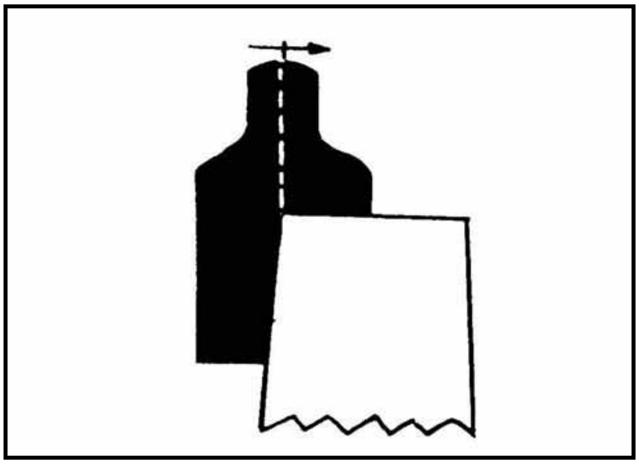


Figure 7-29. Single-lead rule.

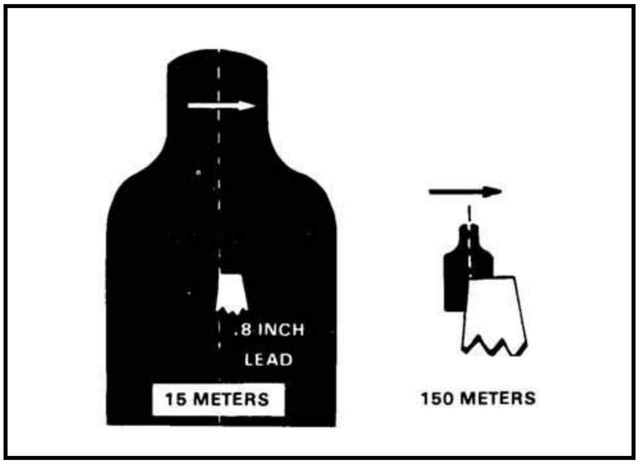


Figure 7-30. Lead increasing at greater ranges.

b. **Target Speed.** Figure 7-31 reflects the differences in lateral speed for various angles of target movement for a target traveling at 8 miles per hour at a distance of 150 meters from the firer. The angle of target movement is the angle between the target-firer line and the target's direction of movement. An 8-mile-per-hour target moves 24 inches during the bullet's flight time. If the target is moving on a 15-degree angle, it moves 6 inches (the equivalent of 2 miles per hour).

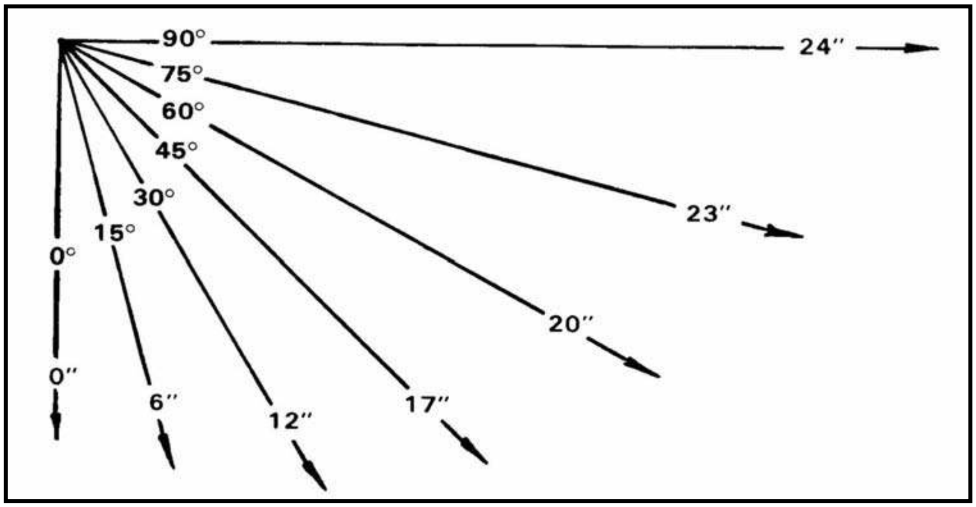


Figure 7-31. Target movement (distance) at various angles.

(2) Since the target lead is half the perceived width of the front sight post, at 100 meters the standard sight provides 5.4 inches of lead for the M16A1/2/3/4 and M4 front sights (Table 7-1).

ANGLE OF TARGET MOVEMENT (Degrees)	RANGE: 100 METERS (STANDARD SIGHT) TARGET SPEED		
	4 MPH	6 MPH	8 MPH
5	+4.9”	+4.5”	+4.3”
10	+4.1”	+3.5”	+2.7”
15	+3.5”	+2.5”	+1.5”
20	+2.8”	+1.5”	+.2”
25	+2.2”	+.7”	-1.0”
30	+1.7”	-.2”	-2.0”
35	+1.1”	-1.1”	-3.2”
40	+.6”	-1.9”	-4.3”
45		-2.7”	-5.4”
50	-.4”	-3.3”	-6.2”
55	-.8”	-4.0”	-7.0”
60	-1.2”	-4.5”	-7.7”
65	-1.5”	-4.9”	-8.4”
70	-1.7”	-5.3”	-8.8”
75	-1.9”	-5.6”	-9.2”
80	-2.0”	-5.9”	-9.6”
85	-2.1”	-5.9”	-9.7”
90	-2.1”	-6.0”	-9.8”
NOTE: Plus (+) indicates bullet strike in the direction of movement; minus (-) indicates bullet strike behind the target center			

Table 7-1. Angle of target movement.

c. **Target Distance.** The front sight post covers only a small part of close-in targets, providing hits on close targets moving at any angle and any speed. However, if the lead rule is applied on more distant targets moving at a slight angle—for example, 5 degrees at 100 meters—the bullet strikes forward of target center, about 4 inches with standard sights and about 7 inches with LLLSS sights. Soldiers must be taught to fire at targets as though they are stationary until lateral movement is observed (15 degrees).

(1) The rule provides for many speed-angle combinations that place the bullet within 2 inches of target center (Table 7-1). Since the soldier is expected to fire a 12-inch group on moving targets at 100 meters, the rule provides for hits on the majority of targets. Even the worst case (a 90-degree target moving at 8 miles per hour) would result in the shot-group center being located 9.8 inches behind target center. If bullets were evenly distributed in a 12-inch group, this would result in hitting the target 40 percent of the time.

(2) Soldiers should be taught to increase their lead if they miss the targets, which increases their probability of hitting all targets. The amount of additional lead required should be developed through experience with only general guidance provided. For example, if there is much lateral movement of the target and the soldier feels, by applying the lead rule and firing fundamentals, he has missed the target, he should increase his lead.

(3) The training program must be simple and provide soldiers with only relevant information to improve their performance in combat. All soldiers should understand and apply the single-lead rule in the absence of more information. Soldiers should understand that moving targets coming toward them or on a slight angle (0 to 15 degrees) should be engaged as stationary targets. Information should be presented and practice allowed on applying additional lead to targets for soldiers who demonstrate this aptitude.

d. **Target Angle.** The single-lead rule does not apply to targets moving at small and large angles (Table 7-2).

(1) A walking enemy soldier at 250 meters is hit dead center when he is moving at 40 degrees. Hits can be obtained if he is moving on any angle between 15 and 75 degrees. When he is running, a center hit is obtained when the target is on an angle of 18 degrees; misses occur when he exceeds an angle of 30 to 35 degrees.

(2) The information provided in Figure 7-31 and Table 7-1 (page 7-33) is designed to enhance instructor understanding so proper concepts are presented during instruction. For example, a target at 100 meters moving at 6 miles per hour receives a center hit when moving at 29 degrees. When moving at an angle less than 29 degrees, the bullet strikes somewhat in front of target center. When moving at an angle of more than 29 degrees, the bullet strikes somewhat behind target center.

STANDARD SIGHT			
RANGE	4 MPH	6 MPH	8 MPH
25M	48°	30°	22°
50M	47°	30°	22°
100M	45°	29°	21°
150M	44°	28°	20°
200M	41°	27°	19°
250M	40°	26°	18°
300M	33°	21°	16°
350M	38°	24°	18°
400M	35°	22°	17°
450M	33°	21°	16°

Table 7-2. Target angle when dead center; hits occur using the single-lead rule.

7-20. MOVING TARGET LIVE-FIRE EXERCISE

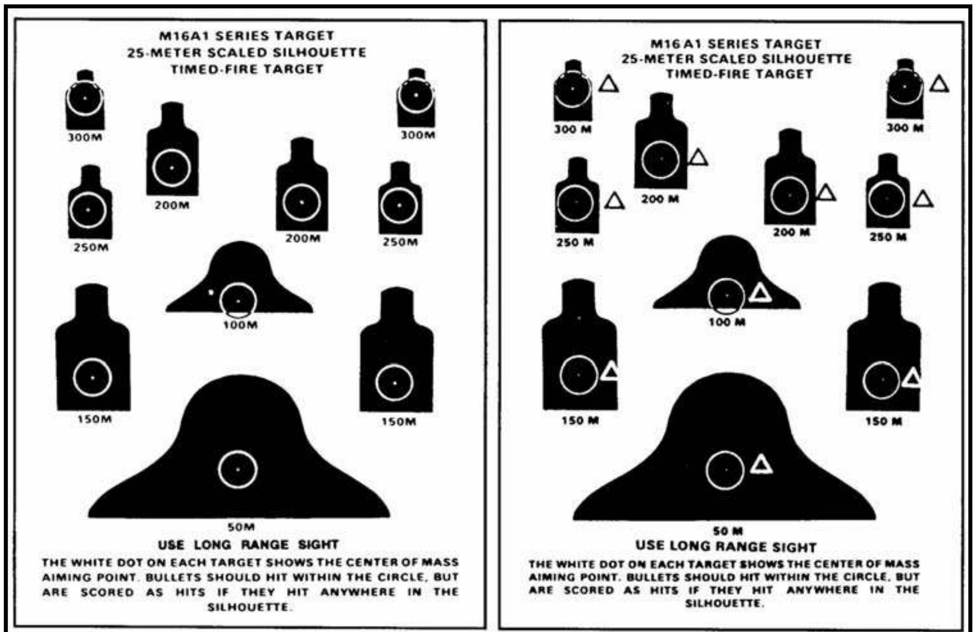
A firing scenario is engaged once for practice and then for qualification. Soldiers who fail to qualify on the initial day of qualification receive only one refire the same day.

7-21. MOVING TARGET TECHNIQUES

The two primary techniques of engaging moving targets are tracking and trapping.

a. Tracking is a more accurate technique of engaging targets by experienced firers. It involves establishing and maintaining an aiming point in relationship to the target and maintaining that sight picture (moving with the target) while squeezing the trigger. As the target moves, this technique puts the firer in position for a second shot if the first one misses.

b. Trapping is the setting up of an aiming point forward of the target and along the target path. The trigger is squeezed as the target comes into the sights. This is a technique that works on targets with slow lateral movement. It does not require tracking skills. It does require that the firer know precisely when the rifle is going to fire. Some soldiers can squeeze the trigger without reacting to the rifle firing, and they may fire better using this technique. Another technique is to use a modified 25-meter scaled timed-fire silhouette (Figure 7-32, page 7-36). Trainers evaluate performance based on where shot groups are placed when the lead rule is applied. This target can be used for both the M16-series rifles, and the M4 carbine.



Standard Timed-Fire Target
NSN 6920-01-167-1397)

Modified StandardTimed-Fire Target
(Locally Fabricated)

Figure 7-32. Timed-fire targets.

Section VI. SHORT-RANGE MARKSMANSHIP TRAINING

Short-range marksmanship (SRM) training provides the individual soldier with the ability to quickly and effectively engage targets at ranges less than 50 meters. A soldier's ability to successfully identify, discriminate, and engage targets during short-range combat (SRC) is essential for soldier survival and mission accomplishment. Although normally associated with UO, SRM techniques are also used during operations in restrictive terrain such as clearing a trench line, the final assault across an objective during an attack or raid, or when fighting in dense vegetation or during periods of limited visibility. Short-range marksmanship instruction consists of four components: Phase I, reflexive firing training (blank fire day and night); Phase II, target discrimination (blank fire day and night); Phase III, marksmanship qualification (day and night live fire); and Phase IV, shotgun and automatic firing familiarization. (Figure 7-33 shows a current training program for SRM training.)

Instructional Intent: Soldiers gain confidence and knowledge in SRM fundamentals. **Special Instructions:** Ensure M16A1 rear sight assembly is set on the unmarked aperture. Ensure M16A2/A4 series rear sight assembly is set on the 0-2 aperture. Soldier is given one 20-round magazine of 5.56-mm ball ammunition. The round must impact within the "lethal zone" to be scored a hit. Ensure all 20 rounds impact the E-type silhouette in order to qualify. **Observables:** Soldier achieves 16 target hits during the day and night iterations. Soldier achieves 14 target hits during the day iteration while wearing a protective mask. Soldier achieves 12 target hits during the night iteration while wearing a protective mask. All rounds impact the E-type silhouette.

Figure 7-33. Short-range marksmanship training program.

***NOTE:** This section addresses the components of SRM not found in doctrinal manuals. SRC TTPs addressed in Chapter 3, Reflective Shootings of FM 3-06.11 are addressed as a component of this section for shoot house training.

7-22. CONDUCT OF SHORT-RANGE MARKSMANSHIP TRAINING

Short-range marksmanship requires individual infantrymen to be trained to standard in reflexive firing, target discrimination, and on all necessary BRM fundamentals prior to semi-annual qualification. An explanation of the base level proficiency requirements is provided with each course of fire. As a minimum, infantrymen should be qualified on their individual weapon within the previous six months. Shotgun and automatic firing is required for annual familiarization only. Reflexive MILES dry-fire drills are an essential part of the training process and should be conducted by the team leader or squad leader during troop-leading procedures and before any SRC or SRM training.

7-23. FUNDAMENTALS OF SHORT-RANGE MARKSMANSHIP

During SRC, there is little or no margin for error. Too slow a shot at the enemy, too fast a shot at a noncombatant, or inaccurate shots can all be disastrous for the soldier. There are four fundamentals: proper weapon ready positions and firing stance, aiming technique, aim point, and trigger manipulation. Mastery of these fundamentals is key to the soldier's ability to survive and accomplish his mission in close quarters. All SRC- and SRM-related training should begin with a review of the principles of safe weapon handling—assume the weapon is always loaded and never point the weapon at anything you do not intend to destroy.

a. **Firing Stance and Ready Positions.** Regardless of the ready position used, soldiers must always assume the correct firing stance to ensure stability and accuracy when engaging targets. The two weapon ready positions are the high ready and low ready

(1) ***Firing Stance.*** The feet are kept approximately shoulder-width apart. Toes are pointed straight to the front (direction of movement). The firing side foot is slightly staggered to the rear of the nonfiring side foot. Knees are slightly bent and the upper body is leaned slightly forward. Shoulders are square and pulled back, not rolled over or slouched. The head is up and both eyes are open. When engaging targets, the gunner

holds the weapon with the butt of the weapon firmly against his shoulder and the firing side elbow close against the body (Figures 7-34 and 7-35).

(2) ***High Ready Position*** (Figure 7-34)**.** The butt of the weapon is held under the armpit, with the barrel pointed slightly up so that the top of the front sight post is just below the line of sight but still within the gunner's peripheral vision. The nonfiring hand grasps the handguards toward the front sling swivel, the trigger finger is outside of the trigger well, and the thumb of the firing hand is on the selector lever. To engage a target from the high ready, the gunner pushes the weapon forward as if to bayonet the target and brings the butt stock firmly against the shoulder as it slides up the body. This technique is best suited for the lineup outside of a building, room, or bunker entrance.

(3) ***Low Ready Position*** (Figure 7-35). The butt of the weapon is placed firmly in the pocket of the shoulder with the barrel pointed down at a 45-degree angle. The nonfiring hand grasps the handguards toward the front sling swivel, the trigger finger is outside of the trigger well, and the thumb of the firing hand is on the selector lever. To engage a target from the low ready, the gunner brings the weapon up until the proper sight picture is achieved. This technique is best suited for movement inside of buildings.

(4) ***Movement Techniques***. Soldiers must practice moving with their weapons up until they no longer look at the ground but concentrate on their sectors of responsibility. Soldiers must avoid stumbling over their own feet. The low ready method is the best method to use when moving or turning. To execute a left turn the soldier places his firing foot forward, shifts all his weight to the firing foot, and pivots, bringing the non-firing foot forward to complete the turn. To turn to the right the firing foot is to the rear, the weight is evenly distributed between the feet, and the body pivots on both feet. To turn to the rear, the firing foot is forward, the weight is placed on the firing foot and the body pivots similar to the drill movement "rear march."

(5) ***Kneeling Position.*** Although short-range engagements generally take place from the standing position a soldier may be required to engage targets from the kneeling position. The kneeling position is generally used when correcting a weapons malfunction.

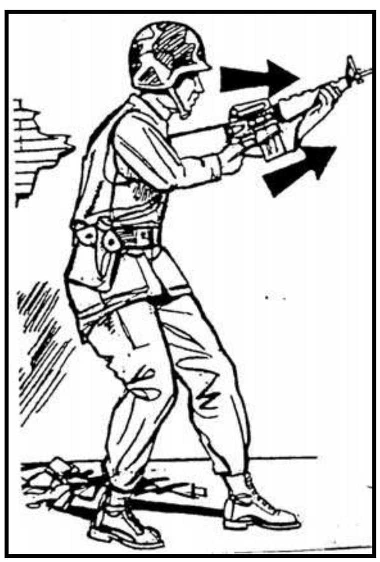


Figure 7-34. Weapon held at the high ready.

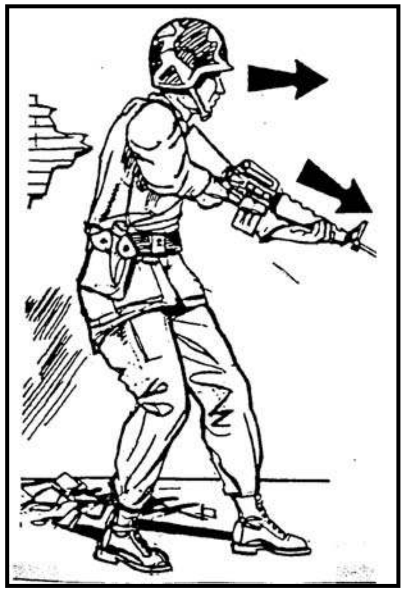


Figure 7-35. Weapon held at the low ready.

b. **Aiming Techniques.** Four aiming techniques are used during SRC. Each has advantages and disadvantages and the soldier must understand when, how, and where to use each technique.

(1) ***Slow Aimed Fire.*** This technique is the slowest but most accurate. It consists of taking a steady position, properly aligning the sight picture, and squeezing off rounds. This technique should only be used to engage targets in excess of 25 meters when good cover and concealment is available or when the need for accuracy overrides the need for speed.

(2) ***Rapid Aimed Fire***. This technique utilizes an imperfect sight picture. When using this technique the soldier focuses on the target and raises his weapon until the target is obscured by the front sight post assembly. Elevation is less critical than windage when using this technique. This aiming technique is extremely effective on targets from 0 to 15 meters and at a rapid rate of fire.

(3) ***Aimed Quick Kill.*** The aimed quick kill technique is the quickest and most accurate method of engaging targets up to 12 meters. Experienced soldiers may use the technique at greater ranges, as they become familiar with it. When using this technique, the soldier aims over the rear sight, down the length of the carry handle, and places the top 1/2 to 3/4 of an inch of the front sight post assembly on the target.

(4) ***Instinctive Fire.*** This is the least accurate technique and should only be used in emergencies. It relies on instinct, experience, and muscle memory. The firer concentrates on the target and points the weapon in the general direction of the target. While gripping the handguards with the nonfiring hand he extends the index finger to the front, automatically aiming the weapon on a line towards the target.

c. **Aim Point**. Short-range engagements fall into two categories based on the mission and hostile threat. Most short-range engagements will be decided by who hits his target with the first round first. During this type of engagement it is more important to knock the enemy soldier down as quickly as possible than it is to kill him immediately.

During this type of engagement soldiers must aim at the "lethal zone" (center mass) of the target as in regular rifle marksmanship. Although shots to the center of the target may prove to be eventually fatal they may not immediately incapacitate the enemy. During SRC a shot that does not immediately incapacitate the enemy may be no better than a clean miss. Because of this, and the possible presence of military equipment or protective vests, soldiers must be able to not only engage soldiers in the "lethal zone" but also to engage them with "incapacitating" shots.

(1) ***Lethal Shot Placement.*** The lethal zone of the target is center mass between the waist and the chest. Shots in this area maximize the hydrostatic shock of the round (Figure 7-36). Due to the nature of SRC, soldiers must continue to engage targets until they go down.

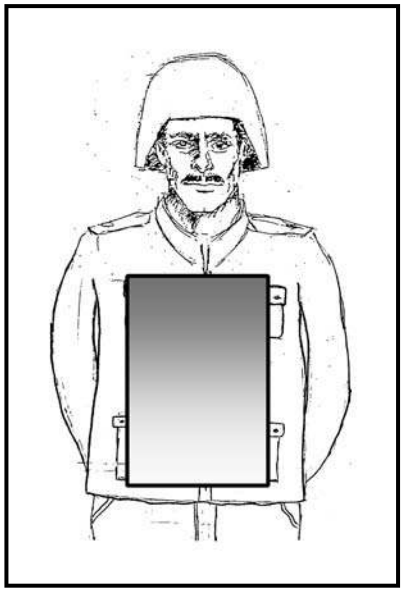


Figure 7-36. Lethal zone aim point.

(2) ***Incapacitating Shot Placement*** (Figure 7-37). The only shot placement that guarantees immediate and total incapacitation is one roughly centered in the face, below the middle of the forehead and the upper lip, and from the eyes in. Shots to the side of the head should be centered between the crown of the skull and the middle of the ear opening, from the center of the cheekbones to the middle of the back of the head.

Figure 7-37. Incapacitation zone aim points.

d. **Trigger Manipulation.** Short-range combat engagements are usually quick, violent, and deadly. Due to the reduced reaction time, imperfect sight picture, and requirement to effectively place rounds into threat targets, soldiers must fire multiple rounds during each engagement to survive. Multiple shots may be fired either through the use of a controlled pair or automatic weapons fire.

(1) ***Controlled Pair.*** A controlled pair is two rounds fired in rapid succession. The soldier fires the first round and allows the weapon to move in its natural arc without fighting the recoil. The firer rapidly brings the weapon back on target and fires a second round. Soldiers must practice the "controlled pair" until it becomes instinctive. Controlled pairs should be fired at single targets until they go down. When multiple targets are present the soldier must fire a controlled pair at each target, then reengage any targets left standing. Rapid, aimed, semiautomatic fire is the most accurate method of engaging targets during SRC.

(2) ***Automatic Fire.*** Automatic weapons fire may be necessary to maximize violence of action or gain fire superiority when gaining a foothold in a room, building, or trench. When properly trained, soldiers should be able to fire six rounds (two three-round bursts) in the same time it takes to fire a controlled pair. The accuracy of engaging targets can be equal to that of semiautomatic fire at 10 meters with practice. The key to firing a weapon on burst or automatic is to squeeze the trigger, not jerk it.

(a) For the majority of soldiers, fully automatic fire is rarely effective and can lead to unnecessary noncombatant casualties or fratricide. Not only is fully automatic fire inaccurate and difficult to control, but also rapidly empties ammunition magazines. A soldier who finds himself out of ammunition with an armed, uninjured enemy soldier during SRC will become a casualty unless a fellow soldier intervenes.

(b) Controlled three-round bursts are better than automatic fire but they are only slightly faster and not as accurate or effective as rapid, aimed, semiautomatic fire.

(3) ***Failure Drill.*** To make sure a target is completely neutralized, soldiers should be trained to execute the failure drill. A controlled pair is fired at the lethal zone of the target, then a single shot to the incapacitating zone. This type of target engagement is particularly useful when engaging targets wearing body armor.

7-24. PRELIMINARY MARKSMANSHIP INSTRUCTION

As with all other forms of marksmanship training, PMI must be conducted to establish a firm foundation on which to build. Soldiers must be taught, and must understand, the fundamentals of SRM described in paragraph 7-23. Blank fire drills are conducted to ensure a complete and through understanding of the fundamentals as well as to provide the trainers with valuable feedback as to the level of proficiency of each soldier. It is important during this training to emphasize basic force protection issues such as muzzle awareness and selector switch manipulation. Soldiers must be drilled on these areas to ensure that future training and performance during combat situations is done in the safest manner possible. The risk of fratricide or noncombatant casualties is greatest during SRC. Preliminary marksmanship instruction should include, at a minimum, the following tasks.

a. **Weapon Ready Positions and Firing Stance.** Ensure that each soldier understands and can properly carry his weapon.

b. **Moving with a Weapon.** Ensure that the soldier can move at a walk and run and turn left, right, and to the rear as well as move from the standing to kneeling position and the kneeling back to the standing position.

c. **Weapons Malfunction Drills.** Ensure soldiers instinctively drop to the kneeling position, clear a malfunction (using SPORTS), and continue to engage targets. This drill can be performed by issuing each soldier a magazine loaded with six to eight rounds of blank ammunition with one expended blank round.

d. **Target Engagement Drills.** These drills teach soldiers to move from the ready position to the firing stance, emphasizing speed and precision movements. Soldiers must be observed to ensure that the finger is outside the trigger well and that the selector switch remains on the "safe" position until the weapon is raised to the firing position. This is a force protection issue and must be drilled until all soldiers can perform to standard.

7-25. PHASE I, REFLEXIVE FIRE TRAINING

Reflexive fire training provides the fundamental skills required to conduct short-range marksmanship. It involves the practical application of all four of the fundamentals of SRM. All soldiers must receive a go on the task Conduct Reflexive Firing, before proceeding with training. Reflexive firing should be conducted as refresher training as often as possible to insure that soldier's skills are always at the highest possible level. This is a perishable skill that must be constantly reinforced.

a. **Reflexive Firing Targets.** Targets can be locally purchased (FBI style) or manufactured by the unit (bowling pin targets). E-type silhouettes may be painted as shown in Figure 7-38.

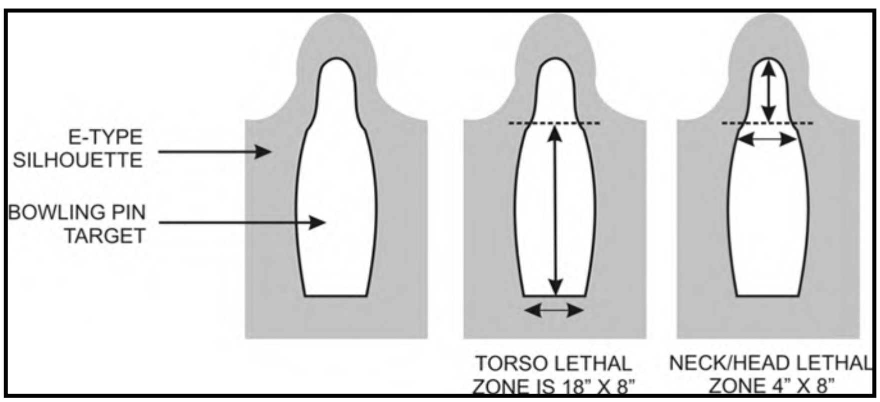


Figure 7-38. Dimensions and placement of bowling pin targets.

b. **Range Setup.** The range must be at least 25 meters in length with identification marks at the 5-, 10-, 15-, and 25-meter distances. Each lane should be marked in a way that prevents cross firing between lanes. A lane safety-coach is assigned to each lane to observe and evaluate the soldier's performance as well as ensure the safe conduct of firing. All firing cues are given by the tower or line safety.

c. **Conduct of Training.** Each soldier will conduct a dry-fire exercise and a blank-fire exercise prior to conducting the live-fire exercise. The dry-fire and blank-fire exercises will give the soldier the repetition needed to successfully engage targets quickly and accurately. Soldiers start at the 25-meter line at the low ready facing the targets. The soldier is then told the engagement position (for example, facing left, turn right) and, once in position, is given the cue to fire. The soldier must, on cue, assume the proper firing position and stance, place the selector lever on semi, use the correct aiming technique for the target's distance, and engage the target. After engaging the target the soldier will continue to cover the target to reinforce firing until the threat is eliminated. Rounds fired after the time standard will be scored as a miss. The number of rounds fired after the time standard will be subtracted from the total number of hits the soldier has scored. The soldier will be evaluated on a "GO/NO GO" basis based on the standards in the training and evaluation outline (T&EO) and scoring table. Soldiers must complete a blank fire iteration before being allowed to live fire.

(1) Each soldier will identify and engage the proper targets at ranges from 5 to 25 meters from the stationary position, while turning and walking. Soldiers must score a GO on the familiarization firing tables (Table 7-3 and Table 7-4, page 7-44) before attempting to qualify.

NOTE: All rounds must impact on the E-type silhouette. Hits are defined as being in the lethal zone (bowling pin).

(2) All tables are fired at night, with and without protective mask, and using automatic fire for familiarization. The tables are also fired using night vision devices. The standard for protective mask firing is 60 percent day and 50 percent night. Unit commanders should conduct training continually to first establish and then sustain levels of proficiency in reflexive firing.

NOTE: If the soldiers will be engaging targets with either lasers, optics, or the protective mask, they should complete all steps using the same equipment. Do not have the soldier's familiarize with iron sights and then fire the live exercise while wearing the protective mask.

POSITION	ROUNDS FIRED	DISTANCE (meters)	METHOD	TIME STANDARD	LETHAL ZONE HIT STANDARD
Straight ahead	4	25	Single shot	None	3
Straight ahead	4	10	Single shot	None	3
Straight ahead	4	25	Controlled pair	None	3
Straight ahead	4	10	Controlled pair	None	3

Table 7-3. Familiarization (stationary).

POSITION	ROUNDS FIRED	DISTANCE (meters)	METHOD	TIME STANDARD	LETHAL ZONE HIT STANDARD
Facing left; turning right	4	25	Controlled pair	None	3
Facing right; turning left	4	25	Controlled pair	None	3
Straight ahead walking	4	10 start at 15	Controlled pair	None	3
Straight ahead	4	5	Controlled pair	None	3

Table 7-4. Familiarization (moving).

7-26. PHASE II, TARGET DISCRIMINATION TRAINING

Target discrimination is the act of distinguishing between threat and nonthreat targets during SRC. During SRC, there is little or no margin for error. A shot at a noncombatant or friendly soldier, or slow inaccurate shots can all be disastrous. Target discrimination is an inescapable responsibility and must be stressed in all situations regardless of mission. It is essential that this training be aimed at instilling fire control and discipline in individual soldiers. The first priority is always the safety of the Infantryman.

a. **Target Discrimination Targets.** Target discrimination is best taught using two or more E-type silhouettes with bowling pins painted on each side of the silhouette (such as brown side and green side). The instructor calls out a color for the shooter to identify on the command "READY, UP" or at the "whistle blast." The shooter quickly scans all targets for the color and engages using a controlled pair. This is the standard that all Infantrymen train to. It will effectively train Infantrymen to accomplish missions under the expected ROE. The OPFOR will wear distinctive uniforms during force-on-force training, which will prepare Infantrymen to eliminate threats based on enemy uniforms and reduce the chances of an Infantryman hesitating and becoming a casualty. Using realistic targets displaying threat and nonthreat personnel is another variation.

(1) Alternative methods include using multiple E-type silhouettes with different painted shapes (squares, triangles, and circles). The instructor calls out a shape for the firers to identify. On the command "READY, UP," or at a whistle blast, the shooters quickly scan all three targets searching for the shape and engage using the controlled pair technique. This is repeated until one shape is mastered. Subsequently, a sequence of shapes are announced, and the firers engage accordingly.

(2) Another variation is to paint a series of 3-inch circles on the E-type silhouettes. The instructors call out which circle to engage (for example, top left) and firers react accordingly. Marksmanship is emphasized using this technique.

(3) Another technique for training is to use pop-up targets (electrical or pull targets).

(4) A good technique for teaching soldiers target discrimination is to have them focus on the target's hands. If a target is a threat, the first and most obvious indicator is a weapon in the target's hands. This is also the center of the uniform, which soldiers should focus on. The soldier must mentally take a "flash picture" of the entire target because an armed target could possibly be a fellow soldier or other friendly, which is why soldiers

train on uniforms (green or brown silhouettes). This level of target discrimination should not be trained until soldiers are thoroughly proficient in basic SRC and SRM tasks.

b. **Range Setup**. The range must be at least 25 meters in length and each lane should be at least 5 meters wide. Each lane should have target holders and should be marked in a way that prevents cross firing between lanes. A coach/safety is assigned to each lane to observe and control the soldier's performance. The tower, lane safety, or senior instructor gives all firing commands.

c. **Conduct of Training.** Each soldier must complete a dry-fire exercise and a blank-fire exercise before moving on to the live-fire portion. (Table 7-3 will be used to score this exercise.) Regardless of the type of target used, the following method will be used to conduct training. The soldier will begin all engagements facing away from the target, which requires the soldier to identify and discriminate, and reinforces skills used during reflexive firing training. The soldier will be given a target description and, on the command "READY," begins to scan for the target. On cue ("Up," voice command, or whistle blast), the soldier will turn toward and engage the target.

(1) Instructors should vary commands and targets so that the soldier does not fall into a pattern. Intermixing "no fire" commands will add to realism.

(2) A soldier will be scored as a "NO GO" if he fails to engage a target or engages a target other than the one called for by the instructor. Soldiers will complete a blank fire validation on this task before live firing. Soldiers will also receive a "NO GO" if at any time their weapon is pointed at another soldier or they fail to keep their weapon on safe before acquiring and engaging the targets. The first priority is always the safety of the soldier.

(3) All soldiers must receive a "GO" on this task before SRM qualification. Targets must be scored and marked after each firing distance.

NOTE: Initial training and sustainment training may be conducted by changing the uniform in the standards statement.

7-27. PHASE III, SHORT-RANGE MARKSMANSHIP QUALIFICATION

Each soldier will conduct a blank-fire exercise under the same conditions as the actual qualification. Each soldier will have a coach to ensure that he is acquiring the target; that the weapon remains on safe until time to engage the target and is then placed back on safe; and that he maintains muzzle awareness throughout the exercise. If a soldier is having difficulty during the blank-fire exercise, he will not continue with the qualification and will be retrained. Soldiers should conduct SRM qualification semiannually. In addition to qualification, commanders should conduct familiarization using the same qualification standards while altering the conditions. Firing the qualification tables in protective masks and during periods of limited visibility should be included. Soldiers should train as they fight—that is with all MTOE equipment. Although the qualification is intended to be fired with open sights only, iterations using laser aiming devices, close-combat optics (CCO), and NVDs is highly encouraged. Soldiers must complete a blank fire iteration of the qualification tables before conducting live-fire qualification.

NOTE: If the soldiers will be engaging targets with either lasers, optics, or the protective mask, they should complete all steps using the same equipment. Do not have the soldier's familiarization with iron sights and then fire the live exercise while wearing the protective mask.

Each soldier engages the target IAW the firing table (Table 7-5) and scores 16 hits day and night. The standard when wearing a protective mask is 14 day and 12 night. For scoring purposes, a hit is a round that impacts within the "lethal zone." In addition to achieving a qualifying score, all 20 rounds must hit the E-type silhouette in order to qualify.

POSITION	ROUNDS FIRED	DISTANCE	METHOD	TIME STANDARD
Straight ahead	2	25m	Controlled pair	3 seconds from command "UP"
Left turn	2	25m	Controlled pair	3 seconds from command "UP"
Right turn	2	25m	Controlled pair	3 seconds from command "UP"
Straight ahead walking	2	10m Begin at 15m	Controlled pair	3 seconds from command "UP"
Straight ahead walking	2	5m Begin at 15m	Controlled pair	3 seconds from command "UP"
Straight ahead kneeling	4	10m Begin at 20m	Controlled pair	3 seconds from command "UP"
Straight ahead	2	25m	Controlled pair	3 seconds from command "UP"
Walk laterally to left	2	10m	Controlled pair	3 seconds from command "UP"

Table 7-5. Record and practice fire.

7-28. PHASE IV, SHOTGUN AND AUTOMATIC FIRING FAMILIARIZATION

Shotgun and automatic firing familiarization is no different for SRM than for BRM. (Refer to TM 9-1005-303-14 for information on shotgun firing familiarization. Refer to paragraph 7-9 of this chapter for information on automatic firing familiarization.)

Section VII. SQUAD DESIGNATED MARKSMAN TRAINING

With the advances made in computer technology in today's world, "smart" weapons systems are constantly being developed that are increasingly more accurate and able to engage targets at much longer ranges. Conversely, today's combat soldier is trained to engage targets only out to 300 meters. This 300-meter limit is well short of the weapon/ammunition combination's capability. Snipers engage targets at 600 meters and beyond. The squad designated marksman (SDM) will be able to engage targets in the "no man's land" gap that exists between that of the average combat soldier and the sniper. Possessing the ability to estimate range, detect targets, and place effective, well-aimed fire on those intermediate range targets, the SDM will play a vital role on the modern battlefield.

7-29. MISSION OF THE SQUAD DESIGNATED MARKSMAN

The primary mission of the SDM is to deploy as a member of the rifle squad. The SDM is a vital member of his individual squad and not a squad sniper. He fires and maneuvers with his squad and performs all the duties of the standard rifleman. The SDM has neither the equipment nor training to operate individually or in a small team to engage targets at extended ranges with precision fires.

The secondary mission of the SDM is to engage key targets from 300 to 500 meters with effective, well-aimed fires using the standard weapon system and standard ammunition. He may or may not be equipped with an optic. The SDM must, therefore, possess a thorough understanding and mastery of the fundamentals of rifle marksmanship as well as ballistics, elevation and windage hold-off, sight manipulation, and range estimation.

7-30. SQUAD DESIGNATED MARKSMAN PROGRAM

The SDM program will provide the squad with a designated marksman that has been trained to engage targets from 300 to 500 meters. He will operate and maneuver as a rifleman, but will have the added responsibility of engaging targets with effective, well-aimed fires out to 500 meters. He can also be used to help direct the fires of other squad members into enemy positions. Due to the increased skill level required for his position, the SDM must maintain a high level of proficiency through continued training of the required skills.

a. **Selection.** The platoon sergeant and squad leaders must take special consideration in selecting the SDM. The SDM must have a solid marksmanship performance, must have a clear understanding of the fundamentals, and must be able to apply these fundamentals consistently during dry-fire and live-fire training.

b. **Concept.** There are five phases to complete to be a qualified SDM. Each phase stresses marksmanship fundamentals and specific skill areas required to perform as an SDM. Soldiers must receive a "GO" in each phase to continue training. Should a soldier fail any area, he should be removed from training.

7-31. SQUAD DESIGNATED MARKSMAN SKILLS PROGRESSION

The skills progression program for the SDM is based on the M16-/M4-series weapons systems and 100 rounds per man ammunition requirement. The program will assess the soldier's ability to apply the fundamentals of marksmanship and train and assess the soldier in several key areas in which he must be proficient to successfully perform his mission. These areas include basic ballistics, mechanical elevation and windage adjustments, elevation and windage hold-off (adjusted aiming points), and range estimation. The firing events will also serve to both reinforce and assess these areas. All weapons used during training will be the assigned weapons of each soldier participating in the training. The firing events will be conducted with the iron sights or back-up iron sights (BIS) only. The firing events will be conducted on a KD range that enables firing out to 600 meters at a minimum.

NOTE: If an optic is issued for use, the phase dealing with adjusted aiming points and its record fire will be removed and relevant optics training and testing will be substituted.

a. **PHASE I—Position Evaluation.** Phase I of the training consists of assuming the proper firing positions and demonstrating the ability to consistently assume each position. The proper positioning of the soldier is vital in completing his mission of delivering accurate, well-aimed fire. The foxhole supported and prone unsupported firing positions will provide the soldier with the smallest target exposure and will be used during this training cycle. The prone supported position can be substituted for the foxhole supported position dependent on range configurations.

NOTES: 1. Ensure weapon is cleared and that no ammunition is loaded prior to training.

2. Ensure weapon is zeroed prior to training.

3. Ensure the soldier is able to assume a steady firing position.

(1) ***Foxhole Supported.*** The soldier must be able to successfully assume a proper supported position while firing from a foxhole. The trainer must ensure that the soldier has a good steady position. To accomplish this, the trainer must do the following:

(a) *Eye Relief.* Ensure that the soldier demonstrates a consistent eye relief by checking the placement of the soldier's cheek on the butt stock of the weapon. Check to make sure that the soldier's eye is the same distance from the rear sight each time he is evaluated.

(b) *Trigger Finger*. Not all soldiers will place their finger on the trigger in the same place; ensure that the soldier uses his own style. Check to ensure that the soldier places his finger on the trigger the same way each time he is evaluated.

(c) *Elbows.* The elbows should be placed firmly on the outside edge of the foxhole a comfortable distance apart. A sandbag, and not the arms, should take the weight of the weapon. Slightly nudge the soldier to ensure that his position is stable each time he is evaluated.

(d) *Nonfiring Hand.* The nonfiring hand should be placed in such a way that the soldier is comfortable and that it provides the best stability for the weapon on the support. Show the soldier different ways this can be done. After the weapon has been stabilized, nudge the soldier to ensure that the weapon is being supported properly.

(e) *Legs.* The legs will be inside the foxhole while firing. The legs should be planted firmly enough so that the soldier can maintain a stable position while firing. Slightly nudge the soldier to make sure that his legs are firmly planted in the foxhole.

After the soldier has assumed a good supported position in the foxhole, the trainer checks his position and takes notes on all of the above characteristics using the Position Evaluation Checklist in Appendix B. After all characteristics have been noted, have the soldier lay his weapon down, relax, and then assume another supported position. The soldier will assume another good supported position in the foxhole and the trainer will evaluate the position by comparing his notes from the original supported position. The soldier should maintain the same characteristic in the second evaluation as he did in the first. Once the trainer is satisfied that the soldier has demonstrated the proper position and is able to show it in two consecutive attempts, the soldier will move to the unsupported prone position. The trainer will have the soldier assume a good unsupported firing position.

NOTE: The main areas that will differ between the foxhole supported and the prone supported positions are in the placement of the elbows, legs, and non-firing hand. These body positions will be similar to those of the prone unsupported position.

(2) ***Prone Unsupported.*** The trainer will have the soldier assume a good unsupported firing position, then check the same characteristics as with the supported firing position with the exception of the elbows, the nonfiring hand and the legs.

(a) *Elbows.* The elbows should be placed on the ground a comfortable distance apart. The bone, and not the muscles, should support the weight of the weapon. This will prevent any unnecessary muscle fatigue and will allow for a steadier firing position. Slightly nudge the soldier to ensure that his position is stable.

(b) *Nonfiring Hand.* The nonfiring hand will be placed in a comfortable position on the hand guards. The nonfiring hand will not be supported on the ground, sandbag or anything that would create a supported position.

(c) *Legs.* Not all soldiers position their legs the same way while shooting from the prone position. Ensure that the soldier's legs are positioned in such a way that he has a stable position. Spread the legs a comfortable distance apart with the heels on the ground or as close as possible without causing strain.

- The trainer then checks the same characteristics as with the supported firing position and taking special care to observe the positioning of the elbows, the non-firing hand and the legs. The trainer will then take notes on the soldier's unsupported prone firing position checking the above characteristics using the position evaluation checklists in Appendix B.
- Once the trainer has noted the soldier's position he will have the soldier lay his weapon down, stand up, relax, and then get back down into another unsupported prone position. The soldier should maintain the same characteristic in the second evaluation as he did in the first evaluation. The trainer should let the soldier hold this firing position for approximately 15 seconds to check for shaking. If the soldier starts to shake, have him relax, then reposition himself.
- Once the trainer is satisfied that the soldier has demonstrated the proper position and is able to accomplish it in two consecutive attempts, the soldier will move on to the next phase of training.

(3) ***Follow-Through.*** Applying the fundamentals increases the chances of a well-aimed shot being fired. When mastered, additional skills can help to increase the accuracy of that well-aimed shot. One of these skills is follow-through.

(a) Follow-through is the act of continuing to apply all the marksmanship fundamentals as the weapon fires as well as immediately after it fires. It consists of the following:

- Keeping the head in firm contact with the stock (stock weld).
- Keeping the finger on the trigger all the way to the rear.
- Continuing to look through the rear aperture.
- Keeping muscles relaxed.
- Avoiding reaction to recoil and or noise.
- Releasing the trigger only after the recoil has stopped.

(b) A good follow-through ensures the weapon is allowed to fire and recoil naturally. The soldier/rifle combination reacts as a single unit to such actions.

b. **PHASE II—Dry-Fire Training.** During the dry-fire training portion the soldier must demonstrate that he can apply the fundamentals of marksmanship correctly. SDMs must have a solid grasp on the fundamentals to successfully engage targets at longer ranges. If the soldier does not receive a "GO" in this phase of training then he will be dropped from the course.

NOTES:
1. Ensure weapon is cleared and that no ammunition is loaded prior to training.
2. Ensure weapon is zeroed prior to training.
3. Ensure the soldier is able to consistently apply the fundamentals of marksmanship.

(1) ***Borelight Exercise.*** If the borelight is not available, the target-box exercise will be used. The borelight dry-fire exercise will provide continuous evaluation of the soldier throughout the integrated act of firing.

(a) To start the exercise, a 25-meter zero target is attached to a flat surface and the soldier is positioned 10 meters away facing the target. The soldier assumes a good prone supported firing position with the borelight inserted in the barrel of the weapon and placed in the dry-fire mode. (The instructor, making notes IAW the SDM position record sheet [Appendix B], will evaluate the soldier's position.) Once the instructor has evaluated the soldier's position, the soldier will aim center mass of the silhouette on the 25-meter zero target and squeeze the trigger.

(b) The borelight will be activated as the trigger is fired and the laser will be seen on the 25-meter zero target. The 25-meter zero target will be marked exactly were the borelight laser hit the target. The soldier will get out of position and then get back into a prone supported firing position. This process will be done until a three-round shot group has been achieved. The soldier will do the same from the prone unsupported. To receive a "GO," the soldier must place a three-round shot group in a 3-centimeter circle from both prone positions.

(2) ***Target-Box Exercise.*** The target-box exercise checks the consistency of aiming and placement of three-round shot groups in a dry-fire environment. To conduct the exercise, the target man places the silhouette anywhere on a plain sheet of paper and moves the silhouette target as directed by the soldier. The two positions must have already been established so that the rifle is pointed at some place on the paper. Twenty-five meters separate the positions. When the soldier establishes proper aiming, he squeezes the trigger to signal to the target man that the shot was fired. The target man then marks through the silhouette with a pen or pencil at the center of mass of the target. The target man then moves the silhouette to another spot on the paper and tells the firer to repeat the process twice more to obtain a shot group. (A simulated shot group covered within a 1/2-centimeter circle indicates consistent aiming.) Since no rifle or ammunition variability is involved, and since there is no requirement to place the shot group in a certain location, a 1/2-centimeter standard may be compared to obtaining a 4-centimeter shot group on the 25-meter live-fire zero range.

(3) ***Dime/Washer Drill.*** The use of the dime/washer drill is a very effective way of measuring the soldier's trigger squeeze. Have the soldier take aim and squeeze the trigger. If the dime or washer remains in place then he has successfully squeezed the trigger. (The soldier must successfully obtain five out of five consecutive shot groups within 1 centimeter and without allowing the dime or washer to drop.) The trainer will make his own evaluation of the soldier's performance and give the soldier a "GO" or "NO-GO." If the soldier receives a "NO-GO," the trainer recommends re-training, re-testing, or possible removal from the course.

After completion of both Phase I and Phase II, the soldier will conduct a firing event (Table 7-6) to zero or confirm the zero on his weapon and reinforce the fundamentals of marksmanship. This firing event will be conducted on a 25-meter range. (The soldier must zero or confirm his zero within 18 rounds.) If the soldier cannot zero within 18 rounds, the trainer recommends re-training, re-testing, or possible removal from the course. After the weapon is zeroed, any additional rounds will be fired and the coach will observe the soldier for deficiencies in his marksmanship fundamentals.

FIRING EVENT	ROUNDS	TARGET RANGE
Zero/Zero Confirmation	18	25 meters

Table 7-6. Zero/zero confirmation firing event.

c. **PHASE III—Range Estimation and Sight Manipulation 100 to 500 Meters.** The SDMs must use range estimation methods to determine distance between their position and the target.

NOTES:
1. Ensure weapon is cleared and that no ammunition is loaded prior to training.
2. Ensure weapon is zeroed prior to training.
3. Ensure the soldier knows how to adjust for wind and gravity.
4. Ensure the soldier can manipulate the rear sight for different ranges.

(1) ***Range Estimation Training***. The SDM can use several different methods to determine range to the target to include the 100-meter unit-of-measure method, range card method, front sight post method, appearance of objects method, and the combination method.

(a) *100-Meter Unit-of-Measure Method.* To use this method, the SDM must be able to visualize a distance of 100 meters on the ground. For ranges up to 500 meters, the SDM determines the number of 100-meter increments between the two objects he wishes to measure. Beyond 500 meters, he must select a point halfway to the object and determine the number of 100-meter increments to the halfway point, then double it to find the range to the object.

(b) *Range Card Method.* The SDM can also use a range card to quickly determine ranges throughout the target area. Once a target is detected, the SDM determines where it is located on the card and then reads the proper range to the target.

(c) *Front Sight Post Method.* Another method to estimate range is by using the front sight post as a scale. Generally, if a man-sized target is 1/2 the width of the front sight post, then he is approximately 300 meters away. If the target is 1/4 the width of the front sight post, then the target is approximately 600 meters away. This method can be used for a quick estimation and engagement.

(d) *Appearance of Objects Method.* This method is a means of determining range based on the size and visible characteristics of an object. To use this method with any degree of accuracy, the SDM must be familiar with the appearance and visible detail of an object at various ranges. However, some common guidelines can be used in relation to a human target to determine range.

- At 200 meters a human target is clear and details can be seen.
- At 300 meters the target is still clear, but no details can be seen.
- At 400 meters the target's outline is clear; however, the target itself is blurry.
- At 500 meters the body tapers and the head disappears.
- At 600 meters the body resembles a wedge shape.

(e) *Combination Method.* In a combat environment, perfect conditions rarely exist. Therefore, only one method of range estimation may not be enough for the SDM's specific mission. For example, terrain with much dead space limits the accuracy of the 100-meter method. By using a combination of two or more methods to determine an unknown range, an experienced SDM should arrive at an estimated range close to the true range.

(2) ***Factors Affecting Range Estimation.*** Three factors affect range estimation: nature of the target, nature of the terrain, and light conditions.

- *Nature of the Target.* An object of regular outline, such as a house, appears closer than one of irregular outline, such as a clump of trees. A target that contrasts with its background appears to be closer than it actually is. A partly exposed target appears more distant than it actually is.
- *Nature of the Terrain.* As the observer's eye follows the contour of the terrain, he tends to overestimate distant targets. Observing over smooth terrain, such as sand, water, or snow, causes the observer to underestimate distant targets. Looking downhill, the target appears farther away. Looking uphill, the target appears closer.
- *Light Conditions.* The more clearly a target can be seen, the closer it appears. When the sun is behind the observer, the target appears to be closer. When the sun is behind the target, the target is more difficult to see and appears to be farther away.

The trainer will have a range estimation course set up for the soldier to practice on using E-type silhouettes at ranges from 100 meters out to 700 meters. Give the soldiers time to find the method that works best for them. Once the soldiers have had time to practice, they will be tested on their ability to estimate range. The soldiers will be given six targets to estimate the range for. The soldier must estimate the range within 50 meters of the actual range to receive a "GO." The soldier must estimate range correctly six out of six targets to move on to the next portion of this phase.

(3) ***Elevation Knob Training.*** Elevation knob training is nothing more than being able to adjust the rear elevation knob to adjust for various ranges that the SDM will have to engage. The rear elevation knob adjusts the point of aim from 300 to 800 meters on the M16A2, and 300 to 600 meters on the M16A4 and M4. The soldier must take his weapon and determine how many adjustments (clicks) there are between the different range settings on his rear elevation adjustment knob (Tables 7-7 and 7-8). With this knowledge

he can better determine his range settings for the different distances between the 100-meter adjustments.

DISTANCE IN METERS	DISTANCE ONE CLICK WILL ADJUST THE POINT OF IMPACT		
	FRONT SIGHT POST	WINDAGE KNOB	ELEVATION WHEEL
25	.83 cm (3/8 in)	.33 cm (1/8 in)	.5 cm (1/4 in)
50	1.50 cm (5/8 in)	.5 cm (1/4 in)	1.5 cm (1/2 in)
75	2.50 cm (1 in)	1.0 cm (3/8 in)	2.0 cm (3/4 in)
100	3.50 cm (1 3/8 in)	1.5 cm (1/2 in)	2.75 cm (1 in)
150	5.00 cm (2 in)	2.0 cm (3/4 in)	4.0 cm (1 1/2 in)
175	6.00 cm (2 3/8 in)	2.25 cm (7/8 in)	5.0 cm (2.0 in)
200	6.50 cm (2 5/8 in)	2.5 cm (1 in)	5.5 cm (2 1/4 in)
250	8.50 cm (3 3/8 in)	3.5 cm (1 1/4 in)	7.0 cm (2 3/4 in)
300	10.0 cm (4 in)	4.0 cm (1 1/2 in)	8.5 cm (3 1/4 in)
400	13.5 cm (5 3/8 in)	5.5 cm (2 1/4 in)	11.0 cm (4 1/2 in)
500	17.0 cm	6.5 cm (2 1/2 in)	14.0 cm (5 1/2 in)
600	20.5 cm	8.0 cm (3 1/8 in)	16. 75 cm (6 1/2 in)
700	24.0 cm	9.0 cm (3 5/8 in)	19.5 cm (7 1/2 in)
800	27.5 cm	10.5 cm (4 1/8 in)	22.5 cm (8 3/4 in)
NOTE: All values were rounded off.			

Table 7-7. M16A2/3 and front sight post of an M16A4.

DISTANCE IN METERS	DISTANCE ONE CLICK WILL ADJUST THE POINT OF IMPACT		
	FRONT SIGHT POST	WINDAGE KNOB	ELEVATION WHEEL
25	1.2 cm (1/2 in)	.5 cm (1/4 in)	.5 cm (1/4 in)
50	2.4 cm (1 in)	1.5 cm (1/2 in)	1.5 cm (1/2 in)
75	3.6 cm (1 1/2 in)	2.0 cm (3/4 in)	2.0 cm (3/4 in)
100	4.8 cm (1 7/8 in)	2.75 cm (1 in)	2.75 cm (1 in)
150	7.2 cm (2 7/8 in)	4.0 cm (1 1/2 in)	4.0 cm (1 1/2 in)
175	8.4 cm (3 3/8 in)	5.0 cm (2.0 in)	5.0 cm (2.0 in)
200	9.6 cm (3 3/4 in)	5.5 cm (2 1/4 in)	5.5 cm (2 1/4 in)
250	12.0 cm (4 3/4 in)	7.0 cm (2 3/4 in)	7.0 cm (2 3/4 in)
300	14.4 cm (5 3/4 in)	8.5 cm (3 1/4 in)	8.5 cm (3 1/4 in)
400	19.2 cm (7 1/2 in)	11.0 cm (4 1/2 in)	11.0 cm (4 1/2 in)
500	24.0 cm (9 1/2 in)	14.0 cm (5 1/2 in)	14.0 cm (5 1/2 in)
600	28.8 cm (11 1/4 in)	16. 75 cm (6 1/2 in)	16. 75 cm (6 1/2 in)
NOTE: All values were rounded off.			

Table 7-8. M4/M4A1 and windage of an M16A4.

Once the soldier has an understanding of how to manipulate his rear elevation knob to set the proper aiming point for his target, have him conduct another range estimation course, but this time not only estimating range but having to set the rear elevation for the range that he has estimated. (The soldier must estimate range and set his rear elevation knob properly six out of six times to receive a "GO.") If the soldier receives a "NO-GO," then the trainer recommends re-training, re-testing, or possible removal from the course. Once the soldier has an understanding of range estimation and sight manipulation, he is able to begin the live-fire training exercise (Table 7-9). The soldier will be given 20 rounds in which to engage 20 targets at ranges from 100 to 500 meters using mechanical sight adjustments.

FIRING EVENT	ROUNDS	TARGET RANGE
Known Distance (Mech. Adj.)	20	100 to 500 meters

Table 7-9. Known distance (mech. adj.) firing event.

NOTES: 1. Ensure weapon is zeroed prior to training.
2. Ensure the soldier knows how to adjust for wind and gravity.
3. Ensure the soldier can manipulate the rear sight for different ranges.

d. **PHASE IV—Hold-Off 100 to 500 Meters.** Hold-off is shifting the point of aim to achieve a desired point of impact. Certain situations, such as multiple targets at varying ranges and rapidly changing winds, do not allow proper windage and elevation adjustments. This technique is used only when the SDM does not have time to change his sight setting. The SDM rarely achieves pinpoint accuracy when holding off, since a minor error in range determination or a lack of a precise aiming point might cause the bullet to miss the desired point. Therefore, familiarization and practice of elevation and windage hold-off techniques prepares the SDM to meet these situations.

NOTES: 1. Ensure weapon is cleared and that no ammunition is loaded prior to training.
2. Ensure weapon is zeroed prior to training
3. Ensure the soldier knows how to adjust for wind and gravity.
4. Ensure the soldier can manipulate the rear sight for different ranges.

(1) ***Elevation.*** The SDM uses hold-off to hit a target at ranges other than the range for which the rifle is presently adjusted. When a soldier aims directly at a target at ranges greater than the set range, his bullet will hit below the point of aim. At lesser ranges, his bullet will hit higher than the point of aim. If the SDM understands this and knows about trajectory and bullet drop, he will be able to hit the target at ranges other than that for which the rifle was adjusted. For example, the SDM adjusts the rifle for a target located 500 meters downrange and another target appears at a range of 600 meters. The hold-off would be 25 inches; that is, the SDM should hold off 25 inches above the center of visible mass in order to hit the center of mass of that particular target. If another target were to appear at 400 meters, the SDM would aim 14 inches below the center of visible mass in order to hit the center of mass.
The chart in Figure 7-39 shows the projectile's trajectory when fired from the M16A2 and the M4 carbine. The red line shows the trajectory of the M4 carbine and the blue line shows the trajectory of the M16A2. This demonstrates the drop of the round at various

ranges. This diagram will also assist the trainer in teaching vertical hold-off during this phase.

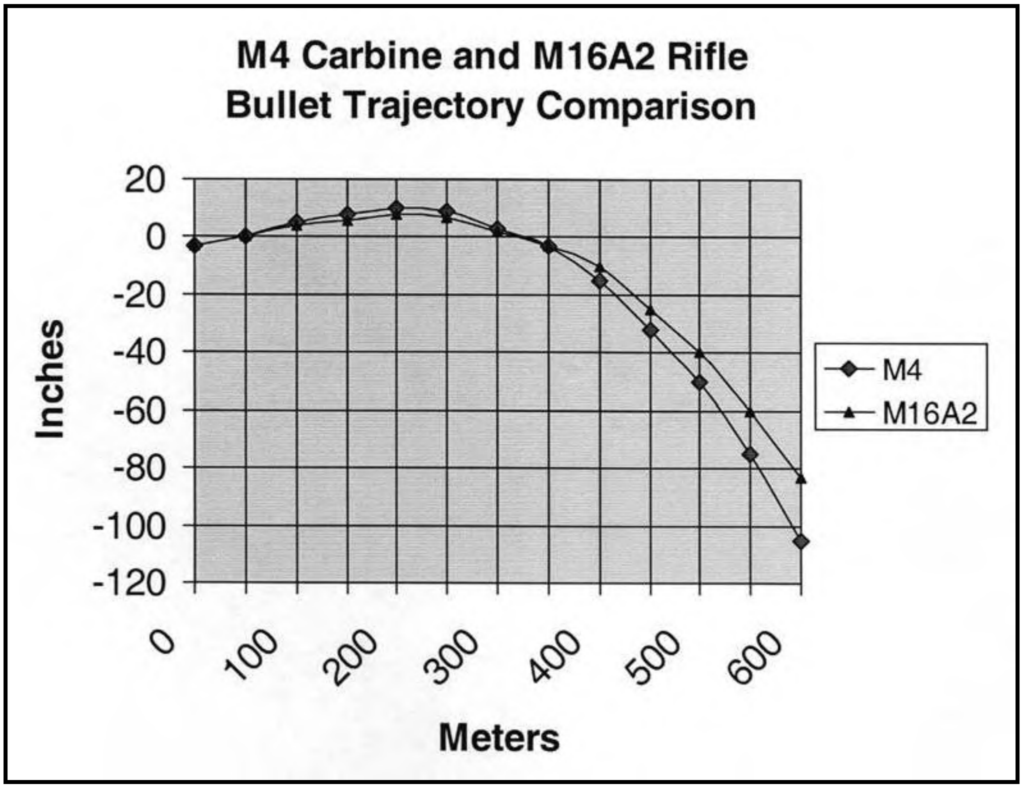


Figure 7-39. Bullet trajectory comparison.

As the chart shows, the hold-off at 400 meters is about half the height of the standard E-type silhouette; therefore, to hold-off at 400 meters you must aim half the height of the target over the target to hit it. The drop at 500 meters is considerably larger, so holding off will not be practical. The shooter will have to adjust his rear elevation knob to get the proper aim point for that distance.

* (2) ***Windage.*** When firing during windy conditions and there is no time to make sight adjustments, the SDM must use hold- off to adjust for windage (Figure 7-40, page 7-56). When holding off, the SDM aims into the wind. If the wind is moving from the right to left, his point of aim is to the right. If the wind is moving from left to right, his point of aim is to the left. Constant practice in wind estimation can bring about proficiency in making sight adjustments or learning to apply hold-off correctly. If the SDM misses the target and the point of impact of the round is observed, he notes the lateral distance of his error and re-fires, holding off that distance in the opposite direction. Table 7-10 shows calculated adjusted aiming points based on wind speed.

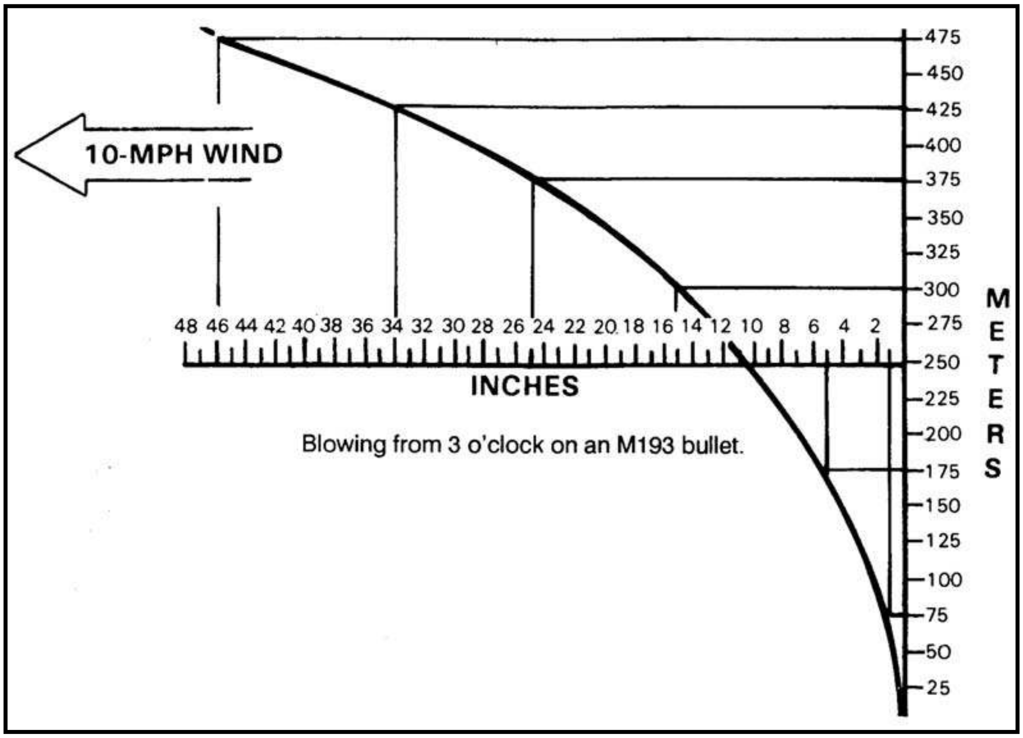


Figure 7-40. Windage effects of a 10-mph crosswind.

WIND SPEED	RANGE (in meters)								
	25	50	75	100	150	175	200	250	300
5 mph	1/4 in.	3/8 in.	1/2 in.	1 in.	2 in.	2.5 in.	3.5 in.	5 in.	7.5 in.
10 mph	1/2 in.	3/4 in.	1 in.	2 in.	4 in.	5 in.	7 in.	10 in.	15 in.
15 mph	3/4 in.	1-1/8 in.	1.5 in.	3 in.	6 in.	7.5 in.	10.5 in	15 in.	22.5 in

Table 7-10. Calculated adjusted aiming point based on wind speed (full value).

*Table 7-11, page 7-58 shows the drift for 10 MPH wind using M855, 5.56 NATO ball ammunition fired in a 16A2 rifle with 300 meters battle sight zero.

Drift for 10 MPH Wind Using M855 5.56 NATO Ball Ammunition Fired in 16A2 Rifle With 300 Meters Battle Sight Zero

Range (meters)	Velocity (fps)	Trajectory (in)	Drop (in)	Drift (in)
0	3,100	-2.5	0.0	0.0
100	2,751	+4.4	-2.3	1.1
200	2,420	+5.8	-10.2	4.9
300	2,115	0.0	-25.3	11.8
400	1,833	-15.0	-49.5	22.4
500	1,569	-42.9	-86.7	38.0
600	1,323	-88.2	-141.3	59.5
700	1,106	-156.1	-220.9	88.4
800	1,010	-267.7	-339.2	124.9

***Table 7-11. Drift for 10 MPH wind using M855 ammunition.**

*The firers can demonstrate that they understand holding off by using an M15 sighting device. The firer aligns the sights on the silhouette on the proper adjusted aiming point. Once the firer has an understanding of elevation and windage hold-off, he is able to begin the live-fire training exercise (Table 7-12). The firer will be given 20 rounds in which to engage 20 targets at ranges from 100 to 500 meters using elevation and windage hold-off.

FIRING EVENT	ROUNDS	TARGET RANGE
Known Distance (Hold Off)	20	100 to 500 meters

***Table 7-12. Firing event, known distance (hold off).**

NOTES: 1. Ensure weapon is zeroed prior to training.
2. Ensure soldier knows how to adjust for wind and gravity.
3. Ensure soldier can manipulate the rear sight for different ranges.

* e. **PHASE V—Field Fire 100 to 500 Meters.** Field fire will consist of both a Record Fire I and a Record Fire II course. The field-fire events (Table 7-13) will test the individual's marksmanship, range estimation, and target detection skills. Each Record Fire course will have targets at ranges from 100 to 500 meters. Each firer will engage a total of 20 targets with 20 rounds. Soldiers will fire the table using both the foxhole supported or prone supported position (sandbags) and the prone unsupported firing position. An individual must attain a total of 14 hits out of 20 targets to pass. The Record Fire I course requires the individual to use mechanical elevation and windage adjustments. The Record Fire II course requires the individual to use elevation and windage hold-off (adjusted aiming points). If the SDM is issued an optic, the Record Fire II course will substitute use of that optic instead of using adjusted aiming points.

NOTES: 1. Ensure weapon is zeroed prior to training.
2. Ensure soldier is able to assume a steady firing position.
3. Ensure soldier is able to consistently apply the fundamentals of marksmanship.
4. Ensure soldier knows how to adjust for wind and gravity.

5. Ensure soldier can manipulate the rear sight for different ranges.

FIRING EVENT	ROUNDS	TARGET RANGE	STANDARD
Record Fire I	20	100 to 500 meters	14 of 20
Record Fire II	20	100 to 500 meters	14 of 20

***Table 7-13. Firing event, Record Fire I and II.**

NOTE: The firer must engage 14 out of 20 targets at 100 to 500 meters during each field-fire exercise. (See Appendix B for a reproducible scorecard.)

f. **Certification.** Once the firer has successfully completed the SDM program, he is designated as an SDM and will be able to perform all duties and responsibilities set forth by these guidelines.

NOTE: The skills of the SDM are highly perishable and sustainment training should be conducted to ensure retention of the skills. At a minimum, sustainment training should be conducted semiannually.

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CHAPTER 8

ADVANCED OPTICS, LASERS, AND IRON SIGHTS (Phase V of Basic Rifle Marksmanship)

Basic rifle marksmanship taught effective engagement of the enemy with the basic rifle or carbine using iron sights to engage targets primarily during the day. Advanced rifle marksmanship added other marksmanship situations that a combat soldier may encounter. This chapter discusses how to enhance marksmanship skills, with proper training, using the Army's newest optics and lasers to ensure the soldier can fight as well at night as he can during the day.

8-1. TRAINING STRATEGIES AND QUALIFICATION STANDARDS

An established day and night advanced marksmanship program equipped with training strategies and proposed qualification standards has been developed.

a. Before beginning a night marksmanship program, soldiers must qualify on their assigned weapons during daylight conditions as outlined in the previous chapters of this manual. This chapter implements new night qualification standards to compliment current Army training strategies.

b. Commanders should follow these training strategies and abide by the qualification standards set forth to the best of their abilities. Although some courses of fire may seem redundant or inappropriate, numerous tests show that these training strategies work and the qualification standards are achievable if the strategy is followed.

8-2. BORELIGHT

The borelight is an accurate means of zeroing weapons and most aided-vision equipment without the use of ammunition. Time and effort must be applied to ensure a precise boresight, which will in turn save time and ammunition. Table 8-1 outlines weapon and aided-vision device combinations that can be zeroed using the borelight with the M16/M4-series weapons. (Figure 8-1 shows the current borelight training program.)

	M16A2	M4/MWS
BACK-UP IRON SIGHT	M16A2 Iron sight can be boresighted	X
AN/PAQ-4B/C	X	X
AN/PEQ-2A	X	X
AN/PAS-13	X	X
M68 CCO	X	X

Table 8-1. Weapon and aided-vision device combinations.

NOTE: The precise boresighting of a laser will allow direct engagement of targets without a 25-meter zero. If a borelight is not available, a 25-meter zero must be done to zero the device. All optics will be 25-meter zeroed; a borelight only aides in zeroing.

Instructional Intent:
Align the bore of the weapon to the optic, laser or iron sight being fired to reduce or eliminate the time and ammunition it currently requires to live fire zero.
Special Instructions:
Zero the borelight.
Use only approved 10-meter boresight targets from Picatinny Arsenal (noted on offset).
Ensure you use the proper 10-meter boresight target for weapon configuration.
Ensure boresighting is conducted 10 meters from the end of the barrel.
Ensure weapon and target is stabilized or the boresight will not be accurate.
Ensure filters for aiming lasers are installed to reduce blooming.
Observables:
Confirm that the borelight spins on itself when zeroed at 10 meters.
Weapon configuration is boresighted using the official and proper targets only.
Confirm the target and weapon is not moving during the boresighting procedure.
Confirm that the borelight is centered on the circle on the target.
Confirm that the aiming device is aiming at the center of the crosshair on the offset.

Figure 8-1. Borelight training program.

DANGERS

1. **DO NOT STARE INTO THE VISIBLE LASER BEAM.**
2. **DO NOT LOOK INTO THE VISIBLE LASER BEAM THROUGH BINOCULARS OR TELESCOPES.**
3. **DO NOT POINT THE VISIBLE LASER BEAM AT MIRROR-LIKE SURFACES.**
4. **DO NOT SHINE THE VISIBLE LASER BEAM INTO OTHER INDIVIDUALS' EYES.**

WARNINGS

1. **Make sure the weapon is CLEAR and on SAFE before using the borelight.**
2. **Ensure that the bolt is locked in the forward position.**
3. **When rotating the borelight to zero it, ensure the mandrel is turning counter clock wise (from the gunners point of view) to avoid loosening the borelight from the mandrel.**

a. **Concept.** Boresighting is a simple procedure that can and will save time and ammunition if the procedures outlined here are strictly followed. The visible laser of the borelight is aligned with the barrel of a designated weapon. Then, using a 10-meter boresight target, the weapon can be boresighted with any optic, laser, or iron sight that the soldier is assigned to fire.

(1) To boresight the weapon using the borelight, ensure that the visible laser is in line with the barrel, zero the borelight to the weapon, and then place the visible laser of the borelight in a designated spot on the 10-meter boresight target. When this is done, move the aiming point of the aiming device to the crosshair on the 10-meter boresight target. The weapon system is now boresighted and ready to engage targets or conduct a 25-meter zero.

(2) With optics, such as the M68, TWS, and AN/PVS-4, the borelight will put the soldier on paper at 25 meters, thus reducing time and ammunition trying to locate rounds during 25-meter zeroing. With lasers, the borelight allows the soldier to boresight and then engage targets, eliminating the 25-meter zeroing procedures altogether.

b. **Zeroing the Borelight.** Before boresighting the weapon system the borelight must first be zeroed to the weapon. To zero the borelight to the weapon, align the visible laser with the barrel of the weapon. Stabilizing the weapon is crucial. The weapon can be stabilized in a rifle box rest or in a field location by laying two rucksacks side by side. Lay the weapon on the rucksacks and then lay another rucksack on top of the weapon to stabilize it.

CAUTION
Do not over adjust the laser or point it at soldiers or reflective material.

NOTE: The weapon does not have to be perfectly level with the ground when boresighting.

(1) Attach the 5.56-mm mandrel to the borelight.

(2) Insert the mandrel into the muzzle of the weapon. The borelight is seated properly when the mandrel cannot be moved any further into the muzzle and the mandrel spins freely. Stabilize the weapon so it will not move.

(3) Measure 10 meters with the 10-meter cord that comes with the borelight or pace off eleven paces.

(4) The zeroing mark is a small dot drawn on a piece of paper, tree bark, or the borelight reference point on the 10-meter boresight target (Figure 8-2, page 8-4).

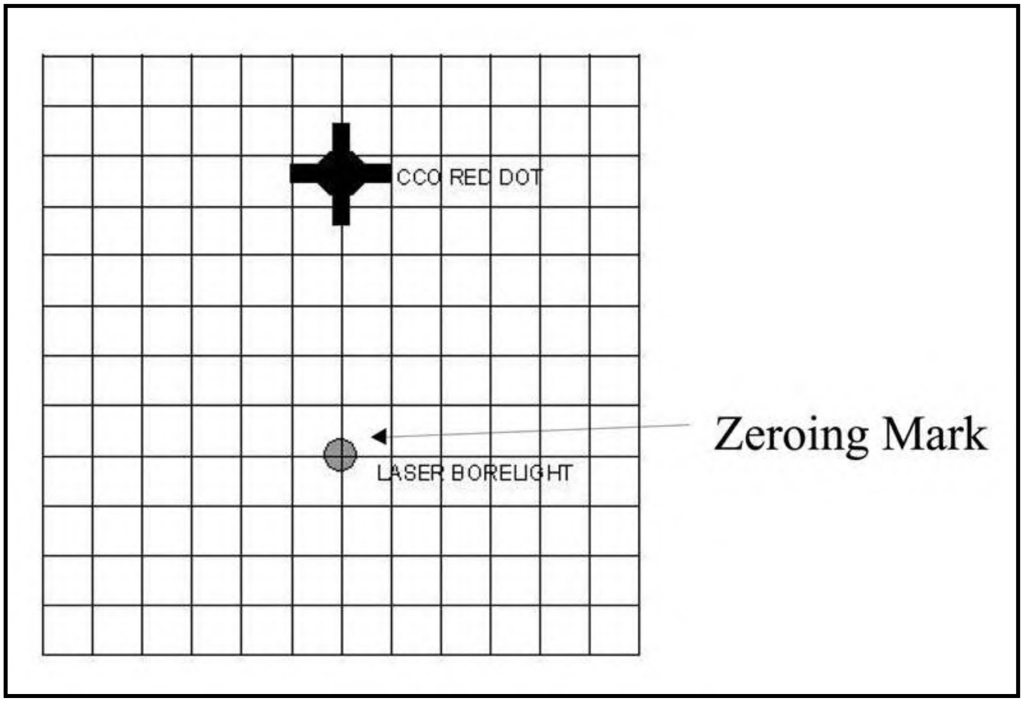


Figure 8-2. Example of a zeroing mark.

(5) Rotate the borelight until the battery compartment is facing upward and the adjusters are on the bottom (Figure 8-3). This position of the borelight, and where the visible laser is pointing, is identified as the start point.

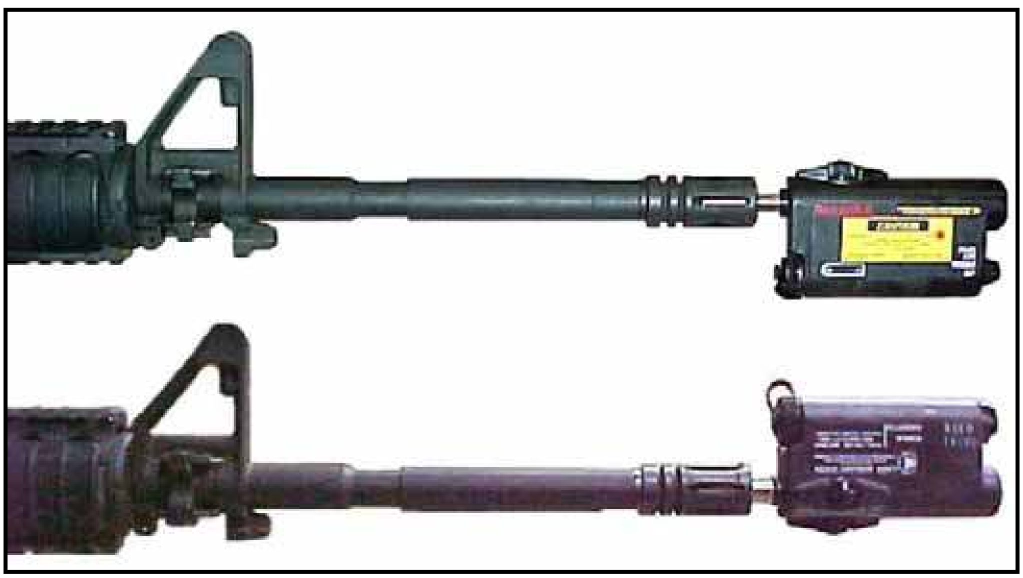


Figure 8-3. Borelight in the START POINT position.

(6) Rotate the borelight until the battery compartment is down and the adjusters are on top to allow for easy access to the adjusters and help with communication and stabilization of the weapon (Figure 8-4). This position of the borelight, and where the visible laser is pointing, is identified as the half turn position.

Figure 8-4. Borelight in the HALF TURN position.

NOTE: The commands "START POINT" and "HALF-TURN" are given to ensure clear communication between the soldier at the weapon and the soldier at the boresight target.

(7) The reference point is the point approximately halfway between the start point and the half-turn point (Figure 8-5).

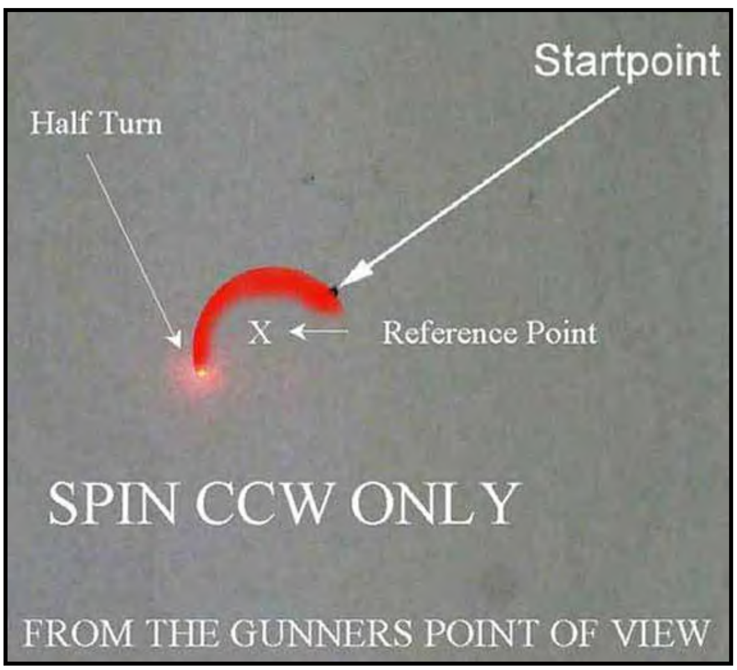


Figure 8-5. Example of a start point, half turn, and reference point.

(8) Turn the borelight on and spin it until it is in the start point position. Place the zeroing mark approximately 10 meters from the end of the barrel so that the visible laser strikes the zeroing mark.

(9) Slowly rotate the borelight 180 degrees while watching the visible laser made by the borelight. If the visible laser stops on the zeroing mark, the borelight is zeroed to the weapon.

(10) If the borelight does not stop on the zeroing mark, elevation and windage adjustments must be made to the borelight.

(11) From the start point, realign the zeroing mark with the visible laser, rotate the borelight 180 degrees to the half turn position, and identify the reference point. Using the adjusters on the borelight, move the visible laser to the reference point. Rotate the borelight back to the start point; move the zeroing mark to the visible laser.

NOTE: If the visible laser cannot be located when the soldier spins the borelight to the half turn position, start this procedure at 2 meters instead of 10 meters. When the visible laser is adjusted to the reference point at 2 meters, then start the procedure again at 10 meters.

(12) Repeat step (11) until the visible laser spins on itself.

NOTE: Every barrel is different; therefore, steps (8) through (10) must be performed with every weapon to ensure that the borelight is zeroed to that barrel. If the borelight is zeroed, then go directly to the boresighting procedures.

c. **Boresighting.** Weapon stability is crucial in boresighting. The weapon should be in the “bolt forward” position and must not be canted left or right during boresighting procedures. If the weapon is boresighted using field-expedient methods (sandbags, rucksacks) and the weapon is laid on the side for stability, ensure that the boresight target is also oriented in the same manner. Two soldiers (a firer and a target holder) are required to properly boresight a weapon. Their duties are as follows:

- The firer’s primary duty is to zero the borelight and make all adjustments on the aided-vision device being used.
- The target holder secures the 10-meter boresight target straight up and down 10 meters from the borelight, and directs the firer in making necessary adjustments to the aiming device. The target holder must wear night vision goggles when boresighting infrared aiming lasers.

NOTES:
1. Appendix G shows the most current 10-meter boresight target. The 10-meter boresight target grids are 1-centimeter squares, unlike the 25-meter zero targets. Contact the proponent of this publication (C Co, 2/29 IN, Ft Benning, GA) for information about the availability of boresight targets.
2. Weapon stabilization is crucial, orientation is irrelevant.

(1) ***Boresighting Iron Sights.*** The back-up iron sights (BIS) can be boresighted to a new user to expedite 25-meter zeroing. To boresight using the BIS, align the iron sights with the Canadian bull on the 10-meter boresight target. Make adjustments to the windage and elevation of the iron sights until the borelight is centered with the circle on the boresight target.

(2) ***Boresighting the M68, CCO***. Before boresighting ensure that the borelight has been zeroed to the weapon. The more accurate the boresight of the M68 to the assigned weapon, the closer to a battlesight zero the weapon will be. 25-meter zeroing must be conducted to ensure the M68 is properly zeroed.

(a) Select the proper 10-meter boresight target for the weapon and M68 configuration. With the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Turn the M68 to the desired setting (position number 4). Have the firer get behind the weapon in a stable supported firing position looking through the M68. Aim the red dot of the M68 on the crosshair located on the 10-meter boresight target. Make adjustments to the M68 until the visible laser of the borelight is centered on the borelight circle on the 10-meter boresight target.

(c) Turn the borelight off. Have the gunner move the weapon off the crosshair, realign the red dot of the M68 on the crosshair, and turn the borelight back on. If the borelight is on the circle and the red dot of the M68 is on the crosshair, the firer's weapon system is boresighted.

NOTE: The M68 is a parallax free sight beyond 50-meters. Boresighting is conducted at 10 meters. This requires the firer to ensure that he acquires the same sight picture and cheek-to-stock weld position each time in order to get a solid boresight. If the firer does not get the same sight picture after the second realignment, he more than likely has a fundamentals problem with his firing position and sight picture. To save time on the range, a coach should troubleshoot the soldier before trying to continue the boresighting of the M68.

(d) Turn the laser off and carefully remove the borelight and the mandrel from the weapon so that the borelight device is not damaged.

(3) ***Boresighting TWS.*** Before boresighting the TWS, make sure the borelight has been zeroed to the weapon. The more accurate the boresight of the TWS to the assigned weapon, the closer to a battlesight zero the firer will be. Zeroing at 25 meters must be conducted to ensure the TWS is properly zeroed. Both the narrow and wide field of views must be boresighted and zeroed.

(a) Select the proper 10-meter boresight target for the weapon/TWS configuration and, with the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Ensure the M16/M4 reticle is displayed. Have the firer get behind the weapon in a stable supported firing position and look through the TWS.

(c) Place a finger on each oval on the 10-meter boresight target. Aim between the fingers with the 300-meter aiming point and make adjustments to the TWS until the visible laser of the borelight is centered on the borelight circle on the 10-meter boresight target.

(d) Have gunner move off the aiming block, realign the TWS to the center of the heated block, and then turn the borelight back on. If the gunner still has the proper boresight alignment the gunner is boresighted; otherwise he will need remedial training on his sight picture.

(e) Change the field of view on the sight by rotating the field-of-view ring and have the gunner repeat steps (a) through (d).

(f) Turn the laser off and carefully remove the borelight and the mandrel from the weapon so that the borelight device is not damaged.

(4) ***Boresighting AN/PAQ-4B/C.*** Before boresighting the AN/PAQ-4B/C, make sure the borelight has been zeroed to the weapon.

DANGER

1. **DO NOT STARE INTO THE INFRARED LASER BEAM WITH THE NAKED EYE OR THROUGH BINOCULARS OR TELESCOPES.**
2. **DO NOT POINT THE INFRARED LASER BEAM AT MIRROR-LIKE SURFACES OR OTHER INDIVIDUALS' EYES.**
3. **ALTHOUGH THE LASER IS EYE SAFE, IT IS A SAFE PRACTICE TO TREAT ALL LASERS AS NOT EYE SAFE.**
4. **3X EXTENDERS MAGNIFY THE LASER AIMING LIGHT; THEREFORE, WHEN USING THE 3X EXTENDERS THE AN/PAQ-4B/C IS CONSIDERED "NOT EYE SAFE" AT ANY DISTANCE.**
5. **DO NOT STORE THE AN/PAQ-4B/C WITH BATTERIES INSTALLED.**

(a) Select the proper 10-meter boresight target for the weapon/AN/PAQ-4B/C configuration and, with the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Install the borelight filter and turn the AN/PAQ-4B/C on. Align the 10-meter boresight target with the visible laser of the borelight.

(c) Adjust the adjusters on the AN/PAQ-4B/C until the infrared laser is centered on the crosshair located on the 10-meter boresight target.

NOTES: 1. The boresight target and zeroing mark must be kept stable during the boresight procedure.

2. Do not turn the adjustment screws too much or they will break. Regardless of the mounting location, the adjuster that is on top or bottom will always be the adjuster for elevation and the one on the side will be the windage adjuster.

   Elevation adjustment screw—one click at 25 meters = 1 centimeter.
   Windage adjustment screw—one click at 25 meters = 1 centimeter.

(5) ***Boresighting AN/PEQ-2A.*** Before boresighting the AN/PEQ-2A, make sure the borelight has been zeroed to the weapon.

DANGER

1. **INVISIBLE LASER RADIATION. AVOID DIRECT EXPOSURE TO THE BEAM.**
2. **DO NOT STARE INTO THE INFRARED LASER BEAM WITH THE NAKED EYE OR THROUGH BINOCULARS OR TELESCOPES.**
3. **DO NOT POINT THE INFRARED LASER BEAM AT MIRROR-LIKE SURFACES OR OTHER INDIVIDUALS' EYES.**
4. **EYE-SAFE DISTANCE IN TRAINING MODE IS BEYOND 25 METERS IN DUAL LO MODE AND IN TACTICAL MODE IS *BEYOND* 220 METERS.**
5. **EYE DAMAGE CAN OCCUR IF CARELESS HANDLING OF THE LASER OCCURS. IN TRAINING MODE THERE'S A 25-METER DANGER AREA IN DUAL LO MODE AND A 220-METER DANGER AREA IN TACTICAL MODE.**
6. **3X EXTENDERS MAGNIFY THE LASER AIMING LIGHT; THEREFORE, WHEN USING THE 3X EXTENDERS THE AN/PEQ-2A IS CONSIDERED "NOT EYE SAFE" AT ANY DISTANCE.**
7. **DO NOT STORE THE AN/PEQ-2A WITH BATTERIES INSTALLED.**

(a) Select the proper 10-meter boresight target for the weapon and AN/PEQ-2A configuration and, with the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Install the filter on the aiming laser and turn the AN/PEQ-2A on. Align the 10-meter boresight target with the visible laser of the borelight.

(c) Adjust the adjusters on the AN/PEQ-2A until the infrared laser is centered on the crosshair located on the 10-meter boresight target.

NOTE: The boresight target and zeroing mark must be kept stable during the boresight procedure.

(d) Adjust the illuminator in the same manner.

(e) Turn the laser off and carefully remove the borelight and the mandrel from the weapon so that the borelight device is not damaged.

NOTES:
1. Each click of elevation and windage is 1 centimeter. For ease, round up to one square. However, each square of the 25-meter zero target is .9 centimeter in actual measurement, which affects large adjustments.
2. Do not turn the adjustment screws too much or they will break. Regardless of the mounting location, the adjuster that is on top or bottom will always be the adjuster for elevation and the one on the side will be the windage adjuster.

(6) ***Boresighting AN/PVS-4.*** Before boresighting make sure that the borelight has been zeroed to the weapon. The more accurate the boresight of the AN/PVS-4 to the assigned weapon the closer the firer will be to battlesight zero. Zeroing at 25 meters must be conducted to ensure the AN/PVS-4 is properly zeroed.

(a) Select the proper 10-meter boresight target for the weapon and AN/PVS-4 configuration and, with the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Ensure the M16 reticle is displayed. Have the firer get behind the weapon in a stable supported firing position and look through the AN/PVS-4.

(c) Turn the borelight laser on. Align the borelight laser with the circle on the 10-meter target offset. Keeping the laser in place, adjust the windage and elevation until the reticle of the AN/PVS-4 is aligned with the circular crosshair.

NOTE: If there is not enough ambient light to see the 10-meter target offset circular crosshair, use a flashlight and shine it indirectly at the target. This will provide enough ambient light for the gunner to see the target.

(d) Turn the borelight off. Have the gunner move his reticle off the circular crosshair and then realign back on the target. Turn the borelight laser back on. If the borelight is in the circle, then the AN/PVS-4 is boresighted.

(e) Turn the laser off and remove the borelight and mandrel from the weapon carefully so that you do not damage the borelight device.

8-3. BACKUP IRON SIGHT

The backup iron sight (BIS) is a semi-permanent flip up sight equipped with a rail-grabbing base. The BIS provides a backup capability effective out to at least 600 meters and can be installed on the M16A4 and M4-series weapons. (Figure 8-6 shows the backup iron sights training program.)

Instructional Intent:
Zero and qualify with the back-up iron sight.
Special Instructions:
Ensure soldiers are applying the marksmanship fundamentals.
Ensure the BIS are in the full vertical position and locked prior to firing.
Ensure the plastic insert is installed in the BIS during boresighting and zeroing.
Observables:
Soldiers attain the same day standards for zeroing and qualification as with the standard iron sights.

Figure 8-6. Backup iron sights training program.

a. **Concept**. The BIS is adjusted for a 300-meter battlefield zero to provide backup in the event an optic or laser device fails to function. The BIS is zeroed on the M4/M4A1 target on the backside of the M16A2 zero targets (NSN 6920-01-395-2949). The 25-meter zeroing procedures are the same as for conventional rear sight assembly on the M16-/M4-series weapons.

b. **Conduct of Training.** All procedures for the BIS are the same as with standard iron sights.

(1) ***Boresight the Iron Sights***. (Optional.)

(2) ***Zero***. The zeroing standards for the BIS are the same as with iron sights. To zero the BIS for the M4-series, set the range selector to 300 meters. To zero the BIS to the M16A4 place the range selector to the white line below the 300-meter mark.

(3) ***Target Detection.*** Target detection procedures for the BIS are the same as with standard iron sights.

(4) ***Practice Qualification.*** A practice qualification must always precede an actual qualification. Practice qualification allows the soldier to practice and refine his skills to succeed during qualification. Practice qualification standards for the BIS are the same as with standard iron sights. If the soldier qualifies during the practice qualification it may be counted as the record qualification.

(5) ***Record Qualification.*** Qualification with the BIS is conducted on a standard record fire range, and the standards for qualification are the same as the record fire day standards.

8-4. M68, CLOSE-COMBAT OPTIC

The M68, CCO is a reflex (nontelescopic) sight. It uses a red aiming reference (collimated dot) and is designed for the "two eyes open" method of sighting. The dot follows the horizontal and vertical movement of the gunner's eye while remaining fixed on the target. No centering or focusing is required. (Figure 8-7 shows the close-combat optic training program.)

Instructional Intent:
Qualify with the M68.
Special Instructions:
Ensure the soldier is proficient with the M68
Ensure with the M16A1/A2 that the M68 does not have the half moon spacer installed
Ensure with the M4, M16A4, and MWS that the M68 has the half moon spacer installed
Ensure the proper offset is used during boresighting procedures
Confirm 10-meter boresight with 25 meter zero
Ensure rail grabber is retightened after initial 3 rounds are fired
Ensure soldier has the M68 dot set for best sight picture.
Ensure that the soldier applies the marksmanship fundamentals
Ensure the soldier zeros and qualifies with the same sight picture (1 or 2 eye method)
Ensure soldier zeros on the M16A2 25 meter zero target
Ensure designated impact zone is 1.4 centimeters down from center mass of the 300-meter silhouette on the 25-meter zero target.
Observables:
The M68 is zeroed to the same standards as with iron sights
Rounds must impact in the 4x4 square designated impact zone.
Soldier achieves the same practice qualification and qualification standards as with day record fire.

***Figure 8-7. M68, close-combat optic training program.**

a. **Concept**. Soldiers must qualify on their assigned weapons during daylight conditions as outlined in this manual. The integrated act of firing with the M68 is identical to the iron sights except for the change in sight picture. The M68 training strategy is the same as the iron sight training strategy.

b. **Conduct of Training.** All procedures for the M68 are the same as with standard iron sights. The M68 equipment training should familiarize the soldier with the proper operation and characteristics of the M68 in accordance with TM 9-1240-413-12&P.

(1) ***Modified Fundamentals.*** The fundamentals of marksmanship are modified as follows:

(a) *Steady Position.* Placing the cheek on the stock weld to get a good sight picture after the M68 is zeroed at 25 meters is no longer necessary. The M68's reflexive sight allows the soldier to fire the weapon with his cheek at a comfortable position; however, the soldier must zero with the same cheek position he will fire with because the parallax free is only effective beyond 50 meters.

(b) *Aiming*. The preferred method of aiming using the M68 is to keep both eyes open, which allows a much greater field of view and makes scanning for targets much easier. However, getting accustomed to the two-eyes-open method takes practice. The soldier must keep the rifle and M68 in a vertical alignment each time he fires.

- *Two-eyes-open method (preferred)*. Position the head so that one eye can focus on the red dot and the other eye can scan downrange. Place the red dot on the center of mass of the target and engage.
- *One-eye-open method.* With the nonfiring eye closed, look through the M68 to ensure that the red dot can be seen clearly. Place the red dot on the center of mass of the target and engage. If the soldier zeros his weapon using the

one-eye-open method, he must engage targets using this method for zero accuracy.

(c) *Breath Control*. This fundamental does not change.

(d) *Trigger Squeeze*. This fundamental does not change.

NOTE: The aiming method used to zero must also be used to engage targets. When using the M68, the weapon must not be canted during aiming or firing.

(2) ***M68 Dry (Nonfiring) Zeroing.*** Starting with a securely installed and live-fire zeroed BIS, mount the reflex sight to the front of the receiver rail or to the top RAS as preferred. Adjust windage and elevation on the reflex sight until the center of the aiming dot is at the tip of the front sight post when viewed through the BIS while assuming a normal firing position.

(3) ***25-Meter Zero Procedures***. When zeroing the M68 CCO at 25 meters a designated *point of impact zone must be identified on the 25-meter zero target (Figure 8-8, page 8-14). Starting from center mass of the 300-meter silhouette on the 25-meter zero target, count down 1½ squares or 1.4 centimeters. This is now the point of impact when zeroing the M68 CCO. Soldiers will continue to aim center mass of the 300-meter silhouette and will make adjustments to the M68 so that the rounds impact in the secondary 4x4 centimeter circular box, 1½ squares or 1.4 centimeters down from the point of aim. Other procedures are the same as standard iron sight procedures.

- Two clicks = 1 centimeter at 25 meters for windage and elevation.
- One click clockwise on elevation moves bullet strike down.
- One click clockwise on windage moves bullet strike left.
- Conduct zeroing only on the M16A2 25-meter zero target.

NOTES:

1. At ranges of 50 meters and beyond, the effects of parallax are minimal. However, at ranges of 50 meters and closer, parallax exists and the firer must ensure that the red dot is centered while zeroing.
2. The aiming method (two eyes open or one eye open) used to zero must be used to engage targets.

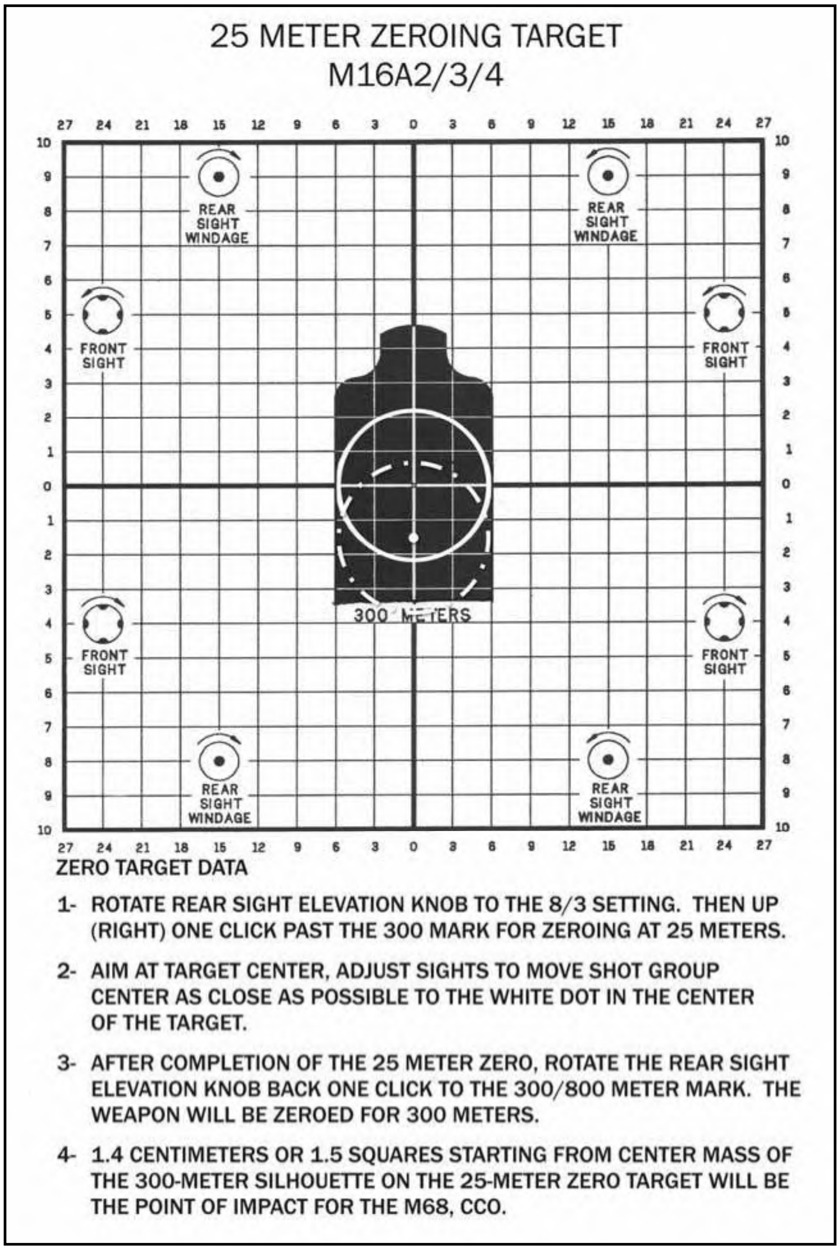


***Figure 8-8. 25 Meter zeroing target M16A2/3/4.**

(4) ***Target Detection.*** Target detection procedures for the M68 are the same as with standard iron sights.

WARNING
In position 4 and above, the red dot is visible through the front of the sight. For night vision operations, close the front lens cover before turning the rotary switch clockwise to position 2 and 3. Check the light for proper intensity before opening the front lens cover. Close the front lens cover before turning the rotary switch counterclockwise to the OFF position. Failure to follow this warning could reveal your position to the enemy.

(5) ***Practice Qualification.*** The procedures are the same as standard iron sight procedures.

(6) ***Record Qualification.*** The procedures are the same as standard iron sight procedures.

8-5. AN/PAS-13 (V2), (V3), THERMAL WEAPON SIGHT

The AN/PAS-13 (V2), (V3), thermal weapon sight (TWS) is an IR imaging sensor used for target acquisition under conditions of low visibility. IR light is received through the telescope, detected by an IR sensor, converted to digital data, processed, and displayed *for the user. (Figure 8-9 shows the AN/PAS-13 training program.)

Instructional Intent:
Qualify with the ANPAS-13, TWS.
Special Instructions:
Ensure soldiers are proficient with the TWS.
Ensure spacer is used with the M4, M16A4, and MWS.
Ensure proper 10-meter boresight target is used during boresight procedures.
Ensure both fields of view (FOV) are boresighted.
Confirm 10-meter boresight with a 25-meter zero.
Ensure M16A2 zero target is used with a four-by-four-centimeter square cut out of the center of the silhouette.
Ensure zero range and qualification range have been thermalized.
Ensure that during zero and qualification every other lane is used.
Ensure range has been inspected for targets that are not thermalized.
Observables:
The TWS is zeroed to the same standards as with iron sights.
Soldier achieves the same practice qualification and qualification standards as with day record fire.

***Figure 8-9. AN/PAS-13 (TWS) training program.**

WARNING

Ensure the weapon is not loaded and is on SAFE before installing the TWS on the weapon. A loaded weapon may accidentally discharge causing severe injury or death.

a. **Concept**. Training strategy on the AN/PAS-13 is much the same as aiming lights. The TWS is a thermal sight and does not require the use of night vision devices. The course of fire for the TWS is the same scenario as the day qualification tables with the same requirements for standards of fire for current day standards. Qualification standards are the same for day and night.

b. **Conduct of Training.** AN/PAS-13 equipment training should familiarize the soldier with the proper operation and characteristics of the TWS in accordance with the TM to include:

(1) ***Modified Fundamentals.*** The fundamentals of BRM change as follows:

(a) *Steady Position*. This fundamental slightly changes due to the height of the sight. Soldiers must adjust their body position so they can properly look through the sight. In most cases, the cheek-to-stock weld no longer exists.

(b) *Aiming*. To properly aim with the TWS, soldiers must ensure that the correct reticle is selected in the sight. (Refer to TM 11-5855-312-10, 31 Oct 00 for reticle selection and point of aim for use with the TWS.)

(c) *Breath Control*. This fundamental is not affected by night firing conditions using the TWS.

(d) *Trigger Squeeze*. This fundamental of marksmanship does not change during night firing.

(2) ***25-Meter Zero Procedures.*** Refer to TM 11-5855-312-10, 31 Oct 00 for target preparation.

(a) Use the same procedures and standards as with iron sights.

(b) At the 25-meter range each increment of azimuth or elevation setting moves strike of the round as follows:

- 1 1/4 centimeters for MTWS on WFOV.
- 3/4 centimeter for MTWS on NFOV.
- 3/4 centimeter for HTWS on WFOV.
- 1/4 centimeter for HTWS on NFOV.

(c) **Retighten the rail grabber** after the first three rounds fired.

* (d) Zero both FOVs (Figure 8-10, page 8-17).

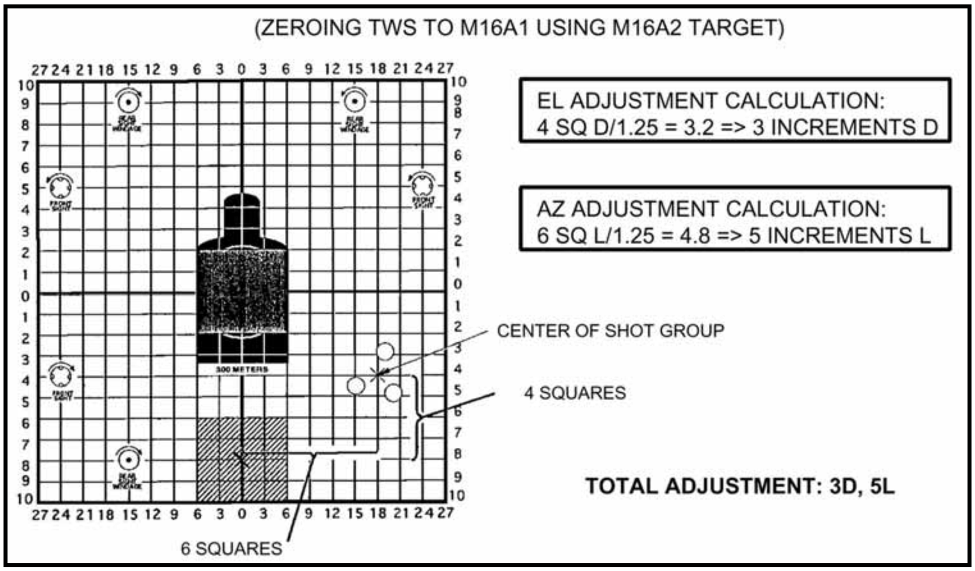


***Figure 8-10. Example of TWS zeroing adjustments.**

(3) ***Target Detection.*** With night vision devices the field of view is much smaller, scanning becomes much more deliberate, and, with the TWS, camouflage becomes less of a factor. Even though night vision devices greatly enhance the soldier's ability to acquire a target at night, increased awareness of target detection must be trained to allow the solider to key in on the visual cues of infrared imagery.

(a) *Select Position.* The TWS is a large device; therefore, selecting a position that allows for good fields of view but at the same time does not silhouette the soldier and his equipment might be a challenge. Since the TWS detects thermal energy (heat) emitted from an object, a position near an object emitting a vast amount of thermal energy (for example, a vehicle with the engine running, a fire, or so on) may affect the soldier's ability to acquire a target.

(b) *Scanning*. With earlier versions of the TWS, scanning too fast causes a stuttering on the screen, which causes the soldier to miss or overlook a target. With these versions scanning must be done slowly in order to maintain a good thermal image on the screen. With the newer version, this stuttering is not as obvious. One advantage the TWS (heavy and medium) has over other night vision devices is that it has two fields of view—wide and narrow. Each field of view has its own advantages and disadvantages. The narrow field of view increases magnification but decreases the field of view. The wide field of view decreases magnification but increases the field of view. The soldier chooses which field of view to use to scan and engage targets.

(c) *Target Indicators*. While scanning the sector and or lane with the TWS, the soldier should be aware of thermal cues that allow him to detect and identify targets. The engine compartment, exhaust, and tires of a vehicle that has been moving are all examples of thermal cues. Adjusting the brightness, contrast, and polarity helps enhance the thermal cues of a target, allowing for quicker detection and identification.

(d) *Sound*. Use the same techniques outlined in day and night target detection.

(e) *Movement*. Thermal cues become much more obvious on a moving object than on an object standing still. A good example is the tire on a vehicle. With the vehicle not moving, the tires are cold. On a moving vehicle, the friction between the road and the tires causes the tires to heat up and become prominent when observed through the TWS. The same is true with the human body—a person moving generates more heat than someone standing still.

(f) *Camouflage*. Probably the biggest advantage the TWS provides is its ability to negate camouflage. The TWS gives the soldier the ability to see through camouflage, such as paint, foliage, and camouflage netting, thereby increasing both day and night target-detecting abilities.

WARNING

If the TWS is operated with the eyecup removed, light emitting from the eyepiece may be visible to the enemy's night vision devices.

(4) ***Practice Qualification.*** Practice qualification with the TWS is the same as day practice qualification with iron sights. Dry fire is done to allow the soldiers to make adjustments to the TWS. Every other firing lane should be used so that the soldier engages only the targets in his lane.

(5) ***Record Qualification.*** Record qualification with the TWS is the same as day record qualification with iron sights.

NOTES:
1. Record qualification with the TWS can be done day and or night. Regardless of the qualification, the standard day record fire for the iron sights will be used. The standards for qualification with the TWS, either day or night, are 23 out of 40.
2. During practice qualification and qualification, it is the soldier's preference on polarity and field of view.

8-6. AN/PAQ-4B/C AND AN/PEQ-2A INFRARED AIMING LASERS

The newest infrared aiming lasers greatly increase the night firing accuracy of all infantry weapons. The infrared aiming lasers complete the transition from day optics to night optics. Their effectiveness is limited by the capability of the image-intensifying (I2) sight *with which they are used. (Figure 8-11, page 8-19) shows the current training program for these lasers.)

Instructional Intent:
Qualify with the AN/PAQ-4B/C or AN/PEQ-2A.
Special Instructions:
Ensure soldiers are proficient with the AN/PAQ-4B/C or AN/PEQ-2A.
Ensure proper 10-meter boresight target is used during boresight procedures.
Ensure borelight filter is used.
Ensure AN/PEQ2A is set to AIM LO.
Ensure illuminator on the AN/PEQ-2A is boresighted.
Ensure M16A2 25-meter zero target is used for 25-meter zero.
Ensure a 3x3-cm hole is cut in the center of the 25-meter zero target and E-type silhouette.
Observables:
Soldier conducts either 10-meter boresight or a 25-meter zero.
Soldier displays good scanning, IR discipline, and IR walking technique.
Soldier achieves at least 17 target hits out of 40 target exposures.

***Figure 8-11. AN/PAQ-4B/C or AN/PEQ-2A training program.**

a. **Concept**. Two training strategies have been devised to adequately train soldiers in the use of the AN/PAQ-4B/C and AN/PEQ-2A infrared aiming laser devices. The night initial training strategy is used for soldiers who have little or no previous experience with night vision goggles, or for units beginning a night-training program. The night sustainment training strategy is for soldiers who are familiar with night vision goggles, and for units that have already implemented a night-training program. However units should always review the night initial training strategy prior to sustainment training.

b. **Conduct of Training.** AN/PAQ-4B/C and AN/PEQ-2A equipment training should familiarize the soldier with the proper operation and characteristics of the AN/PAQ-4B/C and the AN/PEQ-2A in accordance with the TM to include:

(1) ***Modified Fundamentals.*** Although the same four fundamentals of marksmanship are used for night firing, adjustments must be made to accommodate the night vision devices.

(a) *Steady Position.* The firer's natural tendency is to attempt to acquire a good cheek-to-stock weld position and align the iron sights. The gunner must realize that a good cheek-to-stock weld is not possible with NVGs mounted on his head. The firer should ensure that the butt of the weapon is firmly pulled into the pocket of the shoulder to prevent the laser from wobbling. When the soldier is ready to fire, the elbows are firmly planted on the ground to prevent the laser from wobbling excessively.

(b) *Aim.* The gunner must practice raising his head just enough to clear the weapon with his NVGs and acquire a good sight picture by walking the laser onto the target and then aiming at center mass.

(c) *Breath Control.* This fundamental is not modified for night firing conditions.

(d) *Trigger Squeeze.* The objective is to not disrupt alignment of the laser with the target by jerking the trigger.

(2) ***25-Meter Zero Procedures.*** If the borelight is not available, a 25-meter zero must *be conducted (Figure 8-12).

(a) *AN/PAQ-4B/C.*

- Same standards as with iron sights.
- Set the adjusters to their zero preset position (see TM 11-5855-301-12&P).
- Prepare 25-meter zero target by cutting a 3x3-centimeter square out of the center of the silhouette.

- Elevation adjustment screw—one click at 25 meters = 1 centimeter (clockwise = up).
- Windage adjustment screw-one click at 25 meters = 1 centimeter (clockwise = left).
- **Retighten rail grabber** after the first three rounds are fired.

NOTE: When cutting the 3-centimeter square out of the target, some of the strike zone may be cut out. Care must be taken when annotating the impact of the rounds. When the weapon is close to being zeroed, some of the shots may be lost through the hole in the target.

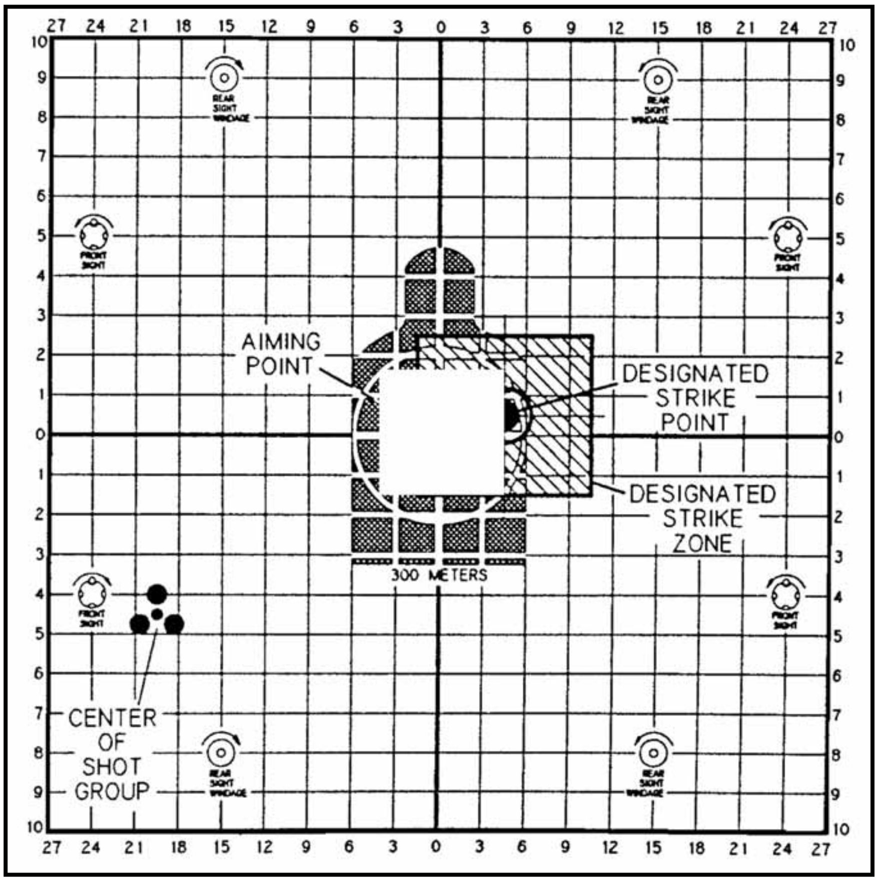


***Figure 8-12. Example of shot group adjustment with strike zone.**

(b) *AN/PEQ-2A.*

- Same standards as with iron sights.
- Set the adjusters to their zero preset position (see TM 11-5855-308-12&P).
- Prepare the 25-meter zero target by cutting out a 3x3-centimeter square in the center of the target and E-type silhouette.
- Turn the aiming beam on in the low power setting (AIM LO). Install aim point filter to eliminate excessive blooming.
- The adjustments for the AN/PEQ-2A (top mounted) are as follows:

- AIMING POINT.
  - Elevation adjustment screw—one click at 25 meters = 1 centimeter or one square (clockwise = up).
  - Windage adjustment screw—one click at 25 meters = 1 centimeter or one square (clockwise = right).
- TARGET ILLUMINATOR.
  - Elevation adjustment screw—one click at 25 meters = 1 centimeter or one square (clockwise = down).
  - Windage adjustment screw—one click at 25 meters = 1 centimeter or one square (clockwise = right).
- **Retighten rail grabber** and AN/PEQ2A.
- Once the aiming beam is zeroed, rotate the selector knob to the DUAL LO, DUAL LO/HI or DUAL HI/HI mode to observe both aiming and illumination beams. Rotate the illumination beam adjusters to align the illumination beam with the aiming beam.

NOTES: 1. Failure to fully tighten the mounting brackets and AN/PEQ2A thumbscrew may cause zero retention problems. Confirm that equipment is tight prior to zeroing.
2. To retain zero, remove the TPIAL and rail grabber as a whole assembly and place back onto the same notch as removed.

(3) ***Target Detection.*** Soldiers should receive in-depth instruction on the proper use and fit of night vision goggles to include characteristics and capabilities, maintenance, and mounting procedures. Extensive testing has proven that the average soldier does not properly use the night vision devices. Unit leaders must be proficient in the train-the-trainer strategy. At night, soldiers should conduct a terrain walk to become more familiar and build confidence using the night vision goggles.

(a) *Scanning for Targets.* The night vision devices have a 40-degree field of view, which causes the average shooter to miss easy targets of opportunity. The soldier must be trained to aggressively scan his sector of fire for targets. The art of target detection at night is only as good as the soldier practices. Regular blinking during scanning relieves some of the eyestrain that the soldier tends to have trying to spot distant targets. Regular blinking must be reinforced during training. After the soldier has mastered the art of scanning he will find that targets are more easily detected by acknowledging the flicker or the movement of a target.

(b) *IR Discipline.* A soldier must be taught that what he can see downrange or on the battlefield through his NVGs, the enemy can also see. The soldier must train to activate his laser at the base of the target and engage the target as soon as the target is detected. After the target has been engaged, the laser is deactivated. When a soldier uses proper IR discipline while scanning for targets, he must keep his weapon oriented within his sector of fire. When the target is detected the soldier orients his weapon around the base of the target, activates his laser, and walks the laser to the center mass of the target for engagement.

(4) ***Field Fire.*** During the dry-fire exercise, soldiers acquire a sight picture on all exposed silhouette targets before conducting the field-fire scenario. This allows the soldier to focus on the targets at range.

- Conduct dry-fire exercise.
- Conduct in the same manner as field fire II.
- Targets at 50, 150, and 250 meters.
- 36 rounds, 18 rounds supported firing position, 18 rounds prone unsupported firing position.

(5) ***Practice Qualification.*** The procedures for practice qualification are:

- Conduct dry-fire exercise.
- Use coaches.
- 20 rounds foxhole supported, 20 rounds unsupported.
- Engage targets from 50 to 250 meters.
- Standards are 17 out of 40.

(6) ***Record Qualification.*** The procedures for record qualification are:

- Conduct dry-fire exercise.
- 20 rounds foxhole supported, 20 rounds unsupported.
- Engage targets from 50 to 250 meters.
- Standards are 17 out of 40.

8-7. AN/PVS-4 NIGHT VISION DEVICE

The AN/PVS-4 night vision device is a portable, battery operated electro-optical instrument used for observation and aimed fire of weapons at night. It amplifies reflected light such as moonlight, starlight, and sky glow so that the viewed scene becomes clearly visible to the operator. It can be mounted on the M16A2 rifle, M4 carbine, M16A4 rifle, *and M4 MWS. Mounting brackets are provided for each type of weapon. (Figure 8-13, page 8-23 shows the AN/PVS-4 training program.)

Instructional Intent:
Qualify with the AN/PVS-4 night vision device.
Special Instructions:
Ensure soldiers are proficient with the AN/PVS-4.
Ensure that the spacer and Picatinny rail grabber are installed when mounting on MWS.
Ensure proper 10-meter boresight target is used during boresight procedures.
Ensure proper reticle is used.
Confirm 10-meter boresight with a 25 meter zero.
Observables:
The AN/PVS-4 is zeroed to the same standard as with the iron sight.
Soldier achieves same practice and qualification standards as done with day record fire.

***Figure 8-13. AN/PVS-4 training program.**

a. **Concept.** Training strategy on the AN/PVS-4 is much the same as aiming lights. The course of fire for the AN/PVS-4 sight is the same scenario as with the aiming lasers with the same qualifications standards.

b. **Conduct of Training.** This training should familiarize the soldier with the proper operation and characteristics of the AN/PVS-4 in accordance with the TM.

(1) ***Modified Fundamentals.*** The fundamentals are changed as follows:

- *Steady position.* This fundamental slightly changes due to the height of the sight. Soldiers must adjust their body position so they can properly look through the sight. In most cases, the cheek-to-stock weld no longer exists.
- *Aiming.* To properly aim the AN/PVS-4, the soldier must ensure that the proper reticle is inserted in the sight. (Refer to TM 11-5855-213-10 to insert the proper reticle.) The aiming point is placed center mass of the target.
- *Breath control.* This fundamental is not affected by night firing conditions using the AN/PVS-4.
- *Trigger squeeze.* This fundamental of marksmanship does not change during night firing.

(2) ***25-Meter Zero Procedures.*** Use the same procedures and standards as with the iron sights along with the following.

- At 25-meter range each increment of azimuth or elevation setting moves the strike of the round .63 centimeters or 1/4 mil. Two clicks of the windage or elevation will move the strike of the round approximately one square on the M16A2 zero target.
- Retighten the thumb screw on the rail grabber after initial three rounds fired.

NOTE: During boresighting or zeroing procedures if there is not enough ambient light available to see either the boresight mark at ten meters or the silhouette on the zero target, a flashlight can be used by shining the light indirectly towards the target. This will provide enough ambient light to allow the soldier to boresight or zero.

(3) ***Target Detection.*** Target detection with the AN/PVS-4 is very similar to target detection with the night vision goggles. The AN/PVS-4 has a 14.5-degree field of view leaving the average shooter to miss easy targets of opportunity, more commonly the 50-meter left or right. The soldier must be trained to aggressively scan his sector of fire for targets. The art of target detection at night is as good as the soldier practices. Regular blinking during scanning relieves some of the eyestrain that the soldier tends to have trying to spot far targets. Regular blinking must be reinforced during training. After the soldier has mastered the art of scanning he will find that targets are more easily detected by acknowledging the flicker or the movement of a target.

(4) ***Field Fire.*** During the dry-fire exercise soldiers acquire a sight picture on all exposed silhouette targets prior to conducting the field-fire scenario. This allows the soldier to focus on the targets at range.

- Conduct dry-fire exercise.
- Conducted in the same manners as Field Fire II (see Appendix F, for scenario).
- Targets at 50, 150, and 250 meters.
- 36 rounds—18 rounds supported firing position, 18 rounds prone unsupported firing position.

(5) ***Practice qualification.*** The procedures for practice qualification are:

- Conduct dry fire exercise.
- Coaches are to be utilized.

- 20 rounds foxhole supported, 20 rounds unsupported.
- Engage targets form 50 to 250 meters.
- Standards 17 out of 40.

(6) ***Record qualification.*** The procedures for record qualification are:

- Conduct dry fire exercise.
- 20 rounds foxhole supported, 20 rounds unsupported.
- Engage targets from 50 to 250 meters.
- Standards 17 out of 40.

APPENDIX A

TRAINING AIDS AND DEVICES

Training aids and devices must be included in a marksmanship program. This chapter lists those available and provides information on how to obtain them for marksmanship training.

A-1. TRAINING RESOURCES

This paragraph provides the classification and nomenclature for training aids, devices, and targets.

a. **Classifications.** Information on the classification of various training resources with a general description is listed in Table A-1.

TY PE	DESCRIPTION
Graphic Training Aids	Charts handout cards, diagrams, posters, overhead transparencies, 35-mm slides, and small plastic aids.
Devices	Three-dimensional training aids such as scale models and simulators.

Table A-1. Classification of resources.

b. **Training Support Center.** Training support centers (TSCs) are located throughout the world and are the POCs for training aids and devices. Each TSC provides training aid services to customers in their geographic area of support to include active Army units and schools, Reserve Components, and ROTC units.

NOTE: For more information concerning TSC operations, write Commander, United States Army Training Support Center, ATTN: ATIC-DM, Fort Eustis, VA 23604.

c. **Training Devices and Exercises.** Several marksmanship training devices are available to aid in sustainment training. They are beneficial when ammunition is limited for training or practice exercises such as field firing on the weaponeer or zeroing and qualifying with SRTA. Some training devices are complex, costly, and in limited supply, while others are relatively simple, cheap, and in large supply. Devices and aids can be used alone or in combinations. Individuals or squads can sustain and practice basic marksmanship skills and fundamentals with devices and or aids.

(1) ***Dominant Eye Training.*** This exercise assists the coach and the firer in determining which eye the firer should use when engaging targets. The firer’s dominant eye should be identified early in the training process to prevent unnecessary problems such as a blurred sight picture or the inability to acquire a tight shot group during the grouping exercise.

(a) Cut a 1-inch circular hole in the center of an 8- by 10-inch piece of material (can be anything from paper to plywood).

(b) The trainer positions himself approximately 5 feet in front of the soldier. The trainer closes his nondominant eye and holds his finger up in front of and just below his dominant eye to provide the soldier with an aiming point.

(c) The soldier holds the training aid with both hands at waist level and looks with both eyes open at the trainer's open eye. With both eyes focused on the trainer's open eye and arms fully extended, the soldier brings the training aid up between himself and the trainer while continuing to look at the trainer's eye through the hole in the training aid. The soldier's eye the trainer sees through the hole in the training aid is the soldier's dominant eye.

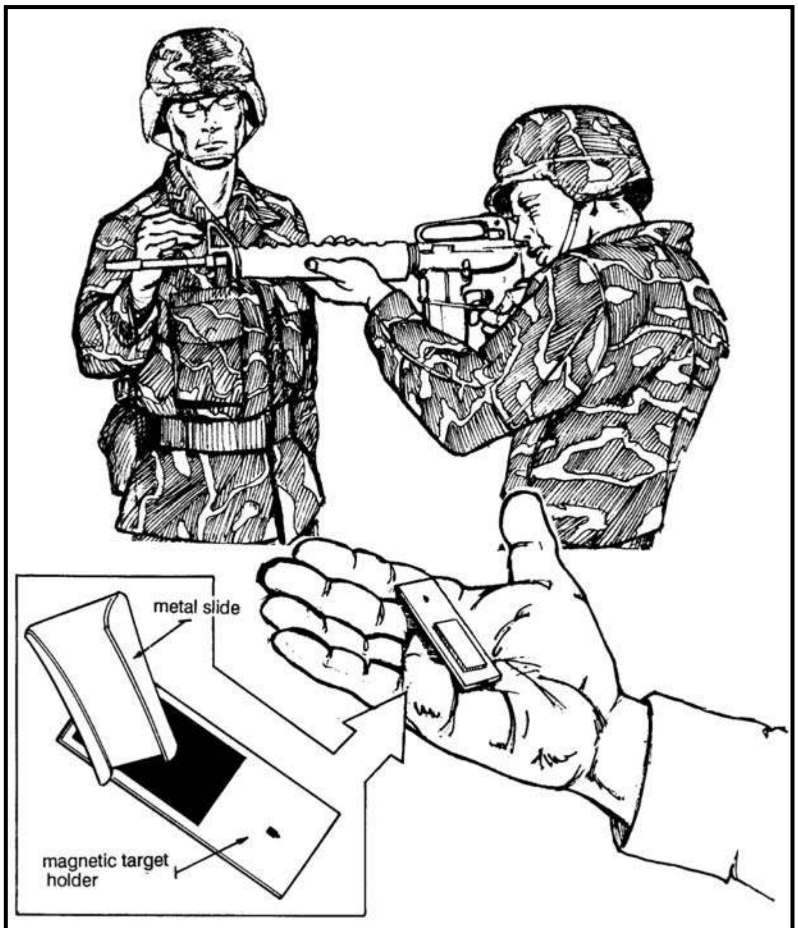
(2) ***Aiming Card.*** The M15A1 aiming card (Figure A-1) determines if the soldier understands how to aim at target center of mass. The card is misaligned, the soldier is instructed to establish the correct point of aim, and a trainer checks it. Several aiming drills provide an understanding of center of mass. This card may be used to ensure the soldier understands adjustment of the aiming point, how to allow for gravity, and how to engage a moving target. The sight-target relationship on the card is the same visual perception the soldier should have when he is zeroing on a standard silhouette target. Each soldier will demonstrate six out of six of the aim points. The soldier will show three side alignment techniques—place the front site post on the left or right edge of the target and bring the front site post to center of mass of the target. The soldier will then show the bottom-up alignment technique—place the front site post at the bottom of the target then bring the front site post to center of mass of the target.

***Figure A-1. The M15A1 aiming card (NSN 6910-00-716-0903).**

(3) ***Riddle Sighting Device***. The Riddle sighting device (Figure A-2) indicates if the soldier understands the aiming process while using the rifle. It is a small plastic plate with a magnet and a drawing of an E-type silhouette target. A two-man team is required for its use.

The soldier assumes a supported or prone firing position. The assistant places the Riddle device on the front sight assembly and adjusts the plastic plate at the direction of the firer until he reports the proper sight picture. Without disturbing the plastic plate, the trainer or coach aims through the sights to determine if the soldier has aligned the target and sight properly. Many sightings are conducted, and the trainer may include variations to ensure the soldier understands the process. Each soldier will demonstrate six out of six aim points starting with the plastic plate offset to the front site post.

NOTE: This device is provided with a small metal clip that slips over the front sight assembly. It allows a smoother surface for attachment of the magnet. The device may also be used without the metal clip.



This device is provided with a small metal clip that slips over the front sight assembly. It allows a smoother surface for attachment of the magnet; however, the device can be used without the metal clip.

Figure A-2. Riddle sighting device.

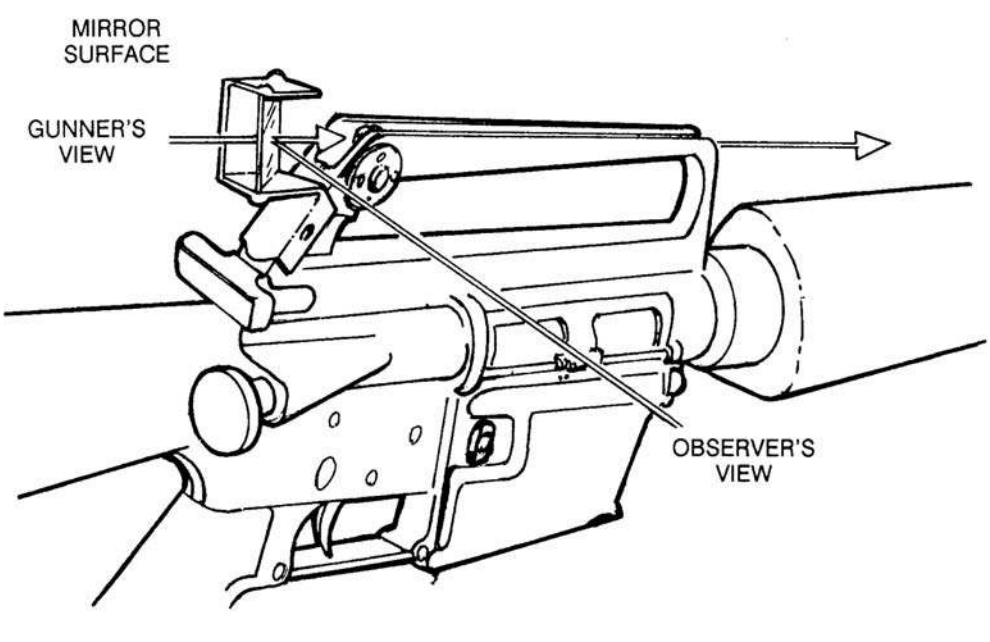
(4) ***M16 Sighting Device****.* The M16 sighting device (Figure A-3, page A-4) is made of metal with a tinted square of glass placed at an angle.

(a) When the device is attached to the rear of the M16A1 carrying handle, an observer can look through the sight to see what the firer sees. The M16 sighting device can be mounted on the M16A2 rifle. The charging handle must be pulled to the rear first. Then, the

M16 sighting device is mounted on the rear of the carrying handle, and the charging handle is returned forward.

(b) The M16 sighting device can be used in a dry-fire or live-fire environment, but a brass cartridge deflector must be used during live fire. The observer must practice with the sight to be effective. For example, the observer looks at a reflected image and if the soldier is aiming to the right, it appears left to the observer. The device must be precisely positioned on the rifle (it may need to be bent to stay on). The observer's position must remain constant. At the same time, the observer talks with the firer to ensure a correct analysis of the aiming procedures. The soldier must achieve six out of six proper site alignment drills.

NOTE: The M16 sighting device is made for left and right-handed firers, and is available for the M16A2. (See subparagraph d for the training aid number.)



The M16 sighting device is made for left- and right-handed firers, and is available for the M16A2.

Figure A-3. M16 sighting device.

(5) ***Blank Firing Attachment (BFA), M15A2/M23***. The BFA (Figure A-4) attaches to the muzzle of the M16-/M4-series weapons. It is designed to keep sufficient gas in the barrel of the weapon to allow semiautomatic, automatic, or burst firing with blank ammunition (M200 only). After firing 50 rounds, the attachment should be checked for a tight fit. Continuous blank firing results in a carbon buildup in the bore, gas tube, and carrier key. When this occurs, the cleaning procedures in TM 9-1005-249-10 or TM 9-1005-249-34 should be followed. The M15A2 is painted red and is used on the M16-series weapons. The M23 is painted yellow and is used on the M4-series weapons. For identification, the M23 is stamped "M4 Carbine Only."

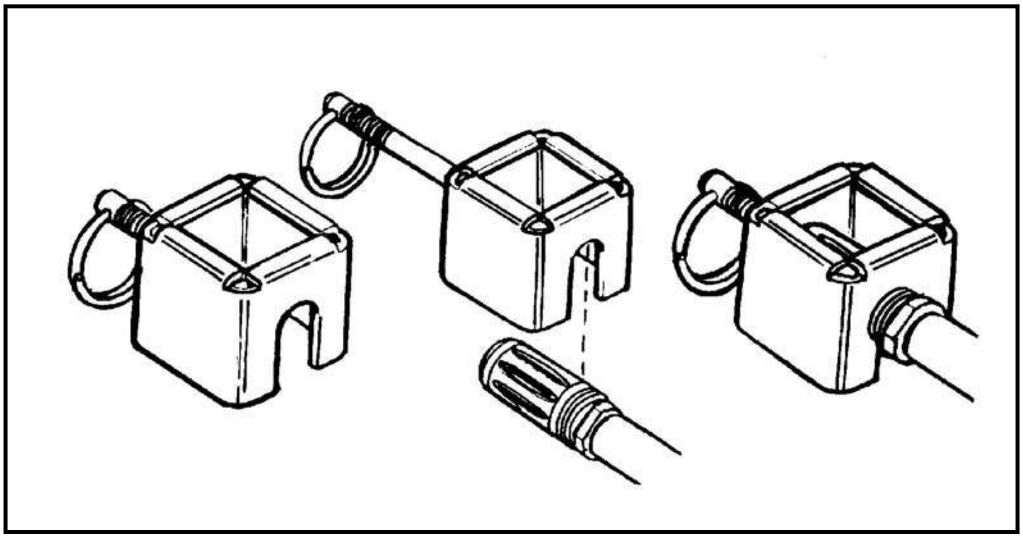


Figure A-4. Blank firing attachment.

CAUTION
Do not use tools to tighten the M15A2/M23 blank firing attachment. Use hands only.

(6) ***Target-Box Exercise***. The target-box exercise checks the consistency of aiming and placement of three-round shot groups in a dry-fire environment (Figure A-5, page A-6).

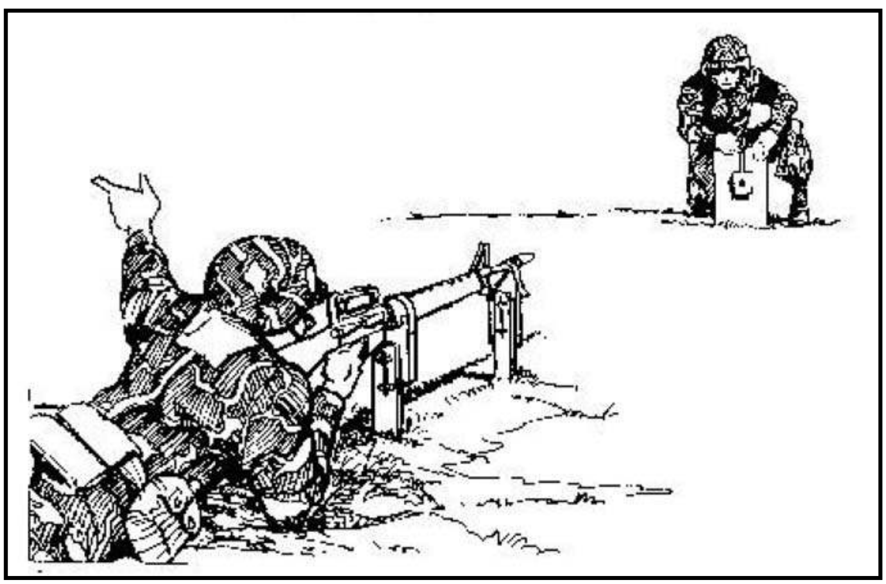


Figure A-5. Target-box exercise.

(a) To conduct the exercise, the target man places the silhouette anywhere on the plain sheet of paper and moves the silhouette target as directed by the firer. The two positions (separated by 15 yards or 25 meters) must have already been established so the rifle is pointed at some place on the paper. When the firer establishes proper aiming, he signals the target man to "Mark." Only hand signals are used since voice commands would be impractical when training several pairs of soldiers at one time.

(b) The target man places the pencil through the hole in the silhouette target and makes a dot on the paper. Then he moves the silhouette to another spot on the paper and indicates to the firer that he is ready for another shot. When the three shots are completed, the target man triangulates the three shots and labels it shot group number one. The firer and instructor view the shot group. Each soldier will dry fire the exercise until they have demonstrated six out of six of the aim points within the plastic target-box paddle's 4-centimeter template. The exercise should be repeated as many times as necessary to achieve two consecutive shot-groups that will fit into the same 2-centimeter circle.

(c) A simulated shot group covered with a 1-centimeter (diameter) circle indicates consistent aiming. Since no rifle or ammunition variability is involved and since there is no requirement to place the shot group in a certain location, a 1-centimeter standard may be compared to obtaining a 4-centimeter shot group on the 25-meter live-fire zero range. The soldier fires several shot groups. After two or three shot groups are completed in one location, the rifle, paper holder, or paper is moved so shots fall on a clean section of the paper.

(d) Any movement of the rifle or paper between the first and third shots of a group voids the exercise. Two devices are available to hold the rifle (Figures A-6 and A-7). The rifle holding device and rifle holding box are positioned on level ground, or are secured by sandbags or stakes to ensure the rifle does not move during the firing of the three shots. Movement of the paper is eased by using a solid backing (Figure A-8, page A-8). Any movement of either is reflected in the size of the shot group. Several varieties of wooden target boxes have been locally fabricated. A new rifle holder has been developed and should be used (Figure A-7).

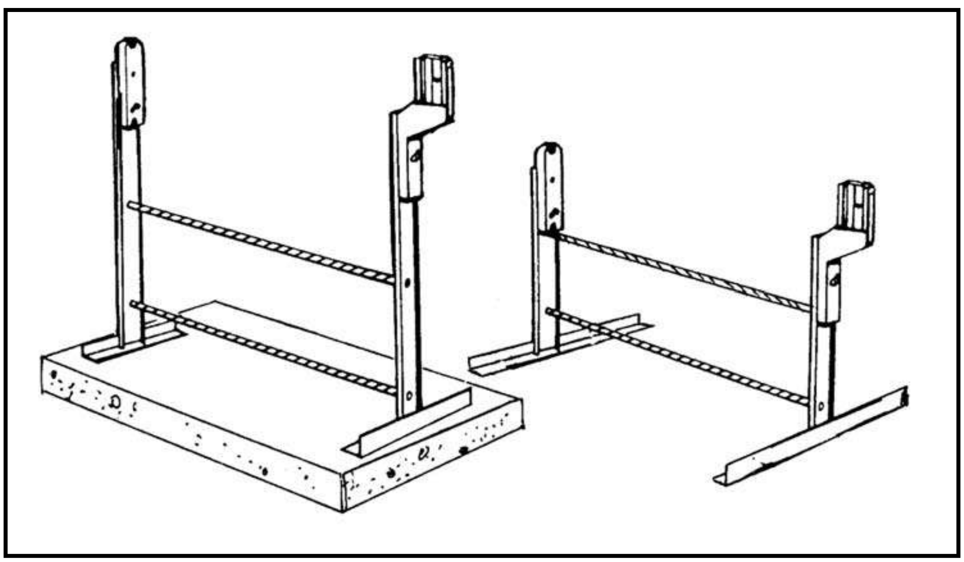


Figure A-6. Rifle holding device (TA-G-12A).

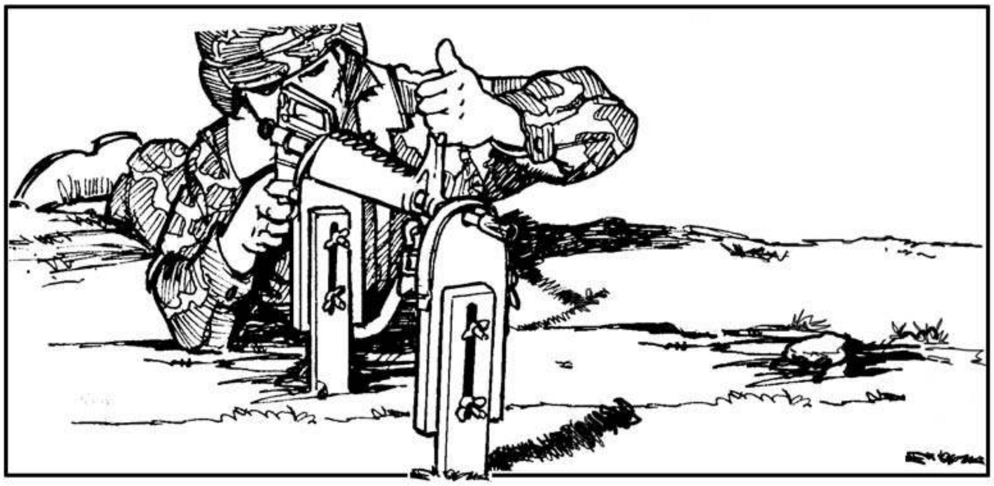


Figure A-7. Rifle holder (locally fabricated).

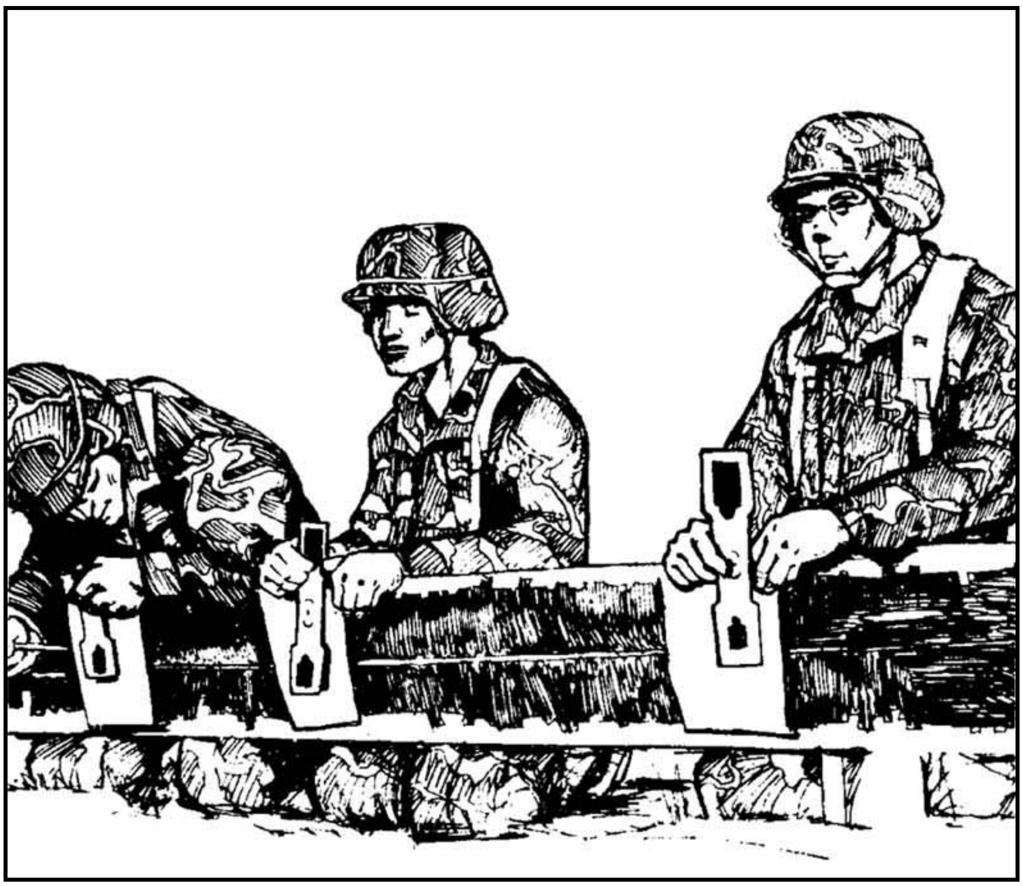


Figure A-8. Paper being placed on a stationary object.

(e) The silhouettes on the plastic paddle (Figure A-9) are scaled to represent an E-type silhouette target at 250 meters. The visual perception during the target-box exercise is similar to what a soldier sees while zeroing on a standard zeroing target. The small E-type silhouette is the same scale at 15 yards as the larger silhouette is at the 25-meter range (some training areas are set up at 15 yards; others are set up at 25 meters). While there are some benefits to representing a 250-meter target, the main benefit of this exercise can be obtained at any distance. A standard zero target can be used at 25 meters in place of the paddle by placing a small hole in the center (dot), moving the target sheet over the paper, and marking as previously outlined.

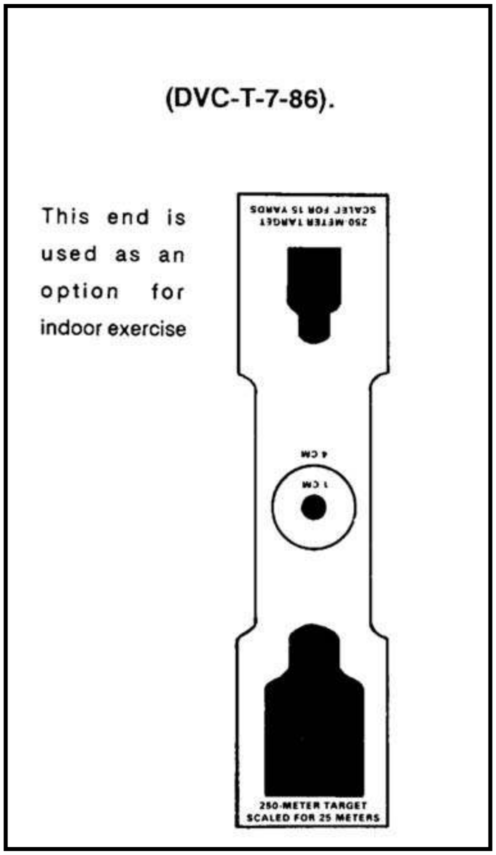


Figure A-9. Target-box paddle (DVC-T-7-86).

(f) The shot-group exercise provides a chance for the trainer to critique the soldier on his aiming procedures, aiming consistency, and placement of shot groups. Assuming the rifle and paper remain stationary and the target man properly marks the three shots, the only factor to cause separation of the dots on the paper is error in the soldier's aiming procedure. When the soldier can consistently direct the target into alignment with the sights on this exercise, he should be able to aim at the same center-of-mass point on the zero range or on targets at actual range.

(7) ***Ball-and-Dummy Exercise***. This exercise is conducted on a live-fire range. The coach or designated assistant inserts a dummy round into a magazine of live rounds. In this way, the coach can detect if the firer knows when the rifle is going to fire. The firer must not know when a dummy round is in the magazine. When the hammer falls on a dummy round, which the firer thought was live, the firer and his coach may see movement. The firer anticipating the shot or using improper trigger squeeze causes this. Proper trigger squeeze

results in no movement when the hammer falls. The soldier will demonstrate the ability to properly utilize the fundamentals of marksmanship six consecutive times.

(8) ***Dime (Washer) Exercise***. This dry-fire technique is used to teach or evaluate the skill of trigger squeeze and is effective when conducted from an unsupported position. When using the M16A1 rifle for this exercise, the soldier must cock the weapon, assume an unsupported firing position, and aim at the target. An assistant places a dime (washer) on the rifle's barrel between the flash suppressor and front sight post assembly. The soldier then tries to squeeze the trigger naturally without causing the dime (washer) to fall off. Several repetitions of this exercise must be conducted to determine if the soldier has problems with trigger squeeze. The purpose of the exercise is for the firer to dry-fire six of six consecutive shots without causing the dime or washer to fall. (Repeat this exercise from the prone unsupported firing position.)

(a) If the dime (washer) is allowed to touch the sight assembly or flash suppressor, it may fall off due to the jolt of the hammer. Also, the strength of the hammer spring on some rifles can make this a difficult exercise to perform.

(b) When using the M16A2 rifle, the dime (washer) exercise is conducted the same except that a locally fabricated device must be attached to the weapon. A piece of 3/4-inch bonding material is folded into a clothes-pin shape and inserted in the flash suppressor of the weapon so the dime (washer) can be placed on top of it.

d. **Selection of Training Aids and Devices.** After training requirements have been established, appropriate training aids and devices can be selected from the TSC. To help in selecting these aids and devices, many of those available and their identification numbers are listed in Table 2.

TYPE/NOMENCLATURE	IDENTIFICATION NUMBER
Weaponeer, Remedial Rifle Marksmanship Trainer	DVC 7-57
M15A2 Blank Firing Attachment	Supply Item (see TM)
Chamber Block (M16A1/A2)	TAD-0001
M16 Sighting Device (A1 0r A2) (Left and Right)	DVC-T 7-84
Target Box Paddle	DVC-T 7-86
Riddle Device	DVC-T 7-87
M16 Rifle Brass Deflector	DVC-T 23-30
M15A1 Aiming Card	DVC-T 07-26
M16A1 Display Mat (canvas)	TAD-0034 (locally)
Rifle Rest (for target-box exercise)	TAD-12 (locally)
Front and Rear Sight, M16 Rifle	TAD-26 (locally)
Front and Rear Sight, M16A2 Rifle	TAD-0026A
GRAPHIC TRAINING AIDS (GTA)	
M16A1 Disassembly Mat (paper)	GTA 09-06-43
Rifle, 5.56mm, M16A1 Mechanical	GTA 7-1-26
Rifle, M16 Disassembly (M16A1)	GTA 9-6-43
M16A1 Rifle Malfunction	GTA 9-6-44
M16A1 Rifle Maintenance Card	GTA 21-1-3

Table A-2. Training aids and devices.

TRAINING FILMS	
*Rifle, M16A1 Part I, Care, Cleaning, Lubrication	TF 21-3907
*Rifle, M16A1 Part II Field Expedients	TF 21-3908
*Also available in videotape.	
VIDEOTAPES	
Engagement of Moving Personnel Targets with the M16A1 Rifle Team from the Foxhole Position	2E/010-071-1271-B
Cycle of Functioning M16A1 Rifle	2E/010-071-0444-B
Overview of BRM Training	2E/010-071-0086-B
TVT 7-13 (Feb 87)	2E/010-071-0725-B
TVT 7-1 Teaching Rifle Marksmanship: Part I	
TVT 7-2 Teaching Rifle Marksmanship: Part II	

Table A-2. Training aids and devices (continued).

e. **Target Ordering Numbers.** Table A-3 lists the description and NSN to use when ordering marksmanship targets.

DESIGNATION	DESCRIPTION	NSN
D Prone	Full length face with V through two scoring areas	6920-00-922-7450
D Prone	Repair center with V through two scoring areas	6920-00-922-7451
E-Silhouette	Full length face, solid color paper	6920-00-600-6874
E-Silhouette	Full length, pop-up, solid color plastic	6920-00-071-4780
E-Silhouette	Full length face, cardboard, kneeling	6920-00-079-1806
F-Silhouette	Short length face, solid color paper	6920-00-610-9086
F-Silhouette	Short length, pop-up, solid color plastic	6920-00-071-4589
F-Silhouette	Short length face, pasteboard	6920-00-795-1807
25-Meter Alternate Course Scaled Qualification target	50 to 300 meter scaled silhouette target	6920-01-167-1398
15-Meter Battlesight-Zero Target (.22 Caliber RFA)	250 meter scaled silhouette target (50-foot indoor range)	6920-01-167-1393
15-Meter Alternate Course C (.22 Caliber RFA)	50 to 300 meter scaled silhouette target (50-foot indoor range)	6920-01-167-1396
25 Meter M16A1 Zero Target	250 meter scaled silhouette target	6920-01-167-1392
25 Meter M16A2 Zero Target	300 meter scaled silhouette target	6920-01-253-4005
25 Meter M16A1 Slow-Fire Target	75 to 300 meter scaled silhouette target	6920-01-167-1391
25 Meter M16A1 Timed-Fire Target	50 to 300 meter scaled silhouette target	6920-01-167-1397

Table A-3. Target ordering numbers.

DESIGNATION	DESCRIPTION	NSN
75 Meter M16A1 Feedback Target	75 meter scaled F-type silhouette	6920-01-169-6921
75 Meter M16A2 Feedback Target	75 meter scaled F-type silhouette	6920-01-253-4006
175 Meter M16A1 Feedback target	175 meter scaled E-type silhouette	6920-01-167-1395
175 Meter M16A2 Feedback Target	175 meter scaled E-type silhouette	6920-01-167-1395
Pasters, Black		6920-00-165-6354
Pasters, Buff		6920-00-172-3572
Landscape target		6920-00-713-8253
Spindle, Target Spotter, Wood		6920-00-713-8257
Spotters, 1 1/2 inches in diameter		6920-00-789-0869
Spotters, 3 inches in diameter		6920-00-713-8255
Spotters, 5 inches in diameter		6920-00-713-8254
Thermal Blankets		xxxx-xx-xxx-xxxx

Table A-3. Target ordering numbers (continued).

A-2. LOCATION OF MISS-AND-HIT (LOMAH) SYSTEM

LOMAH is a range aid used during downrange feedback exercises. The device uses acoustical triangulation to compute the exact location of a supersonic bullet as it passes through a target. The bullet impact is displayed instantly on a video monitor at the firing line. Of more importance, it shows the location of a bullet miss, allowing the firer to make either a sight adjustment or a hold-off for subsequent shots.

a. LOMAH, like other devices, is only an aid. Understanding the weapon and firing techniques, and having a coach/instructor are required when the soldier uses LOMAH.

b. LOMAH ranges have been fielded in USAREUR and Korea. In locations where known distance (KD) ranges are not available and restrictions prohibit walking downrange, LOMAH is a practical alternative to essential downrange feedback. Requests for LOMAH devices should be sent to: Commander, US Army Training Support Center, ATIC-DM, Fort Eustis, VA 23604.

A-3. CALIBER .22 RIMFIRE ADAPTER, M261

The caliber .22 rimfire adapter (RFA) can contribute to a unit's marksmanship program when 5.56-mm ammunition is not available or when ranges that allow firing 5.56-mm ammunition are not available. The RFA can be useful for marksmanship training such as night fire, quick fire, and assault fire. It is not recommended for primary marksmanship training.

a. **Training Considerations.** When service ammunition is in short supply, the RFA can be used to complement a unit's training program.

(1) ***Rifle Performance***. The RFA/.22-caliber rimfire ammunition cannot replicate the exact ballistics of the 5.56-mm ammunition. Efforts to match RFAs with specific rifles can result in reasonable replication. Under ideal training conditions, the RFA should be used with dedicated rifles. Finding the right match of RFA and rifle can eliminate some

variability. A trial-and-error technique can match RFAs to rifles, which results in good firing weapons. The RFA cannot be depended on to fire in the same place as 5.56-mm ammunition. It is not necessary for the soldier to use his own weapon during RFA training.

(2) ***Rifle Zero***. The RFA will not usually group in the same location as 5.56-mm ammunition at 25 meters and cannot be used for weapon zero. It normally fires a slightly larger shot group than 5.56-mm ammunition. When a soldier uses an RFA in his rifle, he must be careful not to lose his 5.56-mm zero. This can be accomplished by using hold-off while firing .22-caliber ammunition or keeping a record of sight changes so the sights can be moved back. The .22-caliber round approximates the 5.56-mm trajectory out to 25 meters. The correct zeroing target or appropriate scaled-silhouette targets can be used for practice firing exercises at 15 meters (50 feet) or 25 meters.

b. **Advantages and Disadvantages.** If the RFA is used as a training aid, the advantages and disadvantages must be considered during training.

(1) ***Advantages***. The .22-caliber ammunition is cheaper and, may be available in larger quantities than 5.56-mm ammunition. It can be fired on all approved indoor ranges and in other close-in ranges where 5.56-mm ammunition is prohibited. RFA training can be used to sustain marksmanship skills during periods when full caliber 5.56-mm ammunition training cannot be conducted.

(2) ***Disadvantages***. Some negative training aspects exist because of differences in the weapon's functioning when using the RFA. These differences include the forward assist not working, and the bolt not locking to the rear after the last round is fired. More malfunctions can occur with the RFA than with 5.56-mm ammunition, and immediate-action procedures are different.

A-4. SHORT-RANGE TRAINING AMMUNITION

Short-range training ammunition (SRTA) is a plastic practice cartridge (M862) that enables a unit to conduct realistic firing training at shorter distances with reduced danger areas. The M862 has a maximum range of 250 meters. The blue plastic projectile reduces the risk of over-penetration and ricochet, which makes it ideal for urban operations training.

a. To fire the M862 SRTA from an M16-/M4-series weapon, the standard bolt and bolt carrier must be replaced by the M2 practice bolt. The M2 practice bolt consists of a bolt carrier, which is a fixed bolt. The practice bolt changes the weapon from a gas-operated action to a blow-back action that permits cyclic fire with the lower-powered M862.

b. Because of the design of the M2 practice bolt, standard 5.56-mm rounds cannot be fired from the weapon while it is installed. (See TM 9-6920-746-12&P for more information on the M862 SRTA and the M2 practice bolt.)

A-5. MULTIPURPOSE ARCADE COMBAT SIMULATOR

The U.S. Army developed the multipurpose arcade combat simulator (MACS) as an inexpensive marksmanship trainer (Figure A-10, page A-14).

a. The system consists of a Commodore 64 microcomputer, 13-inch color monitor, specially designed long-distance light pen, and mount that attaches to the M16A2 rifle. (Some versions use a permanent mount on a demilitarized rifle.) The system is activated by a program cartridge, which contains several training exercises.

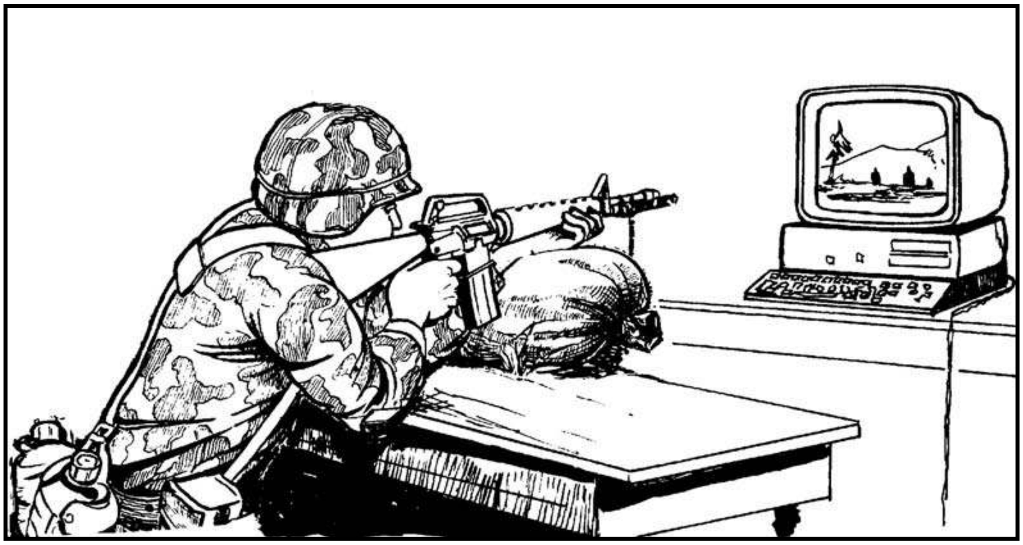


Figure A-10. Multipurpose arcade combat simulator.

b. The MACS was designed to enhance other training techniques and existing training aids and devices used to train and sustain marksmanship skills. It is not designed to replace live-fire training or to eliminate the need for knowledgeable instructors. The MACS provides additional practice for those units without access to adequate range facilities, or that have other resource constraints.

A-6. WEAPONEER

The Weaponeer is an effective rifle marksmanship-training device that simulates the live firing of the M16-series rifle. The system can be used for developing and sustaining marksmanship skills, diagnosing and correcting problems, and assessing basic skills.

a. **Characteristics.** The Weaponeer operates on 110 to 130 volts AC, 10 amperes, 50 or 60 Hz, grounded electrical power. (A stand-alone voltage transformer is provided for overseas units.) The recommended training area for the Weaponeer is 10 by 23 by 8 feet. The operational temperature range is 40 degrees to 100 degrees Fahrenheit. The Weaponeer must be protected from the elements, and should not be subjected to excessive vibration, high dust levels, or condensing humidity. The M16A1/A2 attached to the Weaponeer is demilitarized and does not require the usual weapon security.

b. **Equipment Data.** Table A-4 shows pertinent equipment data.

Major Components (unpacked)	Weight (pounds)	Length (inches)	Width (inches)	Height (inches)
Range assembly	119	99	30	8*/60
Target assembly	64	20	30	24
Operator's console	94	24	29	31
Firing pads:				
stacked	120	93	26	6
prone layout	120	93	74	2
supported position	120	93	52	46
Elevator ladder	20	3	24	61
*Prone position or when closed for transit.				

Table A-4. Equipment data.

c. **Operation.** Figure A-11 shows the Weaponeer in the standing supported firing position. The rifle, with the exception of smoke and cartridge ejection, operates normally, and has the same weight and balance as the standard weapon. An infrared aiming sensor simulates round trajectory and hit point to an accuracy of better than one-minute-of-angle. The recoil rod that attaches at the muzzle end of the rifle simulates recoil. Recoil is provided in both semiautomatic and automatic modes of fire, and is adjustable from no-net force to 30 percent more than that of a live M16. Sound is provided through headphones and is adjustable from 115 to 135 decibels. Special magazines are used. One magazine simulates a continuous load; the other (used to train rapid magazine change) can be loaded with 1 to 30 simulated rounds. Selectable misfire can be used to detect gun shyness and drill immediate action. The front and rear sights are zeroed the same as standard rifles.

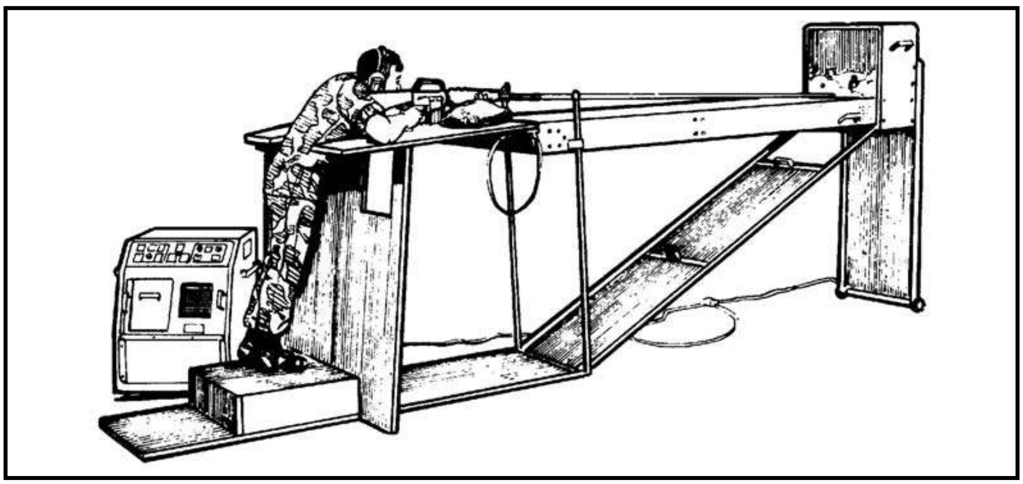


Figure A-11. Weaponeer set up in the standing supported position.

(1) The Weaponeer range can be raised or lowered to accommodate all firing positions. The target assembly contains four targets: a scaled 25-meter zero target and three pop-up targets are standard. E-type and F-type silhouettes at ranges from 75 meters can be used on the Weaponeer. Known-distance and various other types of targets can be used and be

displayed in fixed or random sequences. Target exposure times may be set to unlimited or from 1 to 30 seconds. The fall-when-hit mode can be selected with the KILL button.

(2) The operator's console contains the system control buttons, graphics printer, and video feedback monitor. The back of the console has counters that total rounds and hours, and a storage bin for storing magazines, printer paper and ribbon, headphones, two wrenches for assembling the Weaponeer, and a small allen wrench for aligning the rifle sensor. A remote control, which attaches to the back of the console, enables a trainer or firer to operate select functions away from the console.

d. **Feedback.** The Weaponeer provides feedback to help trainers to teach and soldiers to learn marksmanship skills.

(1) ***Fall-When-Hit Mode.*** Lighting the KILL button enables the fall-when-hit mode. When the button is activated, targets fall when hit. This feedback provides the same hit or miss information as a train-fire (RETS) range.

(2) ***Real-Time Aiming Point Display***. When a firer aims on or near a target, his aiming point relative to the target is continuously displayed on the video screen. The aiming point display allows the trainer to teach and verify aiming techniques, and to continuously monitor the firer's steadiness, techniques, time on target, trigger squeeze, and recovery from recoil.

(3) ***Immediate-Shot-Impact Display***. When a shot is fired, its impact relative to the target is immediately displayed on the video screen as a blinking white dot (Figure A-12, left target).

(4) ***Replay.*** After a shot is fired, a real-rate display of how the firer engaged the target can be replayed on the video screen.

(a) The target to the right in Figure A-12 shows the type of information that can be replayed on the video screen after a series of shots are fired. To show the sequence, the dots have been numbered.

(b) To show a replay, the firer first selects the shot he wishes to replay by operating the EACH SHOT button. Then he presses the REPLAY button. Some Weaponeers record and store replays for only the first three shots.

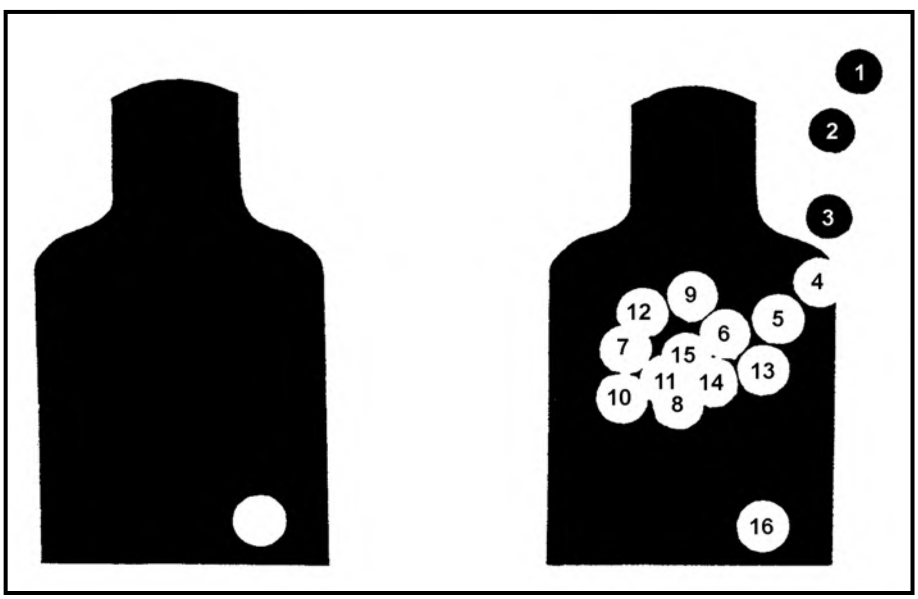


Figure A-12. Replay of shot.

(5) ***Shot Groups***. The impact location of up to 32 shots is automatically stored in the Weaponeer memory and displayed on the video screen. Each impact is indicated by a white dot, which blinks when indicating the last shot. All 32 shots can be fired and displayed on a single target, or split among a combination of targets. The CLEAR button erases all shots from the Weaponeer memory.

(6) ***Printer***. A hard-copy printer is provided for postfiring analysis, for firer progress tracking, and for record keeping. Pressing the PRINT button causes the target displayed on the video to print. (Sample printouts are shown in Figure A-13.) Some Weaponeers can print the three pop-up targets at the same time by holding in the REPLAY button and pressing the PRINT button.

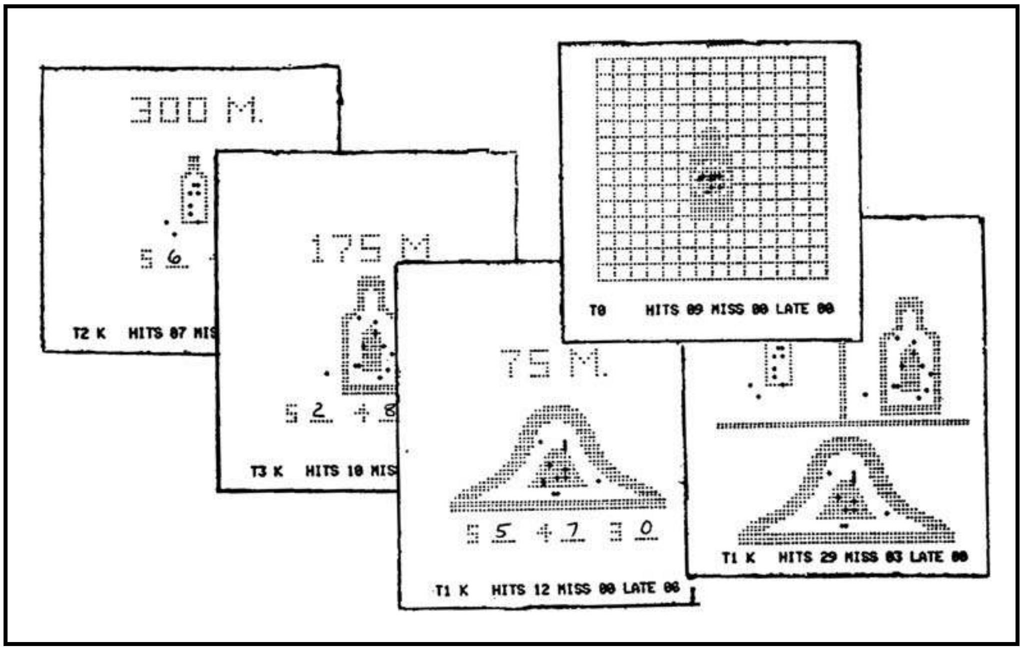


Figure A-13. Weaponeer printouts.

e. **Use of the Weaponeer.** In BRM, the Weaponeer is used to evaluate the firer's ability to apply the four fundamentals. It is used throughout the program to help diagnose and remediate problems. In the unit, the Weaponeer should be used much like it is used in BRM. Concurrent use of the Weaponeer at the rifle range provides valuable remedial training.

(1) The preferred training configuration for the Weaponeer is shown in Figure A-14 on page A-18. One trainer operates the system while three to six soldiers observe the training. Soldiers should rotate, each receiving several short turns on the system. Where high throughput is required, consolidation of available Weaponeers may be considered.

(2) When training soldiers on the Weaponeer—

- Proceed at a relaxed pace, and emphasize accuracy before speed.
- If possible, train with small groups, allowing each soldier several 10- to 15-minute turns on the device.
- For remedial training, try to relax the soldier. A nervous soldier will have trouble learning and gaining confidence in his marksmanship skills. For sustainment training, encourage competition between individuals or units.

(3) In Figure A-14, five soldiers are being trained. One is firing and four are observing, awaiting their turns on the device. The video screen is carefully positioned just outside the vision of the firer, but the firer can easily turn his head to see replays and hit points. The position of the trainer is also important so he can see both the firer and video screen. This is a good position for detecting and correcting firing faults. When the firer is in the standing supported firing position, the console should be placed on a table so the trainer can see the video screen above the firer's rifle (Figure A-15). Observers can see the targets, firer, and video screen and learn procedures that speed up training and help avoid firing faults.

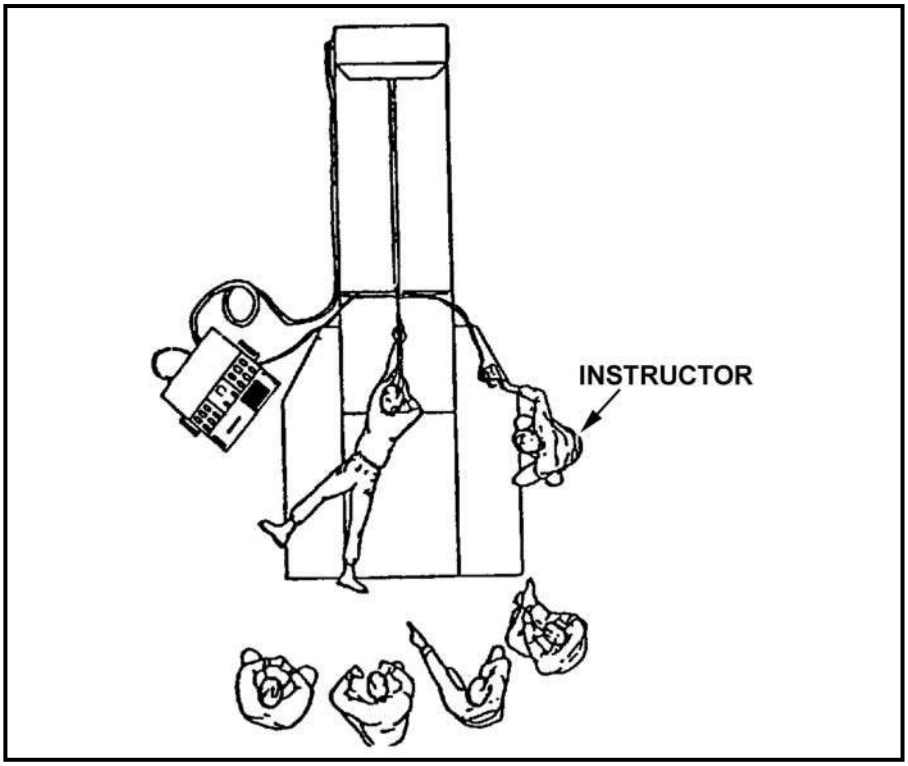


Figure A-14. Weaponeer training configuration.

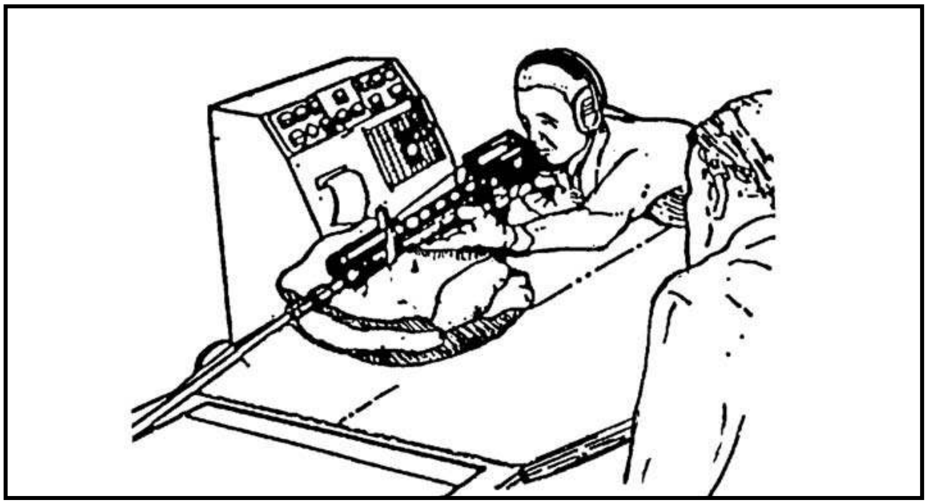


Figure A-15. Training arrangement (supported firing position).

f. **Mobile Configuration.** To use the Weaponeer in a mobile configuration, it must be shock mounted. (The manufacturer's conceptual mobile training unit is shown in Figure A-16.) The TSC, Fort Benning, Georgia, has adopted a mobile mounting stand for supporting the Weaponeer range assembly and computer console (Figure A-17, page A-20).

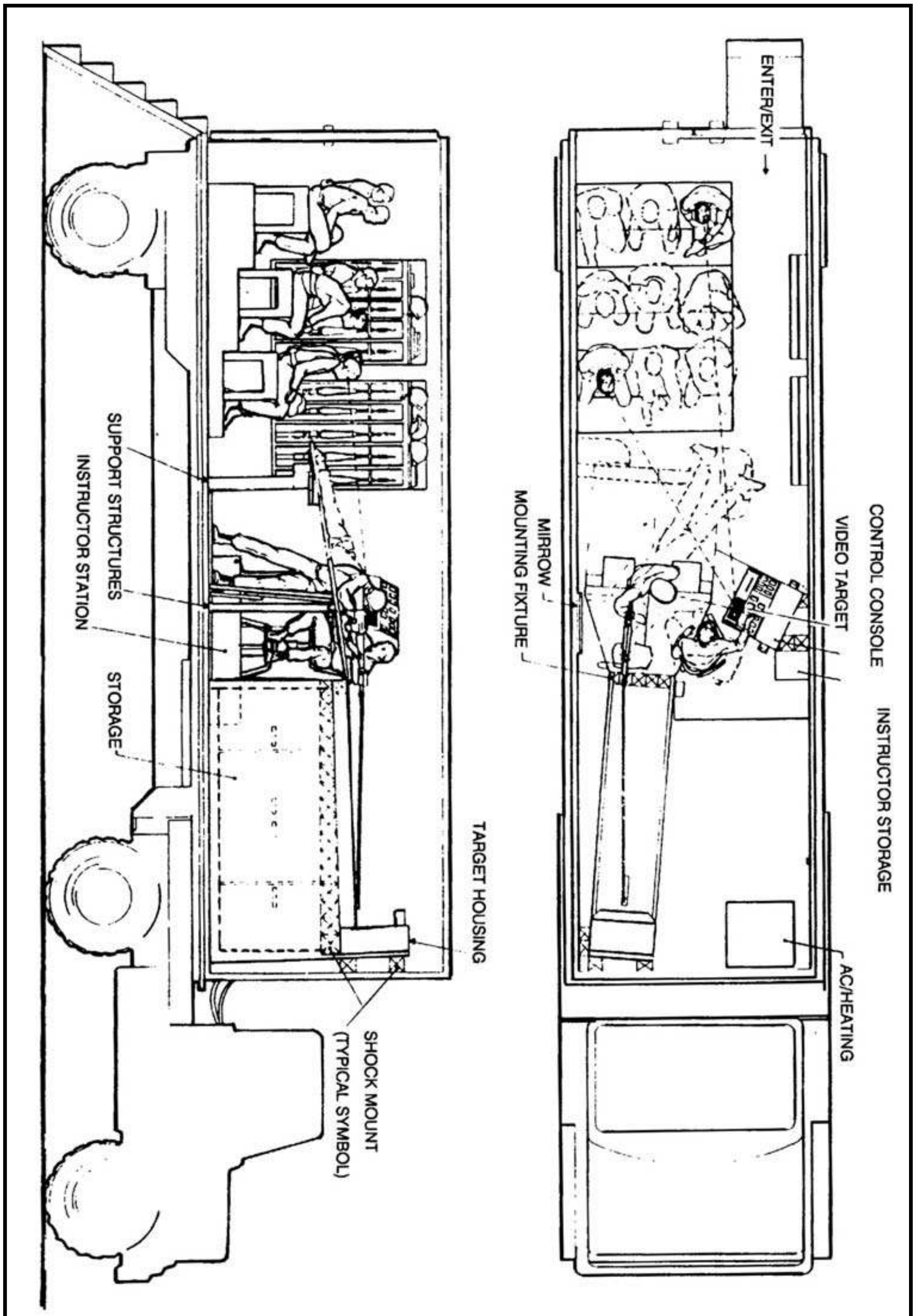


Figure A-16. Mobile training unit (conceptual).

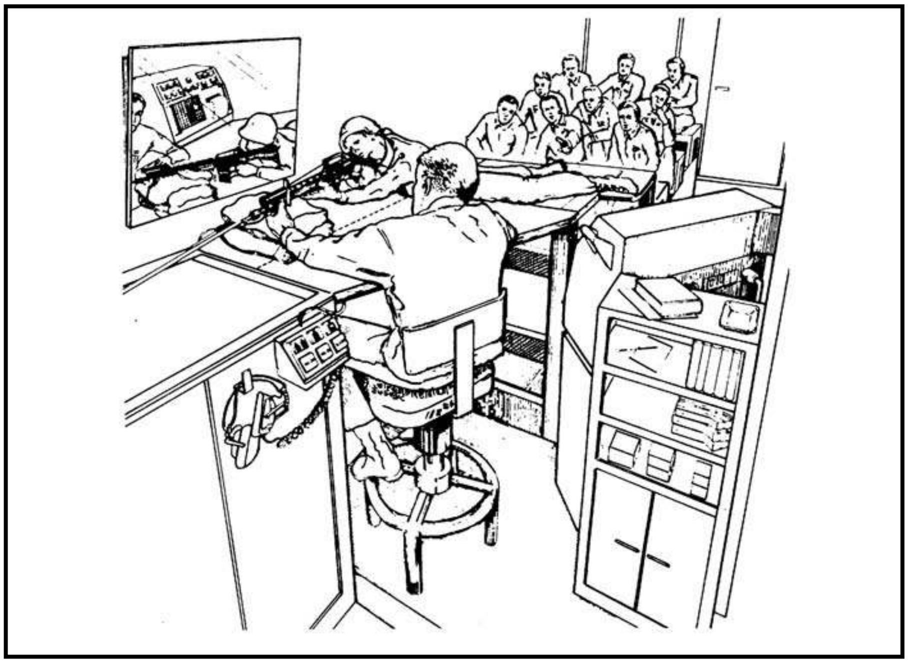


Figure A-17. Mobile mounting stand.

g. **Diagnosis of Firing Problems.** Diagnosis of firing problems is the main purpose of the Weaponeer. The following seven-step program is recommended as a guide. Depending on the extent of the firer's problems and time constraints, the number of shots may be increased.

STEP 1. Tell the soldier to assume a good firing position, aim at a target, and hold steady (supported and prone unsupported positions).

STEP 2. Visually check the firer's firing position and correct any gross errors.

STEP 3. Observe the video screen. If there is no aiming dot on the video screen or if the aiming dot is far from target center, teach sight picture to the firer. If excessive movement is shown by the light dot, check and correct the techniques of the steady position and natural point of aim.

STEP 4. Tell the soldier to fire a three-round shot group aimed at the target's center of mass. Watch the video screen and soldier as he fires. Note violations of the four fundamentals.

STEP 5. Replay each shot to show the firer his aim, steadiness, and trigger squeeze. In Figure A-12, on page A-16, the target on the right shows a numbered series of 16 shots. Dots 1 through 4 indicate that the firer approached the target from high right. Dots 5 through 15 show that he is aiming near the center of the target but does not have a steady position. The sudden shift from dot 15 to 16 (dot 16 is the hit point of the shot) indicates that gun-shyness or improper trigger squeeze caused the firer to pull his aiming point down and to the right just before firing. Replay helps the firer understand and correct his firing errors.

STEP 6. Confirm and refine the diagnosis by allowing the soldier to fire additional three-round shot groups. Use replay to show the firer his firing faults.

STEP 7. Summarize and record the soldier's basic firing problems. These seven steps are designed to diagnose and show the soldier his firing errors. This could be enough to correct the error. Diagnosis needs to be followed up with remedial exercises either with the Weaponeer, target-box exercise, or dime washer exercise.

h. **Unit Sustainment Training.** Sustainment training and prequalification refresher training can be conducted with the Weaponeer, depending on availability.

(1) Direct the soldier to zero the Weaponeer rifle (sandbag supported position). Emphasize tight, consistently placed shot groups. Starting with the closest target and working out to the most distant, direct the soldier to practice slow precision fire at each target (supported and prone unsupported positions).

(2) Direct the soldier to slow fire at random pop-up targets (both firing positions). Emphasize speed and precision. Direct him to slow fire at random pop-up targets with short exposure times (both firing positions).

OPTION: Direct the soldier to practice windage hold-off, rapid magazine change, and immediate action (both firing positions).

OPTION: Direct the soldier to practice night fire, automatic or burst fire, and gasmask fire.

i. **Assessment of Skills.** The Weaponeer can aid in the objective assessment of basic marksmanship. Periodic Weaponeer diagnosis should be conducted and recorded. Each soldier fires until zeroed on the Weaponeer. If unable to zero in 9 to 15 rounds, he should be withdrawn from testing and given remedial training. The soldier fires a surrogate record-fire scenario according to the following:

(1) ***Scenario of Target Presentation.*** Presentation of the targets is controlled by the operator who uses the target buttons.

(2) ***Order of Target Presentation.*** The scaled 100-meter and 250-meter targets (or 75 meters, 175 meters, and 300 meters) are presented in a mixed order according to a planned schedule.

(3) ***Ratio of Target Presentation.*** Targets are presented in a ratio of three 250-meter targets to one 100-meter target (or three 300-meter, two 175-meter to one 75-meter). A 64-target scenario consisting of two 32-target scenarios (the first engaged from the supported position; the second from the prone unsupported position) is conducted with a short break between.

(4) ***Target Exposure Time.*** Exposure time is four seconds for the scaled 250-meter targets (or 175 meters) and two seconds for the scaled 100-meter target (or 75 meters).

(5) ***Intertarget Interval.*** The time between target exposures should be varied from one to eight seconds.

(6) ***Target Mode.*** The kill mode is used so targets fall when hit. A score of 41 hits out of the 64 targets indicates soldiers can proceed to actual record fire. Soldiers who score lower than 41 should receive remedial training.

A-7. ENGAGEMENT SKILLS TRAINER 2000

The engagement skills trainer (EST) 2000 supports realistic and comprehensive "gated" rifle marksmanship instruction, identifies soldiers needs by requiring them to satisfy gate requirements in order to progress, and, when needed, facilitates remedial training prior to qualification. The EST 2000 (Figure A-18) is designed to be used primarily as a unit/institutional, indoor, multipurpose, multilane, small-arms, crew-served, and individual antitank training simulator to—

- Train and evaluate individual marksmanship training for initial entry Soldiers (BCT/OSUT).
- Provide Active and Reserve Component unit sustainment training in preparation for qualification on individual and crew small arms live-fire weapons.
- *Provide unit collective tactical training for static dismounted infantry, scout, engineer, military police squads, and combat support/combat service support (CS/CSS) elements. Simulate weapon training events which will lead to live fire individual and crew weapon qualification.
- *Simulate training events currently not resourced that contribute to increased weapon, crew, fire team, and squad combat effectiveness.
- *Simulate squad collective, defensive, ambush, gunnery, and tactical tasks.
- *Provide the medium for training leaders of fire teams and squads in command, control, and distribution of fires.
- *Save current required ammunition resources, travel time and cost to and from ranges and other range support resources.
- *Support the functional gunnery training strategies and standards in weapons training.

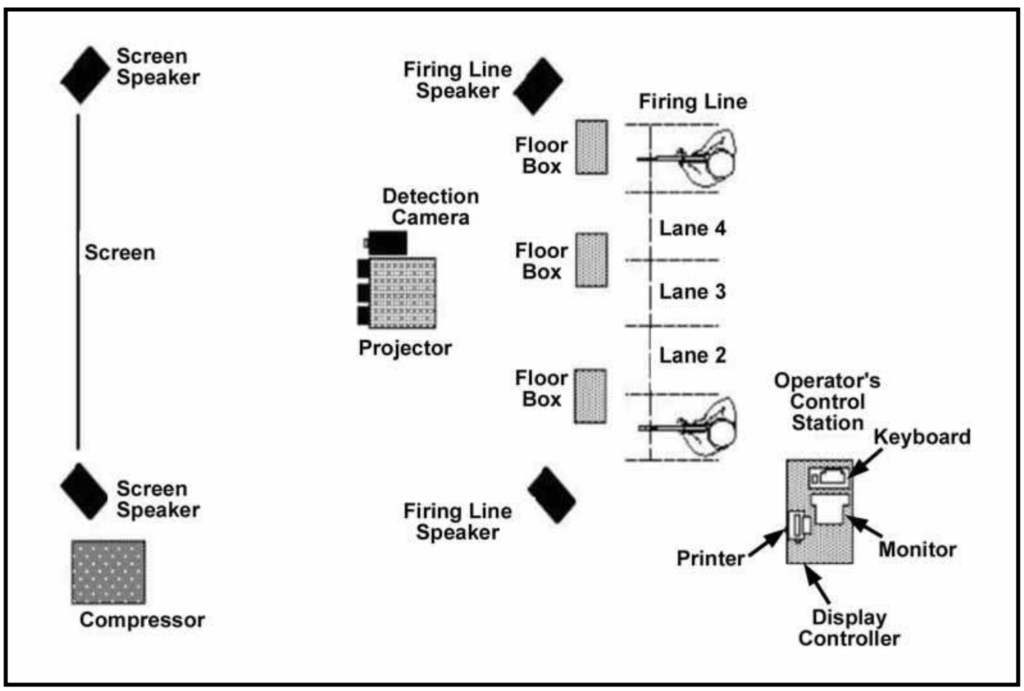


Figure A-18. Engagement skills trainer.

a. **Background.** The EST 2000 matches leading edge technology with user requirements and is designed to meet the small-arms training requirements by providing a realistic training environment, targets, weapons effects, and challenging scenarios.

b. **Authorization.** The EST 2000 is an Infantry School and TRADOC approved TADSS supported by PEO-STRI (formerly STRICOM) and has a life cycle support/sustainment plan.

c. **Funding.** The EST 2000 is a centrally-funded training simulator supported by the production contractor with a one-year, full parts warranty. It will then transition to PEO-STRI's life-cycle contractor support (LCCS) umbrella contract for the life of the system.

d. **General Characteristics.** The EST 2000 replicates eleven weapons including the rifle, carbine, pistol, grenade launcher, all machine guns, MK19, shotgun, and AT4. The EST 2000 has three modes of training:

(1) ***Marksmanship Training.*** The EST 2000 uses Army standard courses of fire for all small-arms weapons. It accurately simulates live-fire ranges in daylight and limited visibility conditions using precision-scaled targets, high-resolution imagery, and essential weapons' system accuracy to compensate for errors (drift, parallax). The EST 2000 isolates, captures, and displays shots with replay that highlights shooter's errors in the application of the fundamentals of marksmanship. Replay of the aim-point trace (before the shot, during the shot, and after the shot) diagnoses shooter problems with aiming, breathing, steady hold, trigger control, and shot recovery for on-the-spot corrections. Cant sensors visually indicate shooter-induced right or left can't possibly resulting in *missed shots. During individual sustainment training, it is recommended that as a minimum, grouping and zeroing, and Field Fire I and II be conducted to standard in the EST 2000 prior to Live Fire qualification.

(2) ***Tactical Collective Training.*** The EST 2000 provides fully articulated interactive targets with variable outcomes based on a squad's action or inaction. It uses realistic 3D modeled battlefield terrain, variable environmental effects that include day/night and dawn/dusk, variable weather conditions, and illumination and will soon include an entry-level indirect fire capability as a product improvement. It uses other special effects to enhance the static eye point of the battlefield to include weapon's effects, explosions, and vehicle damage. The EST 2000 allows the trainer and unit to build scenarios as they would fight. Feedback provided by the EST 2000 to the shooters is shot-by-shot and is tied to each shooter's lane of fire. Most importantly, the tactical collective exercises train squad, team, and element leaders in fire distribution and control.

(3) ***Shoot/Don't Shoot Rules of Engagement Training.*** The EST 2000 uses video-based graphic overlays with multiple escalation or de-escalation points that require the shooter to justify his actions based on his situational awareness. By using the video-based graphic overlays, EST 2000 can be configured to enhance special operations and counterterrorism training. It is also the premier training simulation for stability and support operations training.

WARNING

Laser light is used in the operation of this equipment. Injury may result if personnel fail to observe safety precautions.

- **Never stare into the laser beam, look down the barrel of the simulated weapon, or directly view the laser beam with optical instruments.**
- **Avoid direct eye exposure.**
- **No one should be allowed beyond the firing line.**

The instructor should ensure that all persons entering the training room are aware that laser radiation is present.

e. **Weapon Safety.** Each simulated weapon has the same appearance as a fully functioning weapon, with the exception of the trainer-peculiar umbilical cable. Under certain circumstances, especially in the subdued light of a training room, it is possible to mistake a "live" firearm for a simulated weapon. This situation could create the potential for personal injury or damage to property. To avoid confusion, neither live nor blank ammunition, nor any live weapons, should be allowed in the training room.

(1) Simulated weapons will not accept live or blank ammunition. Any attempt, accidental or otherwise, to chamber a live or blank round may damage the simulated weapon and create an unsafe situation.

(2) The following general safety precautions should be adhered to:

- Fire simulated weapons only if they are pointed downrange.
- Post WARNING signs at all entry doors
- Do not allow personnel to stand downrange from the firing line
- Instruct weapons handlers never to look directly into a barrel
- Take the weapon off-line for testing and service at the first indication of malfunction and refer to the troubleshooting procedures.

f. **Laser Safety.** The lasers used in the simulated weapons meet ANSI Standard Z136.1-1993 Class I Standards for single laser pulse power. This classification is commonly referred to by the industry rating of "eye-safe." However, even eye-safe lasers may be dangerous under extraordinary circumstances. To ensure personnel safety, weapons handlers should not stare directly down a simulated weapon barrel. Serious eye injury could result if a laser malfunctioned while a user was staring into the weapon's muzzle (into the laser beam).

g. **Equipment.** The EST 2000's subsystem functions are described in Table A-5.
The 5-lane EST 2000 subsystem shipping and receiving configuration consists of:

- COMPRESSOR PALLET: Compressor.
- FLOOR BOX/PRINTER SHIPPING CASE:
  Floor box assemblies (3).
  Printer.
  Cable tray.
  EST 2000 Operator's Manual.
  Interactive courseware compact disk.
- SCREEN SHIPPING CASES (2): Screen assembly.

- SPEAKER PALLET: Speakers (2).
- PROJECTOR/CAMERA ASSEMBLY SHIPPING CASE: Projector/camera assembly.
- INSTRUCTOR/OPERATOR STATION SHIPPING CASE:
  Display controller computer assembly.
  Autotracker assembly.
  Keyboard and mouse.
  AC power distribution unit (ACPDU).
  Rack distribution unit (RDU).
- MONITOR SHIPPING CASE: Monitor.
- SIMULATED WEAPONS SHIPPING CASE: Simulated weapons.

ITEM	MODEL	DESCRIPTION
Short Autotracker	Shorts Assembly	Computer-controlled device used to generate weapon aim point data and laser modulation signals.
Hewlett Packard Printer	HP DeskJet 880C	Drop-on-demand thermal inkjet printer used to provide hardcopy records.
Werther International Compressor	100/50 gal Panther	Electrical air compressor used to provide recoil effect for the simulated weapons.
Quantum Computer	Pentium III 500	Display controller computer, 500 MHz processor with 128 MB SDRAM.
D.A.S. Speaker	DS-15A	Self-powered loudspeakers with 150-watt low frequency transducer amplifier and 50-watt high frequency amplifier.
Connect Tech Inc. Rack Distribution Unit	Dflex-4	Multiport serial communications adapter that provides cable routing and signal connections between EST subassemblies.
EMC Multisystems Monitor	OSD Autoscan	On-screen display (OSD) color monitor.
Keyboard	TBD	Enhanced 104 keyboard.
Mouse	TBD	Two-button mouse.
BARCO Projector	708	High-fidelity video projection system with fully automatic convergence and geometry subsystems.
COHU IR Camera	4710	Infrared detection camera used to provide the input signal for autotracker processing
FATS Simulated Weapons	M16A2, M4, M9, M2, M240B, M249,M60, M203, Mk19, M136, M1200	Computer-monitored simulated weapons equipped with lasers and pneumatically simulated recoil.
Floor Box	ECC Assembly	Interface hardware used to supply and regulate voltage to the weapon laser and air pressure recoil.

Table A-5. EST 2000 subsystem functions.

h. **Basic Rifle Marksmanship Training.** The EST 2000 begins training the fundamentals of marksmanship right from the beginning, before the soldier has a chance to develop bad habits.

(1) Using EST 2000 technology, soldiers and units can reduce their rate of marksmanship failures and increase the soldiers' confidence in being able to fire their assigned weapons. EST 2000 is particularly useful for teaching BRM where a "gated" strategy is used requiring a soldier to pass requirements in simulation before firing live ammunition. The soldier does not proceed or pass a gate scenario until he meets the standard.

(2) EST 2000 marksmanship training provides basic range firing and qualification and is accomplished in either 5-, 10-, or 15-lane configurations. Each firer is restricted to one firing lane. EST 2000 training scenarios include:

- Marksmanship—203 scenarios.
- Tactical collective training—181 scenarios total:
  Infantry squad—91.
  Scout squad—19.
  Engineer squad—10.
  Military Police squad—17.
  Military Police team—17.
  Marksman/observer team—3.
  Combat support/combat service support—24.
- Judgmental shoot/don't shoot—4 scenarios.

NOTE: The marksmanship core scenarios can be found in the EST 2000 Operator's Manual, TD-07-6910-702-10, and in Table A-6, pages A-28 through A-32.

i. **Remedial Marksmanship Training.** While use of the EST 2000 BRM gated strategy often reduces the requirements for remedial live-fire training, it is highly useful in diagnosing and correcting problems through simulation gates before the soldier fires actual live rounds. Using the EST 2000 technology of rifle cant, trigger pressure, and before-the-shot, during-the-shot, and after-the-shot AARs, trainers can quickly identify and correct problems thus raising confidence and first-time qualifications.

j. **Tactical Collective Training**. Tactical collective training is conducted on two networked 5-lane subsystems. This configuration can support up to 11 weapons including tandem weapons for the following collective training:

- Infantry squad of nine soldiers.
- Scout squad of five soldiers.
- Engineer squad of nine soldiers.
- Military Police squad of ten soldiers.
- Combat support/combat service support element up to ten soldiers.

The tandem weapons capability is available in collective training only. This capability allows the use of an extra weapon connected to the fifth lane (port 6) in the third floor box allowing a firer to manage two weapons. (For further instructions, refer to the EST 2000 Operator's Manual.)

NOTE: The tactical collective training core scenarios can be found in the EST 2000 *Operator's Manual, TD-07-6910-702-10, and in Table A-7 on pages A-33 through A-41.

k. **Judgmental Shoot/Don't Shoot Training.** Shoot/don't shoot training is conducted on a 5-lane subsystem. This training uses video-based graphic overlays that provide important clues, such as facial expressions and body language, for the firer to cue on. Multiple escalation or de-escalation points are used that require the shooter to justify his actions based on his situational awareness.

NOTE: The judgmental shoot/don't shoot core scenarios can be found in the EST 2000 Operator's Manual, TD-07-6910-702-10, and in Table A-8 on page A-42.

*l. **Unit Sustainment Training.** Sustainment training and prequalification refresher training can be conducted with the EST 2000. Although all units have a sustainment training program, it is recommended that as a minimum, grouping and zeroing, and Field Fire I & II be conducted to standard in the EST 2000 prior to live fire qualification.

m. **Scenario Editor.** The scenarios currently available in the EST 2000 meet 90 percent of a unit's training requirements. As a unit's mission changes or additional training requirements occur, the unit can use the scenario editor to generate or tailor new scenarios. Weapons and TTP changes may also require creation or modification of scenarios. The use of the scenario editor will enhance the individual soldier's skills and, collectively, the squad's ability to engage and destroy an enemy threat. (Complete detailed instructions on how to create and modify scenarios can be found in the EST 2000 Training Support Package).

n. **EST 2000 System Block Diagram.** This navigation diagram (Figure A-19) provides a quick view of how the operator navigates through the instructor/operator (I/O) station.

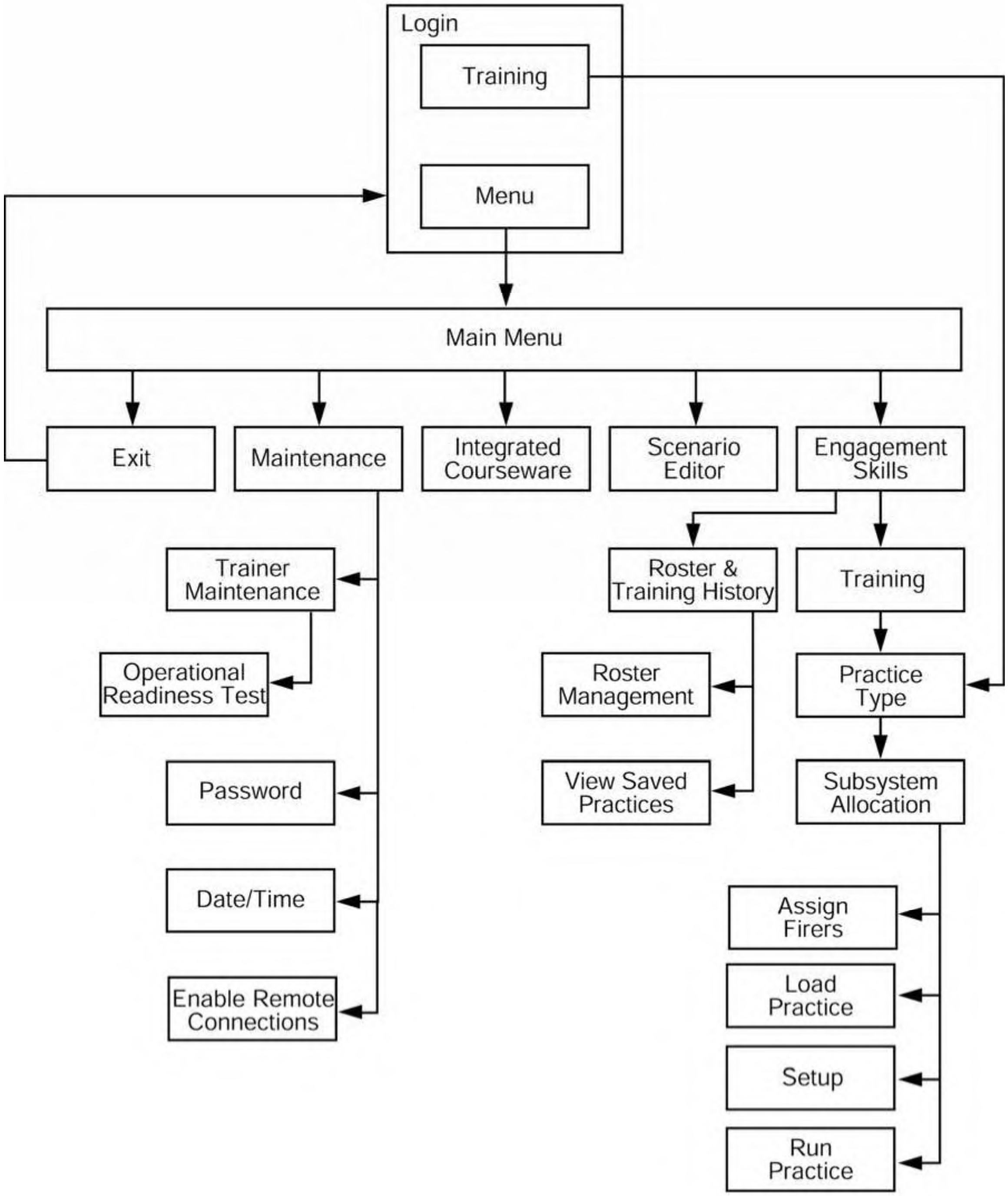


Figure A-19. System block diagram.

MARKSMANSHIP CORE SCENARIOS

No.	SCENARIO TASK	WPN	RDS	AREA/CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
A002	Shot Grouping	M16A2/M4	27	Unspec/Day/Clear	25m	Sngl/Stat	Y	Y	N	Y
A003	Battlesight Zero	M16A2/M4	18	Unspec/Day/Clear	25m	Sngl/Stat	Y	Y	N	Y
A004	Downrange Feedback I	M16A2/M4	6	Unspec/Day/Clear	175m	Sngl/Stat	Y	Y	N	Y
A005	Downrange Feedback II	M16A2/M4	10	Unspec/Day/Clear	75m	Sngl/Stat	Y	Y	N	Y
A006	Downrange Feedback III	M16A2/M4	20	Unspec/Day/Clear	175m	Sngl/Stat	Y	Y	N	Y
A007	Downrange Feedback IV	M16A2/M4	10	Unspec/Day/Clear	300m	Sngl/Stat	Y	Y	N	Y
A008	Field Fire I	M16A2/M4	54	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
A009	Field Fire II	M16A21M4	44	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
A010	Practice Record Fire (Sim)	M16A2/M4	40	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
A011	Record Fire (Sim)	M16A2/M4	40	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
A012	Burst Firing	M16A2/M4	21	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
A013	Protective Mask Firing	M16A2/M4	20	Unspec/Day/Clear	25m	Mult/Stat	Y	Y	Y	Y
A014	Night Fire I	M16A2/M4	35	Unspec/Night/Clear	Multiple	Mult/Stat	Y	Y	N	Y
A015	Night Fire II	M16A2/M4	35	Unspec/Night	Multiple	Mult/Stat	Y	Y	N	Y
A016	Advanced Marksmanship I	M16A2/M4	10	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
A017	Advanced Marksmanship II	M16A2/M4	40	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
A018	Advanced Marksmanship—Qual (Sim)	M16A2/M4	50	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
A019	Quick Fire	M16A2/M4	20	Unspec/Day/Clear	25/50m	Mult/Stat	Y	Y	Y	Y
A020	CBRN Fire	M16A2/M4	30	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
A021	Night Fire I	M16A2/M4	30	Unspec/Night	75/175m	Sngl/Stat	Y	Y	Y	Y
A022	Night Fire II (w AN/PVS-4)	M16A21M4	30	Unspec/Night	Multiple	Sngl/Stat	Y	Y	Y	Y
A023	KD Range I (Zero)	M16A2/M4	12	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	N	Y
A024	KD Range II	M16A2/M4	46	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
A025	Rapid Fire	M16A2/M4	20	Unspec/Day/Clear	25M	Sngl/Stat	Y	Y	Y	Y
A026	Suppressive Fire	M16A21M4	40	Unspec/Day/Clear	25M	Multiple	Y	Y	N	Y
A027	AR Firing	M16A21M4	35	Unspec/Day/Clear	25M	Sngl/Stat	Y	Y	N	Y
B007	Simulated Qualification - Table I	M9	7	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B008	Simulated Qualification - Table II	M9	8	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B009	Simulated Qualification - Table III	M9	7	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B010	Simulated Qualification - Table IV	M9	5	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B011	Simulated Qualification - Table V	M9	13	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B012	Simulated Night Qualification - Table I	M9	7	Unspec/Night	Multiple	Mult/Stat	Y	Y	Y	Y
B013	Simulated Night Qualification - Table II	M9	8	Unspec/Night	Multiple	Mult/Stat	Y	Y	Y	Y
B014	Simulated Night Qualification - Table III	M9	7	Unspec/Night	Multiple	Mult/Stat	Y	Y	Y	Y
B015	Simulated Night Qualification -Table IV	M9	5	Unspec/Night	Multiple	Mult/Stat	Y	Y	Y	Y
B016	Simulated Night Qualification - Table V	M9	13	Unspec/Night	Multiple	Mult/Stat	Y	Y	Y	Y
B017	Simulated CBRN Qualification - Table I	M9	7	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B018	Simulated CBRN Qualification - Table II	M9	8	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B019	Simulated CBRN Qualification - Table III	M9	7	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B020	Simulated CBRN Qualification - Table IV	M9	5	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B021	Simulated CBRN Qualification - Table V	M9	13	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	Y	Y
B022	Alt Sim Qualification - Table I	M9	7	Unspec/Day/Clear	25m	Sngl/Stat	Y	Y	Y	Y
B023	Alt Sim Qualification - Table II	M9	13	Unspec/Day/Clear	25m	Sngl/Stat	Y	Y	Y	Y

***Table A-6. Marksmanship core scenarios.**

No.	SCENARIO TASK	WPN	RDS	AREA/CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
B024	Alt Sim Qualification - Table III	M9	10	Unspec/Day/Clear	25m	Sngl/Stat	Y	Y	Y	Y
B025	Alt Sim Qualification - Table IV	M9	10	Unspec/Day/Clear	25m	Sngl/Stat	Y	Y	Y	Y
B026	Alt Sim Night Qualification	M9	30	Unspec/Day/Clear	25m	Sngl/Stat	Y	Y	Y	Y
B027	Alt Sim CBRN Qualification	M9	20	Unspec/Day/Clear	25m	Sngl/Stat	Y	Y	Y	Y
C001	10 Meter Zeroing	M249	12	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
C002	10m Controlled Burst Firing	M249	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
C003	10m CBRN Traverse & Search I	M249	15	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
C004	10m Traverse & Search I	M249	24	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
C005	10m Traverse & Search II (Sim Qual)	M249	12	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	Y	Y
C006	10m CBRN Traverse & Search II (Sim Qual)	M249	24	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	Y	Y
C007	10m Traverse & Search III (Sim Qual)	M249	15	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	Y	Y
C008	Transition Firing I (Fld Zero)	M249	12	Unspec/Day/Clear	300m	Sngl/Stat	Y	Y	N	Y
C009	Transition Firing II	M249	6	Unspec/Day/Clear	200m	Sngl/Stat	Y	Y	Y	Y
C010	Transition Firing III (Sim Qual)	M249	6	Unspec/Day/Clear	400m	Sngl/Stat	Y	Y	Y	Y
C011	Transition Firing IV (Sim Qual)	M249	6	Unspec/Day/Clear	100m	Sngl/Stat	Y	Y	Y	Y
C012	Transition Firing V (Sim Qual)	M249	6	Unspec/Day/Clear	300m	Sngl/Stat	Y	Y	Y	Y
C013	Transition Firing VI (Sim Qual)	M249	12	Unspec/Day/Clear	100/300m	Sngl/Stat	Y	Y	Y	Y
C014	Transition Firing VII (Sim Qual)	M249	12	Unspec/Day/Clear	200/300m	Mult/Stat	Y	Y	Y	Y
C015	Transition Firing VIII (Sim Qual)	M249	18	Unspec/Day/Clear	100/200/400m	Mult/Stat	Y	Y	Y	Y
C016	Night Firing I (Zeroing AN/PVS-4)	M249	12	Unspec/Night	25m	Sngl/Stat	Y	Y	N	Y
C017	Night Firing II	M249	6	Unspec/Night	200m	Sngl/Stat	Y	Y	N	Y
C018	Night Firing III	M249	6	Unspec/Night	400m	Mult/Stat	Y	Y	N	Y
C019	Night Firing IV	M249	6	Unspec/Night	100m	Sngl/Stat	Y	Y	N	Y
C020	Night Firing V	M249	6	Unspec/Night	300m	Sngl/Stat	Y	Y	N	Y
C021	Night Firing VI	M249	6	Unspec/Night	100m	Sngl/Stat	Y	Y	N	Y
C022	Field Firing I (Zeroing)	M249	12	Unspec/Day/Clear	300m	Sngl/Stat	Y	Y	N	Y
C023	Field Firing II	M249	30	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	N	Y
C024	Field Firing III	M249	46	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
C025	Field Firing IV	M249	60	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
C026	Alternate Field Firing II	M249	6	Unspec/Day/Clear	25m	Sngl/Stat	Y	Y	Y	Y
C027	Alternate Field Firing III	M249	12	Unspec/Day/Clear	50/25m	Sngl/Stat	Y	Y	Y	Y
C028	Alternate Field Firing IV	M249	18	Unspec/Day/Clear	25/50/75m	Sngl/Stat	Y	Y	Y	Y
D001	10 Meter Bipod Firing I (Zeroing)	MG	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D002	10 Meter Bipod Firing II	MG	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D003	10 Meter Bipod Firing III	MG	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D004	10 Meter Bipod Firing IV	MG	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D005	10 Meter Bipod Firing V	MG	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D006	10 Meter Bipod Firing VI	MG	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D007	10 Meter Bipod Firing VII	MG	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D008	10 Meter Tripod Firing Practice I (Zeroing)	MG	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D009	10 Meter Tripod Firing Practice II	MG	24	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D010	10 Meter Tripod Firing Practice III	MG	48	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D011	10 Meter Tripod Firing Practice IV	MG	30	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D012	10 Meter Tripod Firing Record Practice I	MG	48	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D013	10 Meter Tripod Firing Record Practice II	MG	30	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y

*Table A-6. Marksmanship core scenarios (continued).

No.	SCENARIO TASK	WPN	RDS	AREA/CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
D014	10 Meter Tripod Firing Sim Record I	MG	6	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D015	10 Meter Tripod Firing Sim Record II	MG	24	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
D016	10 Meter Tripod Firing Sim Record III	MG	48	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	Y	Y
D017	10 Meter Tripod Firing Sim Record IV	MG	30	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	Y	Y
D018	Transition Firing I	MG	20	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	N	Y
D019	Transition Firing II	MG	120	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
D020	Day Defensive Firing I (Zeroing)	MG	20	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	N	Y
D021	Day Defensive Firing II	MG	100	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
D022	Day Defensive Firing III	MG	80	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
D023	Predetermined Fire I	MG	40	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
D024	Predetermined Fire II	MG	40	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
D025	Predetermined Fire III	MG	40	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
D026	Predetermined Fire IV	MG	20	Unspec/Night	Multiple	Mult/Stat	Y	Y	N	Y
D027	Predetermined Fire V	MG	20	Unspec/Night	Multiple	Mult/Stat	Y	Y	N	Y
D028	Predetermined Fire VI	MG	20	Unspec/Night	Multiple	Mult/Stat	Y	Y	N	Y
D029	Assault Firing I	MG	30	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
D030	Assault Firing II	MG	40	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
D031	Assault Firing III	MG	30	Unspec/Day/Clear	Multiple	Mult/Stat	Y	Y	N	Y
D032	Conduct or Stationary Firing I	MG	25	Unspec/Day/Clear	300m	Mult/Stat	Y	Y	N	Y
D033	Conduct or Stationary Firing II	MG	25	Unspec/Day/Clear	800m	Mult/Stat	Y	Y	N	Y
D034	Conduct or Stationary Firing III	MG	25	Unspec/Day/Clear	1100m	Mult/Stat	Y	Y	N	Y
D035	Conduct or Stationary Firing IV	MG	25	Unspec/Day/Clear	500m	Mult/Stat	Y	Y	N	Y
D036	Conduct or Moving Firing I	MG	25	Unspec/Day/Clear	300m	Mult/Stat	Y	Y	N	Y
D037	Conduct or Moving Firing II	MG	25	Unspec/Day/Clear	300m	Mult/Stat	Y	Y	N	Y
D038	Conduct or Moving Firing III	MG	25	Unspec/Day/Clear	300m	Mult/Stat	Y	Y	N	Y
D040	Conduct of Moving Firing IV	MG	25	Unspec/Day/Clear	300m	Mult/Stat	Y	Y	N	Y
E001	10 Meter Firing I (Zeroing)	M2	12	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
E002	10 Meter Practice	M2	105	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
E003	10 Meter Firing II	M2	14	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
E004	10 Meter Firing III	M2	35	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
E005	10 Meter Firing IV	M2	56	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
E006	10 Meter Simulated Qual Firing V	M2	28	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
E007	10 Meter Simulated Qual Firing VI	M2	56	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
E008	10 Meter Simulated Qual Firing VII	M2	35	Unspec/Day/Clear	10m	Sngl/Stat	Y	Y	N	Y
E009	Day Practice – Table 1	M2	140	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	N	Y
E010	Day Qualification – Table 1	M2	140	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	N	Y
E011	Transition Firing I (Sim Qual)	M2	28	Unspec/Day/Clear	550m	Sngl/Stat	Y	Y	N	Y
E012	Transition Firing II (Sim Qual)	M2	14	Unspec/Day/Clear	800m	Sngl/Stat	Y	Y	Y	Y
E013	Transition Firing III (Sim Qual)	M2	14	Unspec/Day/Clear	400m	Sngl/Stat	Y	Y	Y	Y
E014	Transition Firing IV (Sim Qual)	M2	14	Unspec/Day/Clear	700m	Sngl/Stat	Y	Y	Y	Y
E015	Transition Firing V (Sim Qual)	M2	14	Unspec/Day/Clear	1000m	Sngl/Stat	Y	Y	Y	Y
E016	Transition Firing VI (Sim Qual)	M2	28	Unspec/Day/Clear	400/700m	Sngl/Stat	Y	Y	Y	Y
E017	Transition Firing VII (Sim Qual)	M2	28	Unspec/Day/Clear	550/800m	Sngl/Stat	Y	Y	Y	Y
E018	Transition Firing VIII (Sim Qual)	M2	42	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	Y	Y
E019	CBRN Firing I (Sim Qual)	M2	28	Unspec/Day/Clear	550m	Sngl/Stat	Y	Y	N	Y

***Table A-6. Marksmanship core scenarios (continued).**

No.	SCENARIO TASK	WPN	RDS	AREA/CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
E020	CBRN Firing II (Sim Qual)	M2	14	Unspec/Day/Clear	800m	Sngl/Stat	Y	Y	Y	Y
E021	CBRN Firing III (Sim Qual)	M2	14	Unspec/Day/Clear	400m	Sngl/Stat	Y	Y	Y	Y
E022	CBRN Firing IV (Sim Qual)	M2	14	Unspec/Day/Clear	700m	Sngl/Stat	Y	Y	Y	Y
E023	CBRN Firing V (Sim Qual)	M2	14	Unspec/Day/Clear	1000m	Sngl/Stat	Y	Y	Y	Y
E024	CBRN Firing VI (Sim Qual)	M2	28	Unspec/Day/Clear	400/700m	Multi/Stat	Y	Y	Y	Y
E025	CBRN Firing VII (Sim Qual)	M2	28	Unspec/Day/Clear	550/800m	Multi/Stat	Y	Y	Y	Y
E026	CBRN Firing VIII (Sim Qual)	M2	42	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	Y	Y
E027	Night Firing Sim Qual (Zero AN/TVS-5)	M2	28	Unspec/Night	50m	Sngl/Stat	Y	Y	N	Y
E028	Night Firing Sim Qual II	M2	14	Unspec/Night	800m	Sngl/Stat	Y	Y	Y	Y
E029	Night Firing Sim Qual III	M2	14	Unspec/Night	400m	Sngl/Stat	Y	Y	Y	Y
E030	Night Firing Sim Qual IV	M2	14	Unspec/Night	700m	Sngl/Stat	Y	Y	Y	Y
E031	Night Firing Sim Qual V	M2	14	Unspec/Night	1000m	Sngl/Stat	Y	Y	Y	Y
E032	Night Firing Sim Qual VI	M2	28	Unspec/Night	400/700m	Multi/Stat	Y	Y	Y	Y
E033	Night Firing Sim Qual VII	M2	28	Unspec/Night	550/800m	Multi/Stat	Y	Y	Y	Y
E034	Night Firing Sim Qual VIII	M2	42	Unspec/Night	Multiple	Multi/Stat	Y	Y	Y	Y
E035	Mounted Firing Exercise I	M2	7	Unspec/Day/Clear	450m	Sngl/Stat	Y	Y	N	Y
E036	Mounted Firing Exercise II	M2	14	Unspec/Day/Clear	450m	Sngl/Stat	Y	Y	N	Y
E037	Mounted Firing Exercise III	M2	14	Unspec/Day/Clear	850m	Sngl/Stat	Y	Y	N	Y
E038	Mounted Firing Exercise IV	M2	28	Unspec/Day/Clear	Multiple	Multi/Multi	Y	Y	N	Y
E039	Mounted Firing Exercise V	M2	28	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
E040	Mounted Firing Exercise VI	M2	28	Unspec/Day/Clear	Multiple	Multi/Mov	Y	Y	N	Y
E041	Mounted Firing Exercise VIII	M2	14	Unspec/Day/Clear	500m	Sngl/Stat	Y	Y	N	Y
E042	Mounted Firing Exercise IX	M2	28	Unspec/Day/Clear	Multiple	Multi/Multi	Y	Y	N	Y
E043	Mounted Firing Exercise X	M2	42	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
E044	Predetermined Firing I	M2	12	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
E045	Predetermined Firing II	M2	28	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
E046	Predetermined Firing III	M2	56	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
E047	Predetermined Firing IV	M2	28	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
E048	Predetermined Firing V	M2	28	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
E049	Predetermined Firing VI	M2	14	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
E050	Predetermined Firing VII	M2	14	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
E051	Instructional Fire III	MK19	4	Unspec/Day/Clear	400m	Sngl/Stat	Y	Y	N	Y
F003	Instructional Fire IV	MK19	8	Unspec/Day/Clear	1100m	Sngl/Stat	Y	Y	N	Y
F004	Instructional Fire V	MK19	8	Unspec/Day/Clear	1500m	Sngl/Stat	Y	Y	N	Y
F005	Instructional Fire VI	MK19	6	Unspec/Day/Clear	600m	Multi/Stat	Y	Y	N	Y
F006	Dismounted Range Card III	MK19	4	Unspec/Day/Clear	400m	Sngl/Stat	Y	Y	N	Y
F010	Dismounted Range Card IV	MK19	4	Unspec/Day/Clear	600m	Sngl/Stat	Y	Y	Y	Y
F011	Dismounted Range Card V	MK19	8	Unspec/Day/Clear	1100m	Sngl/Stat	Y	Y	Y	Y
F012	Dismounted Range Card VI	MK19	6	Unspec/Day/Clear	600m	Multi/Stat	Y	Y	Y	Y
F013	Dismounted Range Card VII	MK19	8	Unspec/Day/Clear	1500m	Sngl/Stat	Y	Y	Y	Y
F014	Dismounted Range Card VIII	MK19	12	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	Y	Y
F015	Mounted Combat II	MK19	4	Unspec/Day/Clear	400m	Sngl/Stat	Y	Y	Y	Y
F018	Mounted Combat III	MK19	8	Unspec/Day/Clear	800m	Sngl/Stat	Y	Y	Y	Y
F019	Mounted Combat IV	MK19	6	Unspec/Day/Clear	600m	Multi/Stat	Y	Y	Y	Y
F020	Mounted Combat V	MK19	8	Unspec/Day/Clear	1000m	Sngl/Stat	Y	Y	Y	Y

***Table A-6. Marksmanship core scenarios (continued).**

No.	SCENARIO TASK	WPN	RDS	AREA/CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
F021	Night Fire II	MK19	6	Unspec/Night	400m	Sngl/Stat	Y	Y	Y	Y
F024	Night Fire III	MK19	8	Unspec/Night	600m	Sngl/Stat	Y	Y	Y	Y
F025	Night Fire IV	MK19	8	Unspec/Night	800m	Sngl/Stat	Y	Y	Y	Y
F026	Linear & Deep Targets I	MK19	40	Multiple	Multiple	Multi/Stat	Y	Y	Y	Y
F028	Linear & Deep Targets II	MK19	80	Multiple	Multiple	Multi/Stat	Y	Y	Y	Y
F029	Linear & Deep Targets III	MK19	40	Multiple	Multiple	Multi/Stat	Y	Y	Y	Y
F030	Linear & Deep Targets IV	MK19	80	Multiple	Multiple	Multi/Stat	Y	Y	Y	Y
F031	Linear Targets with Dept I	MK19	40	Multiple	Multiple	Multi/Stat	Y	Y	Y	Y
F032	Linear Targets with Dept II	MK19	80	Multiple	Multiple	Multi/Stat	Y	Y	Y	Y
F033	Area Targets I	MK19	160	Multiple	Multiple	Multi/Stat	Y	Y	Y	Y
F034	Area Targets II	MK19	240	Multiple	Multiple	Multi/Stat	Y	Y	Y	Y
G001	Zero I (Leaf Sight)	M203	3	Unspec/Day/Clear	200m	Sngl/Stat	Y	Y	N	Y
G002	Zero II (Quadrant Sight)	M203	3	Unspec/Day/Clear	200m	Sngl/Stat	Y	Y	N	Y
G003	Simulated Record Fire I	M203	3	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
G004	Simulated Record Fire II	M203	3	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
G005	Simulated Record Fire III	M203	3	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
G006	Simulated Record Fire IV	M203	3	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
G007	Simulated Record Fire V	M203	3	Unspec/Day/Clear	Multiple	Sngl/Stat	Y	Y	Y	Y
G008	Zeroing the AN/PVS-14	M16/M203	10/10	Unspec/Day/Clear	10/25m	Sngl/Stat	Y	Y	Y	Y
G009	Night Firing	M203	3	Unspec/Night	Multiple	Sngl/Stat	Y	Y	N	Y
H001	Instructional Firing	AT4	12	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
H002	Instructional Night Firing	AT4	12	Unspec/Night	Multiple	Multi/Stat	Y	Y	N	Y
H003	Qualification Fire (Sim)	AT4	8	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y
H004	Night Qualification Fire (Sim)	AT4	6	Unspec/Night	Multiple	Multi/Stat	Y	Y	N	Y
H005	Advance Instructional Fire	AT4	8	Unspec/Day/Clear	Multiple	Multi/Stat	Y	Y	N	Y

***Table A-6. Marksmanship core scenarios (continued).**

TACTICAL COLLECTIVE TRAINING CORE SCENARIOS

No.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
K001	Defend	M16s/Atch. MG - All small arms supported	Basic Load	Desert/day, clear	450m	18-man dismounted patrol-80 total personal targets	Y	Y	N	Y
K002	Defend	M16s/4AT4/Atch.- MG All small arms supported	Basic Load	Desert/day, cloudy	400m	2 BTR w/squads preceded by 9 dismounts- 80 total personal targets	Y	Y	N	Y
K003	Defend	M16s/Atch. MG - All small arms supported	Basic Load	Forest/day, cloudy	300m	18-man dismounted patrol-80 total personal targets	Y	Y	N	Y
K004	Defend	M16s/2AT4/Atch. MG - All small arms supported	Basic Load	Forest/night, clear	250m	1 BTR preceded by 10 dismounts - 80 total personal targets	Y	Y	N	Y
K005	Defend	M16s/2AT4/Atch. MG - All small arms supported	Basic Load	Desert/night, clear	300m	2 BTR w/squads preceded by 9 dismounts- 80 total personal targets	Y	Y	N	Y
K006	Defend	M16s/Atch. MG - All small arms supported	Basic Load	Urban/day, clear	100m	18-man dismounted patrol-80 total personal targets	Y	Y	N	Y
K007	Defend	M16s/2AT4/Atch. MG - All small arms supported	Basic Load	Woodland/dusk, haze	250m	1 BTR preceded by 18 dismounts - 80 total personal targets	Y	Y	N	Y
K008	Defend	M16s/Atch. MG - All small arms supported	Basic Load	Woodland/day, cloudy	400m	18-man dismounted patrol-80 total personal targets	Y	Y	N	Y
K009	Overwatch	M16s/Atch. MG/PVS-7 - All small arms supported	Basic Load	Forest/night, clear	100m	1 squad in defense posture w/AK 74s	Y	Y	N	Y
K010	Overwatch	M16s w/Atch. MG - All small arms supported	Basic Load	Urban/day, clear	150m	1 squad-size patrol w/ AK 74s	Y	Y	N	Y
K011	Overwatch	M16s w/Atch. MG - All small arms supported	Basic Load	Forest/day, cloudy	200m	10-man patrol, w/ AK 74s	Y	Y	N	Y
K012	Overwatch	M16s w/Atch. MG - All small arms supported	Basic Load	Jungle/day, clear	75m	9-man dismounted patrol	Y	Y	N	Y
K013	Overwatch	M16s w/Atch. MG - All small arms supported	Basic Load	Mountains/day, rain	200m	1 squad-size element in defense posture	Y	Y	N	Y
K014	Overwatch	M16s w/Atch. MG - All small arms supported	Basic Load	Desert/day, sunrise	175m	9 man dismounted patrol	Y	Y	N	Y
K015	Overwatch	M16s w/Atch. MG - All small arms supported	Basic Load	Woodland/day, clear	100-150m	9-man dismounted patrol	Y	Y	N	Y
K016	Overwatch	M16s w/Atch. MG - All small arms supported	Basic Load	Woodland/dusk, clear	150m	1 bunker w/ MG team w/ RPK 74s	Y	Y	N	Y
K017	Armor Ambush	M16s/4AT4/Atch. MG - All small arms supported	Basic Load	Forest/day, clear	275m	2 BTR w/ mounted squads	Y	Y	N	Y
K018	Armor Ambush	M16s/4AT4/Atch. MG - All small arms supported	Basic Load	Woodland/dusk, clear	275m	2 BTR w/ mounted squads	Y	Y	N	Y
K019	Armor Ambush	M16s/4AT4/Atch.MG - All small arms supported	Basic Load	Urban/day, clear	175m	2 BTR w/ mounted squads	Y	Y	N	Y
K020	Armor Ambush	M16s/2AT4/Atch. MG - All small arms supported	Basic Load	Forest/night, clear	200m	1 BTR 9-man dismounted squad	Y	Y	N	Y

Table A-7. Tactical collective training core scenarios.

No.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
K021	Armor Ambush	M16s/4AT4/Atch. M - All small arms supported	Basic Load	Mountains/dusk, clear	275m	2 BTR w/ mounted squads	Y	Y	N	Y
K022	Armor Ambush	M16s/4AT4/Atch. MG - All small arms supported	Basic Load	Woodland/day, fog	250m	2 BTR w/ mounted squads	Y	Y	N	Y
K023	Armor Ambush	M16s/4AT4/Atch. MG - All small arms supported	Basic Load	Valley(open terrain)/ night, clear	275m	2 BTR w/ mounted squads	Y	Y	N	Y
K024	Armor Ambush	M16s/2AT4/Atch. MG - All small arms supported	Basic Load	Desert/day, clear	275m	1 BTR w/ mounted squad	Y	Y	N	Y
K025	Knock/bunker	M16s w/Atth. MG - All small arms supported	Basic Load	Woods, light veg/ day, haze	300m	2 bunker MG team w/ RPK 74	Y	Y	N	Y
K026	Knock/bunker	M16s w/Atth. MG - All small arms supported	Basic Load	Forest/night, clear	250m	1 bunker 1 MG team W/ RPK74	Y	Y	N	Y
K027	Knock/bunker	M16s w/Atth. MG - All small arms supported	Basic Load	Desert/day, cloudy	300m	2 bunker manned by two men w/ RPK 74s	Y	Y	N	Y
K028	Knock/bunker	M16s w/Atth. MG - All small arms supported	Basic Load	Woodland/night, smoke	350m	1 bunker 1 MG team W/ RPK 74	Y	Y	N	Y
K029	Knock/bunker	M16s, 2AT4s, w/Atth. MG - All small arms supported	Basic Load	Forest/dusk, clear	250m	2 bunker MG team w/ RPK 74	Y	Y	N	Y
K030	Knock/bunker	M16s, 2AT4s, w/Atth. MG - All small arms supported	Basic Load	Mountains/day, rain	200m	2 bunker MG team w/ RPK 74	Y	Y	N	Y
K031	Knock/bunker	M16s w/MG Tm - All small arms supported	Basic Load	Jungle/day, clear	75m	1 bunker 1 MG team W/ RPK 74	Y	Y	N	Y
K032	Knock/bunker	M16s w/MG Tm - All small arms supported	Basic Load	Woodland/dusk, hazy	350m	2 bunker MG team w/ RPK 74	Y	Y	N	Y
K033R1	Support by Fire	All small arms supported	Basic load	Woodland/day, clear	600m	8-man support element + 7-man assault team w/ AK-74s and RPK-74s	Y	Y	N	Y
K034R1	Passage of Lines	All small arms supported	Basic load	Woodland/dusk, clear	450m	10-man dismounted patrol w/ 8 AK-74s and 2 RPK-74s	Y	Y	N	Y
K035R1	Delay	All small arms supported	Basic load	Woodland/day, fog	450m	10-man dismounted patrol w/ 8 AK-74s and 2 RPK-74s	Y	Y	N	Y
K036R1	Support by Fire	All small arms supported	Basic load	Desert/day, clear	500m	8-man support element + 7-man assault team w/ AK-74s and RPK-74S	Y	Y	N	Y
K037R1	Defend (FPL)	All small arms supported	Basic Load	Woodland/day, clear	300m	20-man element x 2 w/ AK-74s	Y	Y	N	Y
K038R1	Passage of Lines	All small arms supported	Basic load	Korean village/dusk, clear	300m	10-man dismounted patrol w/ 8 AK-74s and 2 RPK-74s	Y	Y	N	Y
K039R1	Delay	All small arms supported	Basic load	Desert/day, smoke	300m	10-man dismounted patrol w/ 8 AK-74s and 2 RPK-74s	Y	Y	N	Y
K040R1	Support by Fire	All small arms supported	Basic load	Woodland/day, clear	400m	8-man dismounted patrol w/6 AK-74s and 2 RPK-74s	Y	Y	N	Y
K041	Point Ambush	M16s w/Attch. MG - All small arms supported	Basic Load	Mountains/day, rain	350m	16-man dismounted patrol	Y	Y	N	Y
K042	Point Ambush	M16s w/Attch. MG - All small arms supported	Basic Load	Woodland/day, fog	250m	16-man dismounted patrol	Y	Y	N	Y

Table A-7. Tactical collective training core scenarios (continued).

No.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
K043	Point Ambush	M16s w/Attch. MG - All small arms supported	Basic Load	Valley(open terrain)/ night, clear	200m	16-man dismounted patrol	Y	Y	N	Y
K044	Point Ambush	M16s w/Attch. MG - All small arms supported	Basic Load	Jungle/day, clear	75m	16-man dismounted patrol	Y	Y	N	Y
K045	Point Ambush	M16s w/Attch. MG - All small arms supported	Basic Load	Forest/night, clear	75m	16-man dismounted patrol	Y	Y	N	Y
K046	Point Ambush	M16s w/Attch. MG - All small arms supported	Basic Load	Woodland/dusk, smoke	100m	16-man dismounted patrol	Y	Y	N	Y
K047	Point Ambush	M16s w/Attch. MG - All small arms supported	Basic Load	Valley(open terrain)/ night, clear	100m	16-man dismounted patrol	Y	Y	N	Y
K048	Point Ambush	M16s/2AT4/Atch. MG - All small arms supported	Basic Load	Forest/dusk, clear	200m	1 BTR 16-man dismounted squad	Y	Y	N	Y
K049	Point Ambush	M16s/4AT4/Attch. MG - All small arms supported	Basic Load	Mountains/day, haze	250m	2 BTRs, 14 dismount on contact	Y	Y	N	Y
K050R1	Fire FPL	All small arms supported	Basic load	MOUT/day, clear	300m	20-man element x 2 w/ AK-74s = 40 total	Y	Y	N	Y
K051R1	Fire FPL	All small arms supported	Basic load	Korea/day, clear	300m	20-man element x 2 w/ AK-74s = 40 total	Y	Y	N	Y
K052R1	Call for Fire	All small arms supported	Basic load	Woodland/day, clear	300m	20-man element x 2 w/ AK-74s = 40 total	Y	Y	N	Y
K053R1	Call for Fire	All small arms supported	Basic load	Woodland/day, clear	300m	6 BRDM w/possible 16 men w/ AK-74s	Y	Y	N	Y
K054R1	Call for Fire	All small arms supported	Basic load	Woodland/day, clear	300m	6 BRDM w/possible 48 men w/ AK-74s	Y	Y	N	Y
K055R1	Passage of Lines	All small arms supported	Basic load	Desert/day, clear	450m	10-man dismounted patrol w/AK-74s	Y	Y	N	Y
K056R1	FPL on Bridge	All small arms supported	Basic load	Bridge/day, clear	300m	20-man element x 2 w/ AK-74s = 40 total	Y	Y	N	Y
K057R1	FPL on Bridge	All small arms supported	Basic load	Bridge/day, clear	300m	3 thin-skinned vehicles w/ 14.5mm MG w/4 dismounts and AK-74s	Y	Y	N	Y
K058	Defend MOUT	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Bosnia, urban core/ day, clear	100m	2 BTRs w/ mounted squads +9 dismounts - 26 total personnel targets	Y	Y	N	Y
K059	Defend MOUT	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Korean village/day, haze	150m	2 BTRs w/ mounted squads + 9 dismounts - 35 total personnel targets	Y	Y	N	Y
K060	Defend MOUT	M16/4AT4/Attch MG - All small arms supported	Basic Load	Korea, residential/ day, clear	250m	2 BTRs w/ mounted squads + 10 dismounts - 38 total personnel targets	Y	Y	N	Y
K061	Defend MOUT	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Outlying industrial/ day, rain	200m	18 dismounts + 2 snipers = 54 total personnel targets	Y	Y	N	Y
K062	Defend MOUT	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Bosnia, commercial/ night, clear	100m	18 dismounts - 50 total personnel targets	Y	Y	N	Y
K063	Defend MOUT	M16s/2AT4/Attch MG - All small arms supported	Basic Load	Bosnia, urban core/ day, smoke	175m	9 dismounts - 36 total personnel targets	Y	Y	N	Y

Table A-7. Tactical collective training core scenarios (continued).

No.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
K064	Defend MOUT	M16/2AT4/Attch MG/PVS7 - All small arms supported	Basic Load	Korea, residential/ night, clear	75m	1 BTR w/mounted squad + 9 dismounts - 42 total personnel targets	Y	Y	N	Y
K065	Defend MOUT	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Sub-Sahara Africa, shanty town/dusk	300m	2 BTRs w/ mounted squads + 9 dismounts - 35 total personnel targets	Y	Y	N	Y
K066	Defend MOUT	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Korean village/day, haze	350m	2 BTRs w/ mounted squads + 9 dismounts - 27 total personnel targets	Y	Y	N	Y
K067	Defend MOUT	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Far East, urban/day, clear	350m	3 BTR + 15 dismounts - 15 total personnel targets	Y	Y	N	Y
K068	Point Ambush	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Bosnia, urban core/ dusk, clear	75m	2 BTRs, 7 dismount on contact = 14 total personnel targets	Y	Y	N	Y
K069	Point Ambush	M16s/2AT4/Attch MG - All small arms supported	Basic Load	Bosnia, urban core/ dusk, clear	100m	1 BTR + 16 dismounts	Y	Y	N	Y
K070	Armor Ambush	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Korean village/day, haze	200m	2 BTRs,9 dismount on contact = 18 total personnel targets	Y	Y	N	Y
K071R1	Delay	All small arms supported	Basic load	Desert/day, clear	300m	4 BRDMs w/10 dismounts and AK-74s	Y	Y	N	Y
K072	Defend	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Bosnia, urban core/ dusk, clear	150m	2 BTRs w/ mounted squads + 9 dismounts - 41 total personnel targets	Y	Y	N	Y
K073	Defend	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Far East/urban/day, rain	150-m	2 BTRs w/ mounted squads + 9 dismounts - 32 total personnel targets	Y	Y	N	Y
K074	Point Ambush	M16/2AT4/Attch MG/PVS7 - All small arms supported	Basic Load	Korea, outlying area/ night, clear	200m	1 BTR, 18 man dismounted squad	Y	Y	N	Y
K075	Point Ambush	M16s/4AT4/Attch MG - All small arms supported	Basic Load	Far East, urban/day, clear	150m	2 BTRs, 7 dismount on contact = 14 total personnel targets	Y	Y	N	Y
J010	2-man Guard Post	M16/M9	3 Mags/Ea	Korea, ammo point/ night, snow	10-100m	Civ trk and clothes, weapons	Y	Y	N	Y
J017	2-man Guard Post	M16/M9	3 Mags/Ea	Africa, village, Red Cross supply point/ day, clear	150m	Receiving sniper fire	Y	Y	N	Y
J019	2-man Guard Post	M16/M9	3 Mags/Ea	Bosnia, MOUT, IFOR ckpt/day, clear	10-100m	Receiving sniper fire	Y	Y	N	Y
J025	2-man Guard Post	M16/M9	3 Mags/Ea	Africa, village, food wrhse/night, full moon	10-100m	Receiving sniper fire	Y	Y	N	Y
J027	Patrol Base-Inf Sqd	M16/M249/M203	Basic Load	Forest/day, clear	200m	Enemy patrol firing	Y	Y	N	Y
J028	Patrol Base-Inf Sqd	M16/M249/M203	Basic Load	Forest/day, smoke	100m	Enemy patrol, not firing	Y	Y	N	Y
J029	Patrol Base-Inf Sqd	M16/M249/M203	Basic Load	Jungle/sunset, clear	10m	Civilian, unarmed	Y	Y	N	Y

Table A-7. Tactical collective training core scenarios (continued).

No.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
J030	Patrol Base-Inf Sqd	M16/M249/M203	Basic Load	Jungle/sunrise, fog	50-100m	Enemy patrol, not firing	Y	Y	N	Y
J031	Patrol Base-Inf Sqd	Same+PVS4&7	Basic Load	Forest/night, clear, full moon	100m	Enemy patrol, not firing	Y	Y	N	Y
J032	Patrol Base-Inf Sqd	Same+PVS4&7	Basic Load	Forest/night, smoke	25-50m	Friendly patrol	Y	Y	N	Y
J033	Patrol Base-Inf Sqd	Same+PVS4&7	Basic Load	Jungle/night, clear	25-50m	Civilian, armed	Y	Y	N	Y
J034	Patrol Base-Inf Sqd	Same+PVS4&7	Basic Load	Jungle/night, smoke	25-50m	Friendly patrol firing at you	Y	Y	N	Y
J015	2-man Guard Post	M16/M9	3 Mags/Ea	Bosnia, MOUT, IFOR ckpt/day, clear	10-100m	Delivery vehicle, proper I.D.	Y	Y	N	Y
J016	2-man Guard Post	M16/M9	3 Mags/Ea	Bosnia, MOUT, IFOR ckpt/day, snow	10-100m	Delivery vehicle, no I.D.	Y	Y	N	Y
J021	2-man Guard Post	M16/M9	3 Mags/Ea	Africa, MOUT, food wrhse/night, full moon	10-100m	Military vehicle, no I.D.	Y	Y	N	Y
J022	2-man Guard Post	M16/M9	3 Mags/Ea	Africa, MOUT, food wrhse/night, cloudy	10-100m	Military vehicle, use of duress codeword	Y	Y	N	Y
SCOUT SQUAD - EST 2000 COLLECTIVE SIMULATION EXERCISES										
L001	Defend an observation Post	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Forest/day, clear	300-1000m	Infantry Squad				
L002	Defend an observation Post	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Desert/day, fog	300-1000m	Infantry Squad				
L003	Defend an observation Post	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Forest/night	300-1000m	Infantry Squad				
L004	Support a Hasty attack dismounted	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Forest/day, clear	300-1000m	BDRM				
L005	Support a Hasty attack dismounted	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Forest/night	300-1000m	BDRM				
L006	Support a Hasty attack dismounted	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Desert/night	300-1000m	BDRM				
L007	Conduct a screen	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Forest/day, clear	300-1000m	2 BDRM				
L008	Conduct a screen	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Desert/night	300-1000m	2 BDRM				
L009	Border Defense (Screen)	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Forest/day, clear	300-1000m	Infantry Squad				
L010	Border Defense (Screen)	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Forest/night	300-1000m	Infantry Squad				
L011	Delay	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Forest/day, clear	300-1000m	2 BDRM				
L012	Guard Flank	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Desert/day, fog	300-1000m	2 BDRM				

Table A-7. Tactical collective training core scenarios (continued).

No.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
L013	Table 1 Manipulation Exercise	MK 19	26 rounds							
L014	Table 2 Tripod Exercise	MK 19	33 rounds							
L015	Table 3 Adjustment of fire(stationary)	MK 19	33 rounds							
L016	Table 4 Basic crew qualification	MK 19	66 rounds							
L017	Table 5 Crew proficiency course(Mod)	MK 19	61 rounds							
L018	Table 6 Crew Baseline (Mod)	MK 19	45 rounds							
L019	Table 7 Crew practice (Mod)	MK 19	56 rounds							
ENGINEER SQUAD - EST 2000 COLLECTIVE SIMULATION EXERCISES										
M001	Defend	M16s/2AT4/MG Tm	Basic Load	Desert/day/clear	500m	10-man dismounted patrol	Y	Y	N	Y
M002	Defend	M16s/2AT4/MG Tm	Basic Load	Urban/day/clear	100m	10-man dismounted patrol	Y	Y	N	Y
M003	Defend	M16s/2AT4/MG Tm	Basic Load	Desert/day/cloudy	400m	9-man dismounted patrol	Y	Y	N	Y
M004	Defend MOUT	M16s/2AT4/MG Tm	Basic Load	Bosnia/urban core/dusk/clear	100m	3 BTRs w/ mounted squads	Y	Y	N	Y
M005	Defend MOUT	M16/2AT4/MG Tm/PVS7	Basic Load	Korea/residential/nigh t/haze	250m	2 BTRs w/ mounted squads	Y	Y	N	Y
M006	Defend MOUT	M16s/2AT4/MG Tm	Basic Load	Bosnia/commercial/ni ght/clear	100m	2 BTRs,9 dismount on contact	Y	Y	N	Y
M007	Defend MOUT	M16/2AT4/MG Tm/PVS7	Basic Load	Korea/residential/nigh t/clear	75m	1 BTR 4 man dismounted on contact	Y	Y	N	Y
M008	Defend MOUT	M16s/2AT4/MG Tm	Basic Load	Korea/village/day/haz e	350m	2 BTRs,9 dismount on contact	Y	Y	N	Y
M009	Point Ambush	M16s/2AT4/MG Tm	Basic Load	Bosnia/urban core/dusk/clear	50m	2 BTRs, 9 dismount on contact	Y	Y	N	Y
M010	Defend	M16s/2AT4/MG Tm	Basic Load	Bosnia/urban core/dusk/clear	100m	3 BTRs w/ mounted squads	Y	Y	N	Y
MILITARY POLICE SQUAD COLLECTIVE SIMULATION EXERCISES										
N001	Convoy Security Operations	All EST 2000 weapons	Basic Load	Desert, Day, Clear	500m	10-man dismounted squad	Y	Y	N	Y
N002	Convoy Security Operations	All EST 2000 weapons	Basic Load	Desert, Day, Cloudy	300-1000m	2BTRs, squad dismount on contact	Y	Y	N	Y
N003	Secure and defend position	All EST 2000 weapons	Basic Load	Forest Day, Rain	300m	10-man dismounted patrol	Y	Y	N	Y

Table A-7. Tactical collective training core scenarios (continued).

No.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
N004	Secure and defend position	All EST 2000 weapons	Basic Load	Desert/day, smoke	200-1000m	1BTR, dismounted squad	Y	Y	N	Y
L011	Delay	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Forest/day, clear	300-1000m	2 BDRM				
L012	Guard Flank	M16/M4,M203,M240B,M2,AT4, MK 19	Basic load	Desert/day. fog	300-1000m	2 BDRM				
L013	Table 1 Manipulation Exercise	MK 19	26							
L014	Table 2 Tripod Exercise	MK 19	33							
L015	Table 3 Adjustment of fire(stationary)	MK 19	33							
L016	Table 4 Basic crew qualification	MK 19	66							
L017	Table 5 Crew proficiency course(Mod)	MK 19	61							
L018	Table 6 Crew Baseline (Mod)	MK 19	45							
L019	Table 7 Crew practice (Mod)	MK 19	56							
ENGINEER SQUAD - EST 2000 COLLECTIVE SIMULATION EXERCISES										
M001	Defend	M16s/2AT4/MG Tm	Basic Load	Desert/day, clear	500m	10-man dismounted patrol	Y	Y	N	Y
M002	Defend	M16s/2AT4/MG Tm	Basic Load	Urban/day, clear	100m	10-man dismounted patrol	Y	Y	N	Y
M003	Defend	M16s/2AT4/MG Tm	Basic Load	Desert/day, cloudy	400m	9-man dismounted patrol	Y	Y	N	Y
M004	Defend MOUT	M16s/2AT4/MG Tm	Basic Load	Bosnia, urban core/dusk, clear	100m	3 BTRs w/ mounted squads	Y	Y	N	Y
M005	Defend MOUT	M16/2AT4/MG Tm/PVS7	Basic Load	Korea, residential/ night, haze	250m	2 BTRs w/ mounted squads	Y	Y	N	Y
M006	Defend MOUT	M16s/2AT4/MG Tm	Basic Load	Bosnia, commercial/ night, clear	100m	2 BTRs,9 dismount on contact	Y	Y	N	Y
M007	Defend MOUT	M16/2AT4/MG Tm/PVS7	Basic Load	Korea, residential/ night, clear	75m	1 BTR 4 man dismounted on contact	Y	Y	N	Y
M008	Defend MOUT	M16s/2AT4/MG Tm	Basic Load	Korea, village/day, haze	350m	2 BTRs,9 dismount on contact	Y	Y	N	Y
M009	Point Ambush	M16s/2AT4/MG Tm	Basic Load	Bosnia, urban core/dusk, clear	50m	2 BTRs, 9 dismount on contact	Y	Y	N	Y
M010	Defend	M16s/2AT4/MG Tm	Basic Load	Bosnia, urban core/dusk, clear	100m	3 BTRs w/ mounted squads	Y	Y	N	Y

Table A-7. Tactical collective training core scenarios (continued).

No.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
MILITARY POLICE SQUAD COLLECTIVE SIMULATION EXERCISES										
N001	Convoy Security Operations	All EST 2000 weapons	Basic Load	Desert/day, clear	500m	10-man dismounted squad	Y	Y	N	Y
N002	Convoy Security Operations	All EST 2000 weapons	Basic Load	Desert/day, cloudy	300-1000m	2 BTRs, squad dismount on contact	Y	Y	N	Y
N003	Secure and defend position	All EST 2000 weapons	Basic Load	Forest/day, rain	300m	10-man dismounted patrol	Y	Y	N	Y
N004	Secure and defend position	All EST 2000 weapons	Basic Load	Desert/day, smoke	200-1000m	1BTR, dismounted squad	Y	Y	N	Y
NOTES: 1. All squad and team tactical scenarios should permit the deployment of the Light Vehicle Obscuration Smoke System (LVOSS) on command. 2. All scenarios involving buildings should permit simultaneous interior entry team and exterior cover team play.										
COMBAT SUPPORT/COMBAT SERVICE SUPPORT ELEMENTS - EST 2000 COLLECTIVE SIMULATION EXERCISES										
P001	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Desert/day, clear, weapons free	500-Infinite	Mi-8 Hip hovering, firing	Y	Y	Y	Y
P002	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Desert/day, cloudy, weapons tight	1000 ft	An-2 crossing directly overhead	Y	Y	Y	Y
P003	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Desert/day, clear, weapons hold	500 ft	AH-64, crossing, not firing	Y	Y	Y	Y
P004	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Forest/day, clear, weapons free	500 ft	Su-25 crossing directly overhead	Y	Y	Y	Y
P005	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Forest/day, cloudy, weapons tight	100 ft	UH-60, crossing, not firing	Y	Y	Y	Y
P006	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Forest/day, clear, weapons hold	200 ft	Mi-8 Hip, crossing, not firing	Y	Y	Y	Y
P007	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Desert/night, clear, full moon, weapons free	2000 ft	An-2 Colt, crossing, paratroops exiting	Y	Y	Y	Y
P008	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Desert/night, cloudy, weapons tight	500 ft	Su-25 crossing overhead, not firing	Y	Y	Y	Y
P009	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Desert/night, clear, weapons hold	1500 ft	C130 crossing forward of position	Y	Y	Y	Y
P010	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Forest/night, clear, full moon, weapons free	1000 ft	C17 toward you	Y	Y	Y	Y
P011	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Forest/night, clear, weapons tight	200 ft	Su-25 toward you, firing	Y	Y	Y	Y
P012	Defend Against Air Atk	5-10 soldiers/M16s/1MG	Basic Load	Forest/night, cloudy, weapons hold	150 ft	AH-64 toward you, firing	Y	Y	Y	Y
P013	Defend	5-10 soldiers/M16s/1MG	Basic Load	Desert/day, clear	500 m	3-man friendly patrol, dismounted	Y	Y	Y	Y
P014	Defend	5-10 soldiers/M16s/1MG	Basic Load	Desert/day, smoke	350 m	5-man enemy patrol, dismounted	Y	Y	Y	Y

Table A-7. Tactical collective training core scenarios (continued).

No.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
P015	Defend	5-10 soldiers/M16s/1MG	Basic Load	Desert/day, clear	1000 m	1 BRDM-2	Y	Y	Y	Y
P016	Defend	5-10 soldiers/M16s/1MG	Basic Load	Forest/day, clear	200 m	5-man enemy patrol, dismounted	Y	Y	Y	Y
P017	Defend	5-10 soldiers/M16s/1MG	Basic Load	Forest/day, rain	150 m	3-man friendly patrol, dismounted	Y	Y	Y	Y
P018	Defend	5-10 soldiers/M16s/1MG	Basic Load	Forest/day, smoke	200 m	10-man enemy patrol, dismounted	Y	Y	Y	Y
P019	Defend	5-10 soldiers/M16s/1MG	Basic Load	Desert/night, clear, full moon	300 m	3-man enemy patrol, dismounted	Y	Y	Y	Y
P020	Defend	5-10 soldiers/M16s/1MG	Basic Load	Desert/night, clear	250 m	5-man enemy patrol, dismounted	Y	Y	Y	Y
P021	Defend	5-10 soldiers/M16s/1MG	Basic Load	Desert/night, clear	800 m	1 BRDM-2	Y	Y	Y	Y
P022	Defend	5-10 soldiers/M16s/1MG	Basic Load	Forest/night, clear, full moon	100 m	10-man enemy patrol, dismounted	Y	Y	Y	Y
P023	Defend	5-10 soldiers/M16s/1MG	Basic Load	Forest/night, cloudy	100 m	3-man enemy patrol, dismounted	Y	Y	Y	Y
P024	Defend	5-10 soldiers/M16s/1MG	Basic Load	Forest/night, smoke	75 m	3-man friendly patrol, dismounted	Y	Y	Y	Y

Table A-7. Tactical collective training core scenarios (continued).

JUDGMENTAL SHOOT/DON'T SHOOT CORE SCENARIOS

N0.	SCENARIO TASK	WEAPON	RDS	AREA/ CONDITIONS	RANGE (METERS)	TARGET	IO FDBK	SOLDIER FDBK	TIMED	AAR
SHOOT/DON'T SHOOT - EST 2000 SIMULATION EXERCISES										
ROBBERY SIMULATION EXERCISE										
N038	Hostage rescue	M9	2 Mag	Commissary/day, clear	10-20	2 Suspects, 5 Hostages	Y	Y	N	Y
N039	Robbery	M9	2 Mag	Credit Union/day	10	2 Suspects, 2 Hostages, 1 Teller	Y	Y	N	Y
N040	Robbery	M9	2 Mag	Shoppette/well lit, night, outside	10	2 Suspects, 2 Hostages, 1 Wounded MP	Y	Y	N	Y
N041	Robbery	M9	2 Mag	Electronics Store	10	1 Suspect, 1 Hostage/ Manager	Y	Y	N	Y

Table A-8. Judgmental shoot/don't shoot core scenarios.

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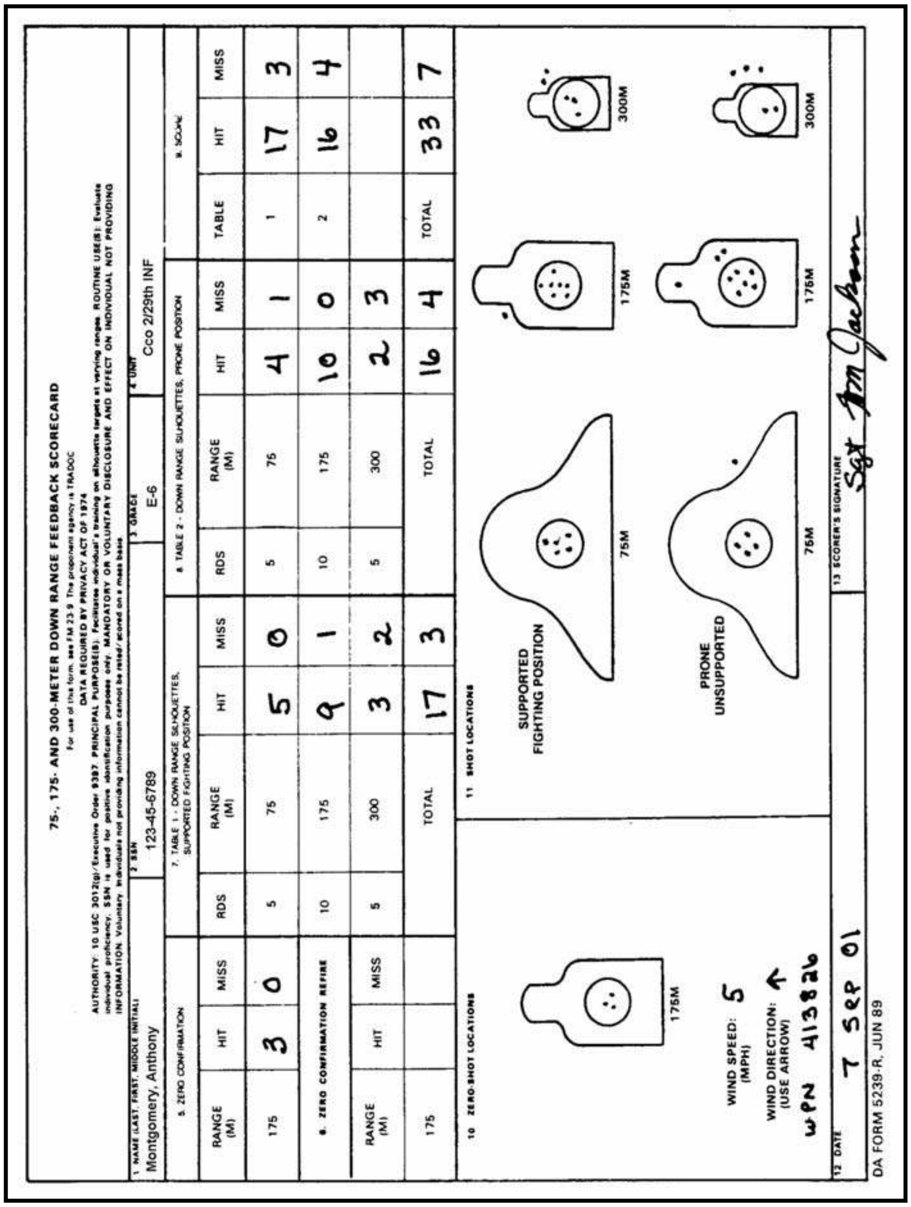
APPENDIX B
SCORECARDS

During live-fire events, a soldier's hit and miss performance is recorded to facilitate the instructor-trainer's critiques or to indicate where more training is needed. The following are examples of completed scorecards.

B-1. EXAMPLES OF COMPLETED SCORECARDS

Figures B-1 through B-6 (pages B-1 through B-6) show examples of completed scorecards.



75-, 175- AND 300-METER DOWN RANGE FEEDBACK SCORECARD

For use of this form, see FM 23-9. The proponent agency is TRADOC

DATA REQUIRED BY PRIVACY ACT OF 1974

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. SSN	3. GRADE	4. UNIT
Montgomery, Anthony	123-45-6789	E-6	Cco 2/29th INF

5. ZERO CONFIRMATION

RANGE (M)	HIT	MISS
175	3	0

6. ZERO CONFIRMATION REFIRE

RANGE (M)	HIT	MISS
175		

7. TABLE 1 - DOWN RANGE SILHOUETTES, SUPPORTED FIGHTING POSITION

RDS	RANGE (M)	HIT	MISS
5	75	5	0
10	175	9	1
5	300	3	2
	TOTAL	17	3

8. TABLE 2 - DOWN RANGE SILHOUETTES, PRONE POSITION

RDS	RANGE (M)	HIT	MISS
5	75	4	1
10	175	10	0
5	300	2	3
	TOTAL	16	4

9. SCORE

TABLE	HIT	MISS
1	17	3
2	16	4
TOTAL	33	7

10. ZERO-SHOT LOCATIONS

175M

WIND SPEED: (MPH) 5

WIND DIRECTION: (USE ARROW) ←

WPN 413826

11. SHOT LOCATIONS

SUPPORTED FIGHTING POSITION — 75M, 175M, 300M

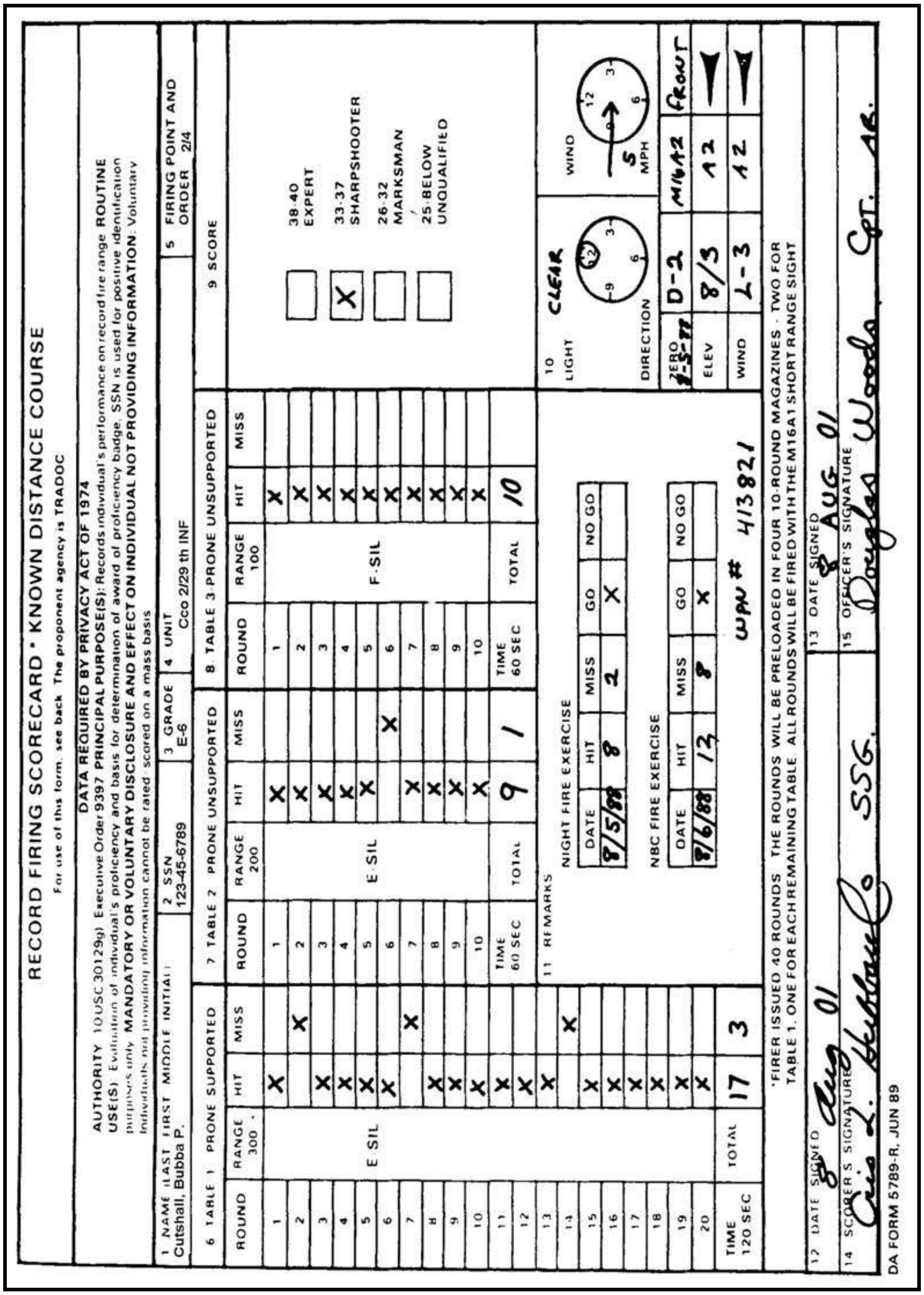
PRONE UNSUPPORTED — 75M, 175M, 300M

12. DATE: 7 SEP 01

13. SCORER'S SIGNATURE: Sgt Jm Jackson

DA FORM 5239-R, JUN 89

Figure B-1. Example of completed DA Form 5239-R (75-, 175-, and 300-Meter Downrange Feedback Scorecard).



RECORD FIRING SCORECARD * KNOWN DISTANCE COURSE

For use of this form, see back. The proponent agency is TRADOC

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g) Executive Order 9397 PRINCIPAL PURPOSE(S): Records individual's performance on record fire range. ROUTINE USE(S): Evaluation of individual's proficiency and basis for determination of award of proficiency badge. SSN is used for positive identification purposes only. MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION: Voluntary. Individuals not providing information cannot be rated/scored on a mass basis.

1 NAME (LAST, FIRST, MIDDLE INITIAL)	2 SSN	3 GRADE	4 UNIT	5 FIRING POINT AND ORDER
Cutshall, Bubba P.	123-45-6789	E-6	Cco 2/29 th INF	2/4

6 TABLE 1 PRONE SUPPORTED

ROUND	RANGE 300	HIT	MISS
1	E-SIL	X	
2			X
3		X	
4		X	
5		X	
6		X	
7			X
8		X	
9		X	
10		X	
11		X	
12		X	
13		X	
14			X
15		X	
16		X	
17		X	
18		X	
19		X	
20		X	
TIME 120 SEC	TOTAL	17	3

7 TABLE 2 PRONE UNSUPPORTED

ROUND	RANGE 200	HIT	MISS
1	E-SIL	X	
2		X	
3		X	
4		X	
5		X	
6			X
7		X	
8		X	
9		X	
10		X	
TIME 60 SEC	TOTAL	9	1

8 TABLE 3 PRONE UNSUPPORTED

ROUND	RANGE 100	HIT	MISS
1	F-SIL	X	
2		X	
3		X	
4		X	
5		X	
6		X	
7		X	
8		X	
9		X	
10		X	
TIME 60 SEC	TOTAL	10	

9 SCORE

- [ ] 38-40 EXPERT
- [X] 33-37 SHARPSHOOTER
- [ ] 26-32 MARKSMAN
- [ ] 25-BELOW UNQUALIFIED

10 LIGHT CLEAR

DIRECTION

WIND 5 MPH

ZERO 8-5-88	D-2	M16A2	FRONT
ELEV	8/3	12	
WIND	L-3	12	

11 REMARKS

NIGHT FIRE EXERCISE

DATE	HIT	MISS	GO	NO GO
8/5/88	8	2	X	

NBC FIRE EXERCISE

DATE	HIT	MISS	GO	NO GO
8/6/88	12	8	X	

WPN # 413821

*FIRER ISSUED 40 ROUNDS. THE ROUNDS WILL BE PRELOADED IN FOUR 10-ROUND MAGAZINES - TWO FOR TABLE 1, ONE FOR EACH REMAINING TABLE. ALL ROUNDS WILL BE FIRED WITH THE M16A1 SHORT RANGE SIGHT

12 DATE SIGNED 8 Aug 01

13 DATE SIGNED 8 AUG 01

14 SCORER'S SIGNATURE Cris L. Hubbard SSG.

15 OFFICER'S SIGNATURE Douglas Woods CPT. AR.

DA FORM 5789-R, JUN 89

Figure B-2. Example of completed DA Form 5789-R (Record Firing Scorecard—Known-Distance Course) (front).

SINGLE TARGET
FIELD FIRING SCORECARD

For use of this form, see FM 23.9. The proponent agency is TRADOC

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g)/Executive Order 9397. PRINCIPAL PURPOSE(S): Facilitates individual's transition to distant target and provides feedback. ROUTINE USE(S): Evaluate individual proficiency. SSN is used for positive identification purposes only. MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION: Voluntary individuals not providing information cannot be rated/scored on a mass basis.

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. SSN	3. GRADE	4. UNIT	5. ROSTER NO
Burger, Joe	123-45-6789	E-7	Cco 2/29th INF	007

6. INTRODUCTION TABLE 1 - SUPPORTED FIGHTING POSITION					7. TABLE 2 - SUPPORTING FIGHTING POSITION					8. TABLE 3 - PRONE POSITION					9. SCORE		
RD	RANGE (M)	TIME (SEC)	HIT	MISS	RD	RANGE (M)	TIME (SEC)	HIT	MISS	RD	RANGE (M)	TIME (SEC)	HIT	MISS	TABLE	HIT	MISS
1	75	6	X		1	75	6	X		1	75	7	X		2	14	4
2	75	6	X		2	175	8	X		2	175	9		X	3	12	6
3	75	6	X		3	300	10	X		3	300	11		X			
4	75	6	X		4	175	8		X	4	175	9	X				
5	75	6	X		5	75	6	X		5	75	7	X				
6	175	8	X		6	300	10	X		6	300	11	X				
7	175	8		X	7	300	10		X	7	300	11		X			
8	175	8	X		8	75	6	X		8	75	7	X				
9	175	8	X		9	175	8	X		9	175	9	X				
10	175	8	X		10	175	4	X		10	175	9		X			
11	175	6	X		11	300	[illegible]		X	11	300	11	X				
12	175	8	X		12	175	8	X		12	175	9	X				
13	300	10		X	13	75	[illegible]	X		13	75	7	X				
14	300	10		X	14	300	10	X		14	300	11		X			
15	300	10	X		15	175	8	X		15	175	9	X				
16	300	10	X		16	75	6	X		16	75	7		X			
17	300	10	X		17	300	10		X	17	300	11	X				
18	300	10		X	18	75	8	X		18	75	7	X				
		TOTAL	14	4			TOTAL	14	4			TOTAL	12	6	TOTAL	26	10

10. REMARKS

11. DATE SIGNED	12. SCORER'S SIGNATURE
2 April 2001	SPC Frank Calisso

DA FORM 3601-R, JUN 89.

Figure B-3. Example of completed DA Form 3601-R (Single Target—Field Firing Scorecard).

SINGLE AND MULTIPLE TARGETS
FIELD FIRING SCORECARD

For use of this form, see FM 23-9. The proponent agency is TRADOC

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012 (g)/Executive Order 9397. PRINCIPAL PURPOSE(S): Facilitates individual's transition to distant target and provides feedback. ROUTINE USE(S): Evaluate individual proficiency. SSN is used for positive identification purposes only. MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION: Voluntary. Individual not providing information cannot be rated/scored on a mass basis.

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. SSN	3. GRADE	4. UNIT	5. ROSTER NO
Gonzales, Ricky R.	123-45-6789	E-5	Cco 2/29th INF	555

6. INTRODUCTION
TABLE 1 - SUPPORTED FIGHTING POSITION

RD	RANGE (M)	TIME (SEC)	HIT	MISS
1	75	5	X	
2	175	7	X	
3	75	11	X	
4	300			X
5	75	9	X	
6	175			X
7	75	10	X	
8	300			X
9	175	11	X	
10	300			X
		TOTAL	6	4

7. TABLE 2 - SUPPORTING FIGHTING POSITION

RD	RANGE (M)	TIME (SEC)	HIT	MISS
1	175	7	X	
2	75	10	X	
3	300			X
4	75	9	X	
5	175		X	
6	300	9	X	
7	75	9	X	
8	175		X	
9	175	11	X	
10	300			X
11	75	11	X	
12	175		X	
13	175	11	X	
14	300			X
15	75	5	X	
16	175	11	X	
17	300		X	
18	75	9	X	
19	175		X	
20	75	10	X	
21	300			X
22	175	7	X	
		TOTAL	18	4

8. TABLE 3 - PRONE POSITION

RD	RANGE (M)	TIME (SEC)	HIT	MISS
1	75	6	X	
2	175	8	X	
3	75	13	X	
4	300			X
5	75	11	X	
6	175		X	
7	75	12	X	
8	300		X	
9	175	13	X	
10	300			X
11	75	11	X	
12	175		X	
13	175	8		X
14	75	6	X	
15	75	11	X	
16	175		X	
17	75	12	X	
18	300			X
19	75	11	X	
20	175		X	
21	175	13		X
22	300			X
		TOTAL	16	6

9. SCORE

TABLE	HIT	MISS
2	18	4
3	16	6
TOTAL	34	10

10. REMARKS
CHECK ADJUSTED AIM @ 300M.

11. DATE SIGNED
17 Mar 01

12. SCORER'S SIGNATURE
Sgt. J.P. Hogan

DA FORM 5241-R, JUN 89

Figure B-4. Example of completed DA Form 5241-R (Single and Multiple Targets—Field Firing Scorecard).

RECORD FIRE SCORECARD

For use of this form see, FM 3-22.9; proponent agency is TRADOC

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g)/Executive Order 9397.
PRINCIPAL PURPOSE(S): Facilitates individual's transition to distant target and provides feedback.
ROUTINE USE(S): Evaluate individual proficiency: SSN is used for positive identification purpose only.
DISCLOSURE: Voluntary. Individuals not providing information cannot be rated/scored on mass basis.

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. LAST 4 SSN	3. GRADE	4. UNIT	5. ROSTER NO.
WHITE, ROBERT M.	0100	E-7	Co C 2/29 H INF	C017

6. TABLE 1 - PRONE SUPPORTED OR FOXHOLE SUPPORTED

RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE	RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE
1	50	3	X			11	100	8	X		
2	200	6	X			12	200		X		
3	100	4	X			13	150	10	X		
4	150	5		X		14	300		X		
5	300	8	X			15	100	9	X		
6	250	7	X			16	250		X		
7	50	3	X			17	200	6		X	
8	200	6		X		18	150	5	X		
9	150	5	X			19	50	6	X		
10	250	7	X			20	100		X		
		TOTAL	8	2				TOTAL	9	1	

7. TABLE 2 - PRONE UNSUPPORTED

RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE
1	200	6	X		
2	250	8	X		
3	150	6	X		
4	300	10	X		
5	200		X		
6	150	12	X		
7	200		X		
8	250	9	X		
9	150		X		
10	150	6	X		
		TOTAL	10		

8. TABLE 3 - KNEELING

RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE
1	150	8		X	
2	50	4	X		
3	100	5	X		
4	150	6	X		
5	100	5	X		
6	50	4	X		
7	100	5	X		
8	150	6	X		
9	50	4	X		
10	100	5	X		
		TOTAL	9	1	

9. SCORE

TABLE	HIT	MISS	NO FIRE
1	17	3	
2	10		
3	9	1	
TOTAL	36	4	

10. QUALIFICATION SCORES/RATINGS *(Check One)*

[X] 36-40 EXPERT [ ] 30-35 SHARPSHOOTER [ ] 23-29 MARKSMAN [ ] 22-BELOW UNQUALIFIED

11. FIRER'S QUALIFICATION SCORE: EXPERT

12. REMARKS

13. NIGHT FIRE EXERCISE

DATE	HIT	MISS	GO	NO GO
3/7/06	8	2	X	

14. CBRN FIRE EXERCISE

DATE	HIT	MISS	GO	NO GO
3/7/06	12	8	X	

15. CHECK WHICH AIMING DEVICE WAS USED

[X] IRON SIGHT [ ] AN/PAS-13 (DAY)
[ ] BACK UP IRON SIGHT [X] AN/PAS-13 (NIGHT)
[ ] MGS

16. DATE SIGNED *(YYYYMMDD)* 2006/03/07

17. SCORER'S SIGNATURE Robert Green SFC

18. DATE SIGNED *(YYYYMMDD)* 2006/03/07

19. OFFICER'S SIGNATURE Samuel Brown CPT

DA FORM 3595-R, JULY 2006 DA FORM 3595-R, NOV 2002, IS OBSOLETE. APD V1.00

***Figure B-5. Example of completed DA Form 3595-R (Record Fire Scorecard).**

RECORD FIRING SCORECARD * SCALED TARGET ALTERNATE COURSE

For use of this form, see FM 3-22.9. The proponent agency is TRADOC

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g)/Executive Order 9397.
PRINCIPAL PURPOSE(S): Facilitates individual's transition to distant target and provides feedback.
ROUTINE USE(S): Evaluate individual proficiency: SSN is used for positive identification purpose only.
DISCLOSURE: Mandatory or voluntary disclosure and effect on individual not providing information. Voluntary. Individuals not providing information cannot be rated/scored on mass basis.

1. NAME (LAST FIRST MIDDLE INITIAL)	2. LAST 4 SSN	3. GRADE	4. UNIT	5. ROSTER NO	6. DATE (YYYYMMDD)
Spicer, Curtis P	0002	E-7	Co C 2/29th INF	C102	2006/07/05

7. TABLE 1 - PRONE SUPPORTED OR FOXHOLE SUPPORTED			8. TABLE 2 - PRONE UNSUPPORTED			9. TABLE 3 - KNEELING		
TARGET	RANGE (M)	HIT	TARGET	RANGE (M)	HIT	TARGET	RANGE (M)	HIT
1	300	X	1	300	X	1	300	X
2	300	O	2	250	X	2	250	O
3	250	X	3	200	X	3	200	X
4	250	X	4	200	X	4	200	X
5	200	X	5	150	X	5	150	X
6	200	X	6	150	X	6	150	X
7	200	X	7	100	X	7	100	X
8	200	X	8	100	X	8	100	X
9	150	X	9	100	X	9	100	X
10	150	X	10	50	X	10	50	X
11	150	X	TIME 60 SEC	HITS	10	TIME 60 SEC	HITS	9
12	150	X						
13	100	X						
14	100	X						
15	100	X						
16	100	X						
17	100	X						
18	100	X						
19	50	X						
20	50	X						
TIME 120 SEC	HITS	19						

10. REMARKS

11. QUALIFICATION SCORES/RATING *(Check one)*

X	38-40 EXPERT		26-32 MARKSMAN
	33-37 SHARPSHOOTER		25-BELOW UNQUALIFIED

TOTAL HITS TABLES 1, 2 AND 3 =

NIGHT FIRE EXERCISE

HIT	MISS	GO	NO GO
8	2	X	

CBRN FIRE EXERCISE

HIT	MISS	GO	NO GO
12	4	X	

*FIRER ISSUED 40 ROUNDS TO ENGAGE 10 TARGETS - NO MORE THAN 4 RDS PER TARGET. THE ROUNDS WILL BE PRELOADED IN 1, 20 ROUND MAGAZINE FOR TABLE ONE, 1, 10 ROUND MAGAZINE FOR TABLE TWO, AND 1, 10 ROUND MAGAZINE FOR TABLE THREE. ALL ROUNDS WILL BE FIRED WITH THE LONG RANGE SIGHT ON THE M4/M16 RIFLE SERIES. HITS ARE DENOTED BY AN "X" MARK. MISSES ARE DENOTED BY A ZERO "0".

12. DATE SIGNED (YYYYMMDD)	13. DATE SIGNED (YYYYMMDD)
2006/07/05	2006/07/05
14. SCORER'S SIGNATURE	15. OFFICER'S SIGNATURE
Greg Graham SFC	Jeff Ray CPT

DA FORM 5790-R, JULY 2006 DA FORM 5790-R, JUN 89, IS OBSOLETE. APD V1.00

***Figure B-6. Example of completed DA Form 5790-R (Record Firing Scorecard—Scaled Target Alternate Course (front) (25 and 15 meters).**

B-2. REPRODUCIBLE FORMS

Blank copies of the following can be found at the back of the book.

- DA Form 3595-R (Record Fire Scorecard)
- DA Form 3601-R (Single Target Field Firing Scorecard)
- DA Form 5239-R (75-, 175-, and 300-Meter Downrange Feedback Scorecard)
- DA Form 5241-R (Single and Multiple Targets - Field Firing Scorecard)
- DA Form 5789-R (Record Firing Scorecard - Known-Distance Course)
- DA Form 5790-R (Record Firing Scorecard - Scaled Target Alternate Course)
- DA Form 7489-R (Record Night Fire Scorecard)
- Squad Designated Marksman—Record Fire I and II Scorecard
- Squad Designated Marksman—Position Evaluation (Supported)
- Squad Designated Marksman—Position Evaluation (Unsupported)

These forms, scorecards, and position evaluation sheets are not available through normal supply channels. You may reproduce them locally on 8 1/2- x 11-inch paper.

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APPENDIX C
LASER MARKSMANSHIP TRAINING SYSTEM

The Laser Marksmanship Training System (LMTS) is a commercial, off-the-shelf trainer that is in limited use throughout the force due to the nonavailability of the EST 2000.

C-1. GENERAL CHARACTERISTICS

The LMTS supports training with a soldier's own weapon without the use of live ammunition. It is not designed to replace live-fire training or to eliminate the need for knowledgeable instructors. Major components include a battery-powered laser transmitter mounted to a mandrel inserted in the rifle barrel or affixed to the front sight with a mounting bracket, and a variety of laser-sensitive targets. The exercise is performed in the same manner as live fire, except the "ammunition" is a laser beam. The target senses shot locations, which are shown on a laptop screen. Unit commanders should expect, and require, the following:

- A training process that focuses on the four fundamentals of marksmanship (steady position, sight alignment and picture, breath control, and trigger squeeze).
- Opportunity for experienced marksmen to "test out" and serve as peer trainers or return to other duties.
- Real-time feedback.
- All-season training.
- Soldiers trained on their assigned weapon throughout the process.

* a. **Background.** The LMTS has been purchased by Active Components (AC) with their own funds. Reserve Components (RC) have acquired LMTS as a result of supplemental Congressional funding.

* b. **Authorization for Use.** The LMTS is authorized for use by AC and RC units and institutions in accordance with the Total Army Rifle Marksmanship Strategy, which was approved by the United States Army Infantry School (USAIS) on 4 August 2006.

c. **Funding.** The LMTS is not an Army-funded simulator as is the EST 2000, nor is it covered under the Army's centralized logistics support system. Units that have purchased the LMTS will sustain their logistical supportability from their own operating funds.

C-2. EQUIPMENT

Software enhancements continue to optimize the training process and minimize computer requirements by enabling an instructor to control up to 10 targets with only one computer. This feature reduces overall system costs and provides maximum throughput with a minimum number of instructors. Minimum LMTS systems consist of a basic laser transmitter with a rod to fit the weapon and a laser target. Systems can be expanded to include a variety of components. (Table C-1, page C-9, provides a complete component list.)

C-3. MARKSMANSHIP TRAINING

Using LMTS technology, units can consistently reduce the rate of first time marksmanship failures and increase the confidence of new soldiers in their ability to fire their basic weapon. For initial skill development (for example, initial entry training) exercises 1 through 4 in paragraph C-6 should be conducted sequentially. After grouping and zeroing standards, the soldier moves to the LMTS alternate course C target where the course of fire replicates the live-fire course (except the "ammunition" is a laser beam). Failure to meet the standards for this course of fire identifies the soldier as a candidate for remedial training.

C-4. REMEDIAL TRAINING

Failure to achieve the standards set forth in this manual identifies the soldier as a candidate for remedial training. Using the LMTS technology, trainers can quickly identify and correct problems, significantly raising qualification rates after subsequent attempts at qualification. After remedial training, the soldier moves to the LMTS alternate course C target where the course of fire replicates the live-fire course (except the "ammunition" is a laser beam).

C-5. SUSTAINMENT TRAINING

The training model in the exercises (paragraph C-6) provides commanders and unit trainers with a sustainment training system that can be employed throughout the year, ideally as integrated concurrent training that causes the least disruption to other planned training. Soldiers would be administered a skill test at a regular frequency (current training guidance recommends quarterly). The results of this test would allow commanders to focus training efforts on those soldiers least able to demonstrate the minimum skills required. For quarterly sustainment training, soldiers should first be pretested to determine the extent of training required. The pretest should begin with the grouping exercise (from exercise 3) followed by the electronic alternate course C or mini-RETS (exercise 4). Soldiers not able to meet pretest standards are given refresher training in the four fundamentals of rifle marksmanship, followed by completion of exercises 1 through 4 in paragraph C-6.

C-6. EXERCISES

The LMTS exercises define procedures for using LMTS equipment to train and sustain basic marksmanship fundamentals. They may be conducted as independent stations or combined on a single station as appropriate for the training scenario. (Check the LMTS operator's manual for specific information about equipment setup and operation.) Trainers should employ LMTS equipment in a manner that accounts for:

- Space and time available at the training site.
- Unit size and composition.
- Remedial training requirements.
- Equipment availability.

a. Training in exercises 1 through 3 should be conducted using the soldier's own service rifle in the dry-fire mode. Exercise 4 may be conducted in the dry-fire mode, but the added realism provided by one of the optional sound and recoil replicators should be employed. These options provide nearly 100 percent of the recoil felt with full rifle function. They require the soldier to properly load magazines and enable the trainer to cause the rifle to misfeed or misfire to verify a soldier's ability to perform immediate action procedures to reduce a stoppage.

b. If the LMTS training immediately precedes a live-fire grouping and zeroing exercise and time permits, trainers may wish to take advantage of the prezeroing capability of the system during exercise 3 by using calibrated or "spun" lasers (see the LMTS operator's manual for a description of the calibration process). Using the calibrated lasers, soldiers make adjustments to their own rifle sights during exercise 3 resulting in a savings of time and ammunition on the grouping and zeroing range. All LMTS-based zeros must be confirmed by live fire. If no live firing is planned, calibrated lasers need not be used and adjustments are made to the laser in exercise 3.

Exercise 1: Reflective Target Exercise.

Action: Demonstrate the four fundamentals of rifle marksmanship while using the LMTS reflective zero target.

Conditions: Given an M16-/M4-series weapon, laser transmitter with mandrel, and reflective target.

Standards: Demonstrate the four fundamentals of marksmanship by:

- Achieving a good steady position.
- Applying the proper sight alignment and sight picture.
- Applying proper breath control.
- Applying proper trigger squeeze.

Exercise 1 introduces soldiers to the four fundamentals of marksmanship, how to diagnose and correct shooter problems, and reinforces proper application of the fundamentals. This exercise requires a high degree of instructor involvement, but one instructor may effectively train up to 20 lanes. Decreased trainer-shooter ratio will result in decreased efficiency and effectiveness. One trainer per 10 lanes is the optimum ratio. The exercise requires little time to complete, so it is recommended that it be combined with exercise 2 to allow more advanced shooters to progress while problem shooters receive remedial training, which helps retain group integrity. A reflective zero target with MP400 laser/mandrel provides a simple but effective tool for remedial training during live-fire exercises. Problem shooters should be sent to a remedial station for a quick check of the application of the fundamentals and remedial training as needed.

Step 1. The soldier assumes a proper supported position using sandbags. The trainer inserts the MP-400/LTA-556C assembly in the rifle barrel and uses laser windage and elevation adjustments to achieve a bold sight adjustment with laser spot on front sight (Figure C-1, page C-4). With the laser in the ON position, soldiers should become familiar with both supported and unsupported firing positions.

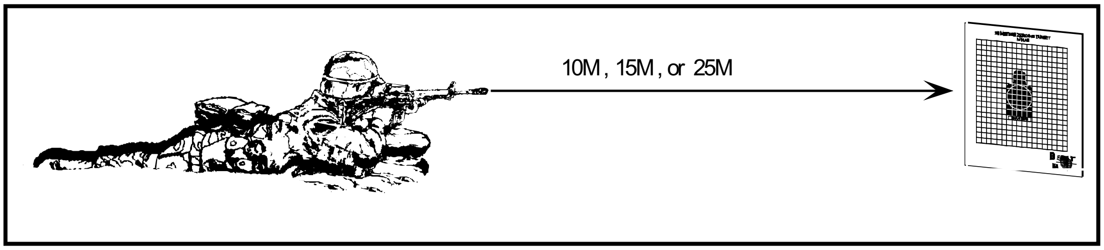

Figure C-1. Exercise 1.

Step 2. Under trainer supervision, the soldier establishes a proper sight alignment and sight picture on a reflective zero target set at 10 meters, 15 meters, or 25 meters (use appropriate target with corresponding distance).

NOTE: With the MP-400 laser turned to ON, the trainer or coach blocks the beam with his finger.

Step 3. When the soldier is confident with the sight alignment and picture, the trainer removes his finger and observes the location of the red laser dot on the target.

Step 4. If the laser dot is in the 4-centimeter circle, proceed to Step 5. If the laser dot is outside the 4-centimeter circle, the trainer instructs the soldier regarding correct aiming techniques to bring the dot inside the circle, and repeats Step 2.

NOTE: If the trainer is reasonably certain that the laser and sights are aligned, the visible laser dot may be used to help the shooter understand correct sight picture and alignment. The shooter should be instructed to bring the laser dot to the center mass of the target silhouette, then observe the relationship of the front and rear sights to the target.

Step 5. With the MP-400 in constant ON mode, use the red dot trace to confirm steady hold and proper breathing and trigger control.

NOTE: This trace can also be used to show the effects of improper steady position breath control and trigger control and reinforce proper techniques.

Step 6. Turn the MP-400 to the training (TRN) mode and instruct the soldier to fire six shots into the target center of mass. Observe the laser hits to confirm proper application of the four fundamentals of rifle marksmanship. Failure to achieve this standard provides an early indication of the need for more intense instruction in the fundamentals of marksmanship or remedial training.

Exercise 2: Interactive Dry Fire.
Action: Demonstrate the integrated act of firing while using the LMTS 130-target system.
Conditions: Given an M16-/M4-series weapon, laser transmitter with mandrel, and TR-700 targets with military masks.
Standards: Achieve 8 hits out of 10 shots two times on an open-face target from the prone unsupported position. Achieve 8 hits out of 10 shots two times on a 300-meter masked target from the supported position.

This exercise provides soldiers an opportunity for practicing the four fundamentals of rifle marksmanship in the integrated act of firing and may easily be conducted concurrently with exercise 1 on the same station. The TR-700 targets may be used both indoors and outdoors in various environments and arrangements to meet training requirement.

Step 1. The soldier assumes a proper firing position (uses sandbags for supported position) (Figure C-2).

NOTE: Sleeping mats should be used on hard floors.

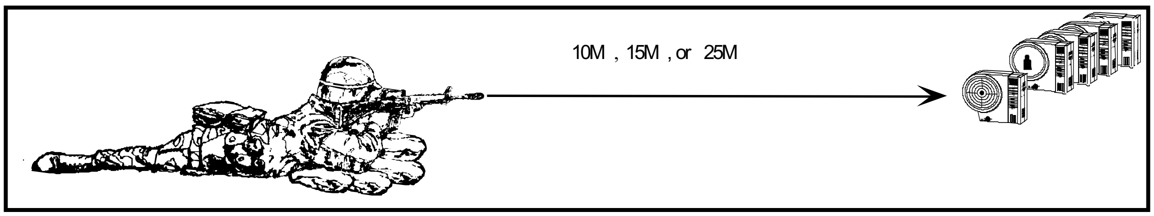

Figure C-2. Exercise 2.

Step 2. The soldier applies the four fundamentals of marksmanship to engage a TR-700 target (open face) with 10 shots from the prone unsupported position. The soldier cocks the rifle after each shot; forcing a break and reestablishing a proper stock weld to build muscle memory.

NOTE: The TR-700 open-face target at 25 meters equals a doublewide E-silhouette target at 300 meters.

Step 3. The trainer inspects the target score for the number of hits. If the number is less than eight, the trainer should perform a visual laser-sight alignment check. If the laser-sight alignment is correct, the trainer reconfirms the soldier's understanding of the four fundamentals of marksmanship and directs the soldier to repeat Step 2. If the number of hits is less than eight after several tries, the soldier reports for remedial training. If the number of hits is eight or more, the soldier repeats Step 2 to confirm and then proceeds to step 4.

Step 4. After the soldier completes step 3, a 300-meter scaled E-silhouette mask is installed over the face of a TR-700 target. The soldier repeats Step 2 from the supported position with the 300-meter mask installed, and repeats Step 4 to confirm.

Step 5. (Optional) As time allows, increase the number of shots to 20 and or install smaller masks for additional skill challenge. Additional firing positions may also be reinforced if needed.

NOTES:
1. The largest mask presents a 300-meter E-target size scaled for 25 meters.
2. The middle mask presents a 300-meter E-target size scaled for 15 meters or a 450-meter E-target size scaled for 25 meters.
3. The smallest mask presents a 300-meter E-target size scaled for 10 meters, a 450-meter E-target size scaled for 15 meters, or a 600-meter E-target size scaled for 25 meters.

Exercise 3: Grouping and Zeroing.
Action: Group and zero an M16/M4 series weapon using the TR-900 Target System with military mask.
Conditions: Given an M16/M4 series weapon, laser transmitter with mandrel, and TR-900 Target System with military mask.
Standards: From the supported firing position:

- ***Grouping.*** Fire up to 27 shots or less (dry fire) in three-round shot groups and achieve two consecutive shot groups within a 4-centimeter circle (25 meters), 2.4-centimeter circle (15 meters), or 1.6-centimeter circle (10 meters).
- ***Battlesight Zero.*** Adjust the sights so that five out of six rounds in two consecutive shot groups strike within the zeroing circle in the silhouette on the zeroing target.

This exercise evaluates a soldier's ability to apply the four fundamentals of rifle marksmanship in the integrated act of firing through shot grouping. The exercise is conducted in the same manner as live-fire grouping and zeroing exercises and can make those exercises more efficient and effective. All normal range commands should be used to reinforce training in proper range procedures. Up to 10 targets may be grouped together for scoring on one computer. This exercise is most efficient with one trainer to run the control and scoring console plus one trainer for every five lanes. Training distance must correspond to the distance used in exercise 4.

NOTE: Whenever this exercise is conducted prior to a live-fire exercise, calibrated lasers should be used to support prezeroing. Adjustments to the rear sight of a M16A2 and the front sight of a M16A1 must be made when training at 10 meters or 15 meters to compensate for parallax error. See the LMTS operator's manual for a detailed description of these adjustments.

Step 1. From the supported firing position (Figure C-3), the soldier fires three-round shot groups at the center of mass of the target overlay, continuing until two consecutive groups fall within a 4-centimeter circle anywhere on the target (maximum 27 shots). Trainers should provide feedback to the soldier between each shot group. If the soldier is unable to achieve the standard within 27 shots, the trainer attempts remedial actions or sends the soldier to the remedial training station.

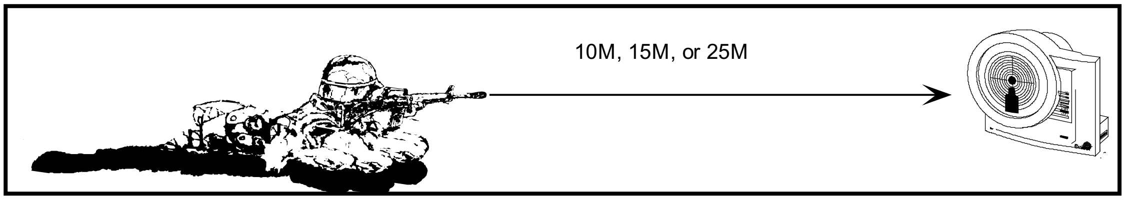

Figure C-3. Exercise 3.

Step 2. When the grouping standard is met, the soldier makes appropriate sight changes as instructed by the trainer who begins a new session for the zeroing process. The soldier continues to fire three-round shot groups, adjusting the sights as instructed by the trainer to bring the shot groups (maximum 18 shots) within the zeroing circle on the target silhouette. When a shot group falls within the zeroing circle, the soldier fires an additional shot group for confirmation. Five of six shots must fall within the zeroing circle.

NOTE: Failure to achieve the standard identifies the soldier as a candidate for remedial training who should not progress to exercise 4 until the standard is met.

Exercise 4: LMTS Prequalification.
Action: Engage 10-, 15-, or 25-meter alternate course C scaled silhouettes with an M16-/M4-series weapon.
Conditions: Given an M16-/M4-series weapon, laser transmitter with mandrel, and electronic alternate C target system with 10 10-meter, 15-meter, or 25-meter scaled silhouettes. Engage each silhouette with two shots from the supported position and two shots from the prone unsupported position.
Standard: Without assistance, the soldier engages 10 target silhouettes using the M16-/M4-series weapon with laser transmitter, and achieves a minimum of 30 hits out of 40 shots.

Exercise 4 is used as a skill test to determine the need for training or the results of training and serves as an accurate predictor of live-fire alternate course C performance. Soldiers failing to meet the standards of this exercise should receive remedial training prior to live-fire qualification. The exercise may be conducted in the dry-fire mode with soldiers recocking the rifle between shots. The dry-fire method should use a magazine with the follower and spring removed. Another option for the dry-fire mode involves removing the charging handle and attaching a piece of cord (looped on both ends with the free end about 3 inches from the end of the stock) to the bolt. The coach can recock the rifle between shots by pulling the cord directly to the rear. The sound and recoil replicator options include the M16A2 Blazer (see paragraph C-7) and the alternate laser-mounting bracket used with a standard BFA. Both options offer added realism by providing full rifle function, sound, and recoil. When using the special safe Blazer blanks, the Blazer option may be employed indoors without hearing protection. Standard M200 blanks may only be used with the BFA outdoors with hearing protection. When available, the LMTS mini-RETS range should be employed for added training realism and to prepare soldiers for firing on pop-up targets.

Step 1. The soldier assumes the proper firing position using sandbags in the supported position (Figure C-4).

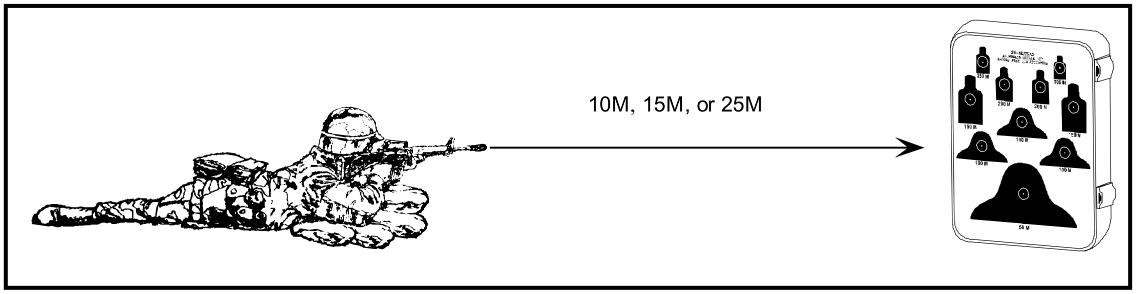

Figure C-4. Exercise 4.

Step 2. The trainer prepares the electronic 25-meter alternate C target and computer control station for the prequalification skill test. The course may be conducted at 25 meters, 15 meters, or 10 meters using the appropriate target overlay.

NOTE: The trainer should use appropriate range commands and enforce all range safety procedures.

Step 3. The soldier applies the four fundamentals of rifle marksmanship using the service rifle (laser-zeroed) during exercise 3 to fire alternate course C.

Step 4. The computer automatically times the test and can print a score sheet.

C-7. SOUND AND RECOIL REPLICATOR

To add realism to the training, a special upper receiver sound and recoil replicator provides full live-fire functionality (without the projectile). It supplies nearly 100 percent of the recoil with 50 percent of the noise using a specially designed nontoxic theatrical blank.

C-8. LMTS PARTS LIST

Table C-1 shows a complete parts list for the LMTS.

PART	INCLUDES
110 System (110v or 220v)	TR-700 target, LT100C laser, transmitter rod, mask set, AC power adapter, and user's manual.
330A System (110v or 220v)	TR-900 target, LT100C laser, transmitter rod, cable, software, AC power adapter, and user's manual.
360 System (available in 3-, 4-, and 5-target array)	TR-900 target, LT100 laser, transmitter rod, cable set, software, AC power adapter, control box, and user's manual.
430 System (110v or 220v)	TR-900 target, MP400 laser, 556C rod, software, AC power adapter, and user's manual.
Mini-Range	TR-700 target, LT100C laser, transmitter rod, transceiver unit with RS-232 cable, software, E-tag, AC power adapter, and user's manual.
Sound and Recoil Replicator System	M16A2 Upper Receiver M4 Upper Receiver CO2-Powered Weapon Simulator M4 or M16
Borelight Kit	MP400 laser, LTA-556C transmitter rod, and carrying case.
Targets	TR-700 Electronic TR-900 Electronic 25-m Zero Reflective (Small) 25-m Zero Reflective (Large) Other reflective targets available
Laser Transmitters	LT-100 laser transmitter LT-500 "in-barrel" laser transmitter
System Software	330A System 360 System Mini-Range System
Instruction Booklets	110 System 330A System 360 System
Laser Transmitter Rods	LTA-1200 Type B 12-gauge LTA-190 Type B Cal .177 LTA-220 Type B Cal .22 LTA-240 Type B Cal .25 LTA-310-2 Type A Cal .30, 2" Barrel LTA-380 Type A Cal .38 and .357 LTA-380-2 Type A Cal .38 and .357, 2" Barrel LTA-410 Type A Cal .40 and .41 LTA-440 Type A Cal .44 LTA-450-2 Type A Cal .45, 2" Barrel LTA-500 Type A Cal .50 LTA-556C Cal 5.56-mm (Special Order) LTA-762C Cal 7.62-mm (Special Order)

***Table C-1. Complete LMTS parts list.**

Mask Sets for TR-700 Target Overlays for TR-900 Target	Training Masks: increased range/difficult, off-center grouping, sniper training, slot—horizontal or vertical. Scaled range E-type silhouettes for use at 25 and 15 meters. Hunting Masks: red fox, white tail jackrabbit, mouflon, moose, white tailed deer, rock dove, pheasant, clay pigeon. Overlays: Scaled range E-type silhouettes for use at 25 and 15 meters.
System Components and Accessories	Training vest for TR-700 target Sound and Recoil Replicator Consumable—5.56-mm, 7.62-mm, and 9-mm. Notebook computer Safety rod CO2 4 oz. CO2 7.5 oz. CO2 20 pound AC-600 110v adapter for TR-700 target AC-610 220v adapter for TR-700 target AC-910 110v adapter for TR-900 target AC-920 220v adapter for TR-900 target RC-260 remote cable BL-265 daisy chain cable BL-640 long cable BL-650 daisy chain cable RS-232 15-m cable extension CB-440 control box TR-700 RF control (E-tag) Mini-range transceiver unit (tag-reader)
Carrying Cases	110 System 330A System 360 System (per three targets) M16/M4 Sound and Recoil Replicator Borelight Kit

***Table C-1. Complete LMTS parts list (continued).**

APPENDIX D

RANGE SAFETY AND RISK MANAGEMENT

All personnel training on a rifle range should be briefed on the safety and local requirements for that range. The briefing fulfills the minimum requirements for a rifle range safety briefing. Information may be added to conform to local requirements and safety regulations. ARs 210-21, 385-10, and 385-63 should be reviewed by all range personnel (OIC, safety officer, NCOIC, and so on) before operating any range.

D-1. RECOMMENDED BRIEFING

The first priority on any range is training, but safety must be at the forefront of the training program. The safety program will prescribe safety precautions necessary to minimize the possibility of accidents in the firing and other uses of ammunition by troops in training and range operations. The safety program should include the following:

- Identify surface danger zones (SDZ) as described in AR 385-63.
- Inspect for objects located near the muzzle of the weapon before firing, especially during unassisted night fire.
- Identify the location of medical personnel.
- Identify left and right limits of the range. Firers never fire outside of these limits.
- When not on the firing line the weapon selector lever is on safe and the bolt locked to the rear.
- Firers always enter and exit the firing line at the entry or exit point.
- Before occupying a firing position, inspect it for wildlife or obstructions.
- Always keep the muzzle of the weapon pointed downrange when on the firing line, finger outside of the trigger housing area.
- Identify the designated smoking area (if applicable).
- Never touch a weapon while personnel are downrange or in front of the firing line.
- Load the weapon only on command from the tower or control point.
- Never fire without the use of hearing protection.
- Left-handed firers will fire their weapon with a left-handed brass deflector attached to the weapon, if necessary.
- When entering or exiting the firing line the weapon must be cleared with a cleaning rod.
- Consider the rifle loaded at all times, even in break areas. Never point the weapon at anyone.
- Anyone observing an unsafe act will immediately call “CEASE FIRE”, place the weapon on safe, place it in the v-notched stake or lay it on the sandbags, and give the verbal and visual command of cease fire.
- Once cleared off the firing line, firers report to the ammunition point and turn in all brass and ammunition.
- No one will leave the range until they have been inspected for live ammunition and brass.

- In case of an electrical storm, personnel will be directed to lock and clear all weapons, ground their equipment (except wet weather gear), and disperse into a predetermined area.
- Eating and drinking are not permitted on the firing line unless the tower operator permits drinking from the canteen. (Drink water often to prevent heat injuries.)

D-2. PERSONNEL AND DUTIES

To provide both a safe and efficient range operation and effective instruction, the following is an example of personnel and duties that may be required.

a. **OIC.** The OIC is responsible for the overall operation of the range before, during, and after live firing.

b. **Range Safety Officer.** The range safety officer is responsible for the safe operation of the range to include conducting a safety orientation before each scheduled live-fire exercise. He ensures that a brass and ammunition check is made before the unit leaves the range. He ensures that all personnel comply with the safety regulations and procedures prescribed for the conduct of a live-fire exercise. He ensures that all left-handed firers use left-handed firing devices. This officer should not be assigned other duties.

c. **NCOIC.** The NCOIC assists the OIC and safety officer, as required; for example, by supervising enlisted personnel who are supporting the live-fire exercise.

d. **Ammunition Detail.** This detail is composed of one or more ammunition handlers whose responsibilities are to break down, issue, receive, account for, and safeguard live ammunition. The detail also collects expended ammunition casings and other residue.

e. **Unit Armorer.** The unit armorer repairs the rifle to include replacing parts, as required.

f. **Assistant Instructor.** One assistant instructor is assigned for each one to ten firing points. Each assistant ensures that all firers observe safety regulations and procedures, and he assists firers having problems.

g. **Medical Personnel.** They provide medical support as required by regulations governing live-fire exercises.

h. **Control Tower Operators.** They raise and lower the targets, time the exposures, sound the audible signal, and give the fire commands. If possible, two men should be chosen to perform these functions.

i. **Maintenance Detail.** This detail should be composed of two segments: one to conduct small-arms repair and one to perform minor maintenance on the target-holding mechanisms.

D-3. AMMUNITION POSITIONING AND ISSUANCE

To provide a safe and operational range, the following are recommended procedures for handling ammunition.

a. Locate all ammunition at firing sites outside the backblast area (when applicable) for the weapons involved. Store ammunition at a position that will minimize the potential for ignition, explosion, or rapid burning.

b. Issue ammunition to firing units immediately before scheduled training exercises. Distribute small arms ammunition to troops only when they are on the ready line or firing line.

c. Cover all ammunition to protect it from the elements and direct rays of the sun. Provide air circulation between the ammunition and cover for proper ventilation.

d. Limit the unpacking of ammunition at the firing line to the minimum number of rounds needed for efficient fire of the exercise. Retain packaging material until firing is complete. Units will not burn wooden containers or indiscriminately fire ammunition to preclude return to a storage site.

*D-4. RISK MANAGEMENT

Risk management and assessment of training and operations will be performed in accordance with requirements of AR 385-10, FM 25-100, FM 25-101, FM 100-14, and this manual. This paragraph assigns responsibilities for risk management and assessment.

a. **Safety Manager.** The safety manager will—

- Provide overall coordination of the risk management program.
- Provide guidance and assistance to facilitate effective implementation of the program.
- Review the risk management worksheet for operations and training determined to have high or extremely high residual risk.
- Check worksheet during range and training inspections.

b. **Commanders.** Commanders will—

- Develop, in writing, and implement a comprehensive risk management program that meets the requirements of this manual.
- Integrate risk management into all operations and training.
- Train all leaders in risk management concepts, the requirements of this manual, and the organizational risk management program.
- Ensure a formal, documented risk management worksheet is completed for each training activity and each operation using the procedures and form described in this manual. This document will be completed during the planning phase of the operation or training.
- Ensure worksheets are reviewed by, and the risk accepted in writing by, the leader at the appropriate level as designated in this manual.
- Maintain copies of all worksheets in the appropriate organizational files, and at the training or operation site.
- Develop a comprehensive daily risk assessment checklist, which addresses those factors that may change from day to day or iteration to iteration, and identifies new hazards not addressed in the risk management worksheet.
- Ensure a daily risk assessment checklist is completed before beginning the training or operation. This document will be completed immediately before the execution phase of the operation or training. For those operations conducted on a repetitive basis, the checklist must be completed before each days training or operation. If conditions change significantly during the operation, the checklist should be reevaluated.

- Require the leader conducting the operation or training to consult with and receive approval from the individual who accepted the risk on the risk management worksheet when the daily risk assessment checklist indicates the overall rating for the operation or training is high or extremely high, when any factor is rated as extreme risk, or when more than one factor is rated as high risk.
- Ensure daily risk assessment checklists are maintained at the operation or training site until the event is completed. If an accident occurs during the operation, the checklist should be maintained until the investigation is complete.
- Ensure risk management worksheets are reevaluated before each operation or training event in coordination with the daily risk assessment checklist by the individual(s) responsible for the operation or training.
- Ensure the worksheet and daily risk assessment checklists are used as the basis for preoperational or training safety briefings of involved personnel.

c. **General Procedures.** Risk management will be integrated into every operation and training event conducted on the installation or by installation organizations at other locations.

(1) A formal, documented risk management worksheet and daily risk assessment checklist will be prepared for every operation and every training event.

(2) The worksheet and daily risk assessment checklists will be prepared and risks will be accepted using the methodology and form described in this manual.

(3) For those training events or operations conducted on a repetitive basis, there is no requirement to complete a new worksheet before each iteration. The initial worksheet is sufficient unless changes have been made to the training scenario or operation plan that would affect the safety of personnel, equipment, or the environment, or new hazards are identified on the daily risk assessment checklist that are not on the initial risk management worksheet.

(4) Whenever there is a change of command or supervision, the risk management worksheets accepted by the outgoing commander or manager will be revised, updated, and submitted to the new commander or manager for acceptance of risks.

(5) The worksheet will be revised whenever a change in the training or operation could affect the safety of personnel, equipment, or the environment, or hazards are identified that are not on the current risk management worksheet.

d. **Rules of Risk Management.** No unnecessary risk will be accepted. The leader who has authority to accept a risk is responsible for protecting his personnel from unnecessary risk. An unnecessary risk is one that could be reduced or eliminated without hindering mission accomplishment.

(1) Risk decisions must be made at a level consistent with the risk involved. The leader ultimately responsible for the mission should make the risk decision.

(2) Risk is acceptable if benefits outweigh costs. Leaders must understand that risk-taking is a decision-making process that balances mission benefits and costs. They must be prepared to take acceptable risks to accomplish the mission.

e. **Risk Management Process.** The process of risk management is a complete cycle that feeds back to its start point in a logical manner. A key consideration in managing risk is to match the process to the extent of the risk probability. If the risk is high, the process should be complete and detailed. At lower levels of risk, the process may be abbreviated. Generally, all steps of the process should be retained with curtailment achieved by cutting back on the details of each step, not by eliminating a step. Steps will be documented on the risk management worksheet and the daily risk assessment checklist.

(1) ***Identify the Hazards***. The hazards are the potential sources of danger that could be encountered while performing a task or mission. Leaders must try to identify all hazards associated with the operation or training. Special attention should be paid to identifying those hazards that have the potential to change such as weather, level of supervision, soldier alertness, terrain, equipment conditions, and so on. In this situation, each possibility should be identified; for example, weather changes could include heat, cold, lightning, high wind, tornadoes, and so on.

(2) ***Assess the Hazards***. Identified hazards must be assessed to determine their cumulative effect on the operation. Controls will be developed for each identified hazard to reduce or eliminate the risk. The risk level for each hazard and the overall operation will be determined before implementation of control measures (initial) and after controls are implemented (residual).

(3) ***Make a Risk Decision***. Leaders are expected to weigh the risk against the benefits of conducting training or performing an operation. Initial risk levels, controls, and residual risk levels should be considered when making a risk acceptance decision. Risk decisions must be made at a level that corresponds with the degree of risk.

(4) ***Implement Controls***. The controls established as a result of the first three steps are implemented in step four. Included is leader action to reduce or eliminate hazards. Specific controls will be integrated into plans, orders, SOPs, training performance standards, and rehearsals. Knowledge of controls down to the individual soldier or employee is essential.

(5) ***Supervise***. Supervision goes beyond ensuring that personnel do what is expected of them. It includes following up during and after an action to ensure that all went according to plan, reevaluating the plan or making adjustments as required to accommodate unforeseen issues, and incorporating lessons learned for future use.

e. **Preparation of the Risk Management Worksheet.** This form will be completed during the planning phase of the operation or training.

(1) Each hazard will be noted in column one.

(2) Each of the hazards will be analyzed using the risk assessment matrix to determine the probability of its causing an accident and the most likely severity of the consequences should an accident occur. The matrix will first be applied to the hazard before controls are implemented. The initial probability of an accident occurring from each hazard will be noted in column two of the form, initial effect will be noted in column three of the form, and the initial risk level of extremely high, high, medium, or low for each hazard will be noted in column four of the form. The initial overall risk for the operation will be circled at the bottom of the form. The overall initial risk equals the highest initial risk identified in column four.

(3) Specify controls for each hazard. Controls should be keyed to each identified hazard and should address differing levels of the hazard, if appropriate. For example, where heat is listed as a hazard, address specific measures to be taken at each heat category level as well as general requirements such as taking wet bulb readings at the operation site rather than depending on readings taken at another part of the installation.

(4) Each of the hazards will again be analyzed using the risk assessment matrix (Figure D-1) to determine the probability of its causing an accident and the most likely severity of the consequences should an accident occur. The matrix will be applied to the hazard after controls are implemented. The residual probability of an accident occurring from each hazard will be noted in column six of the form, residual effect will be noted in column seven of the form, and the residual risk level of extremely high, high, medium, or low for each hazard will be noted in column eight of the form. The residual overall risk for the operation will be circled at the bottom of the form. The overall residual risk equals the highest residual risk identified in column eight.

(5) The signature block of the appropriate risk acceptance authority will be placed in the lower right of the first page of the form.

* f. **Approval of the Risk Management Worksheet.** The residual risk level determines who may accept the risk and sign the risk management worksheet.

(1) Acceptance of risk and signature on the worksheet will be accomplished by the following based on the overall level of residual risk.

(a) Extremely high: MACOM commander.

* (b) High: At the risk acceptance level directed by unit-specific MACOM policy.

* (c) Medium or low: At the risk acceptance level directed by unit-specific MACOM policy.

(2) The signature block of the individual accepting the risk will be entered on the bottom of the first page of the worksheet. The form will then be signed and dated. Requests for risk acceptance decisions at the installation or MACOM level must be properly staffed through the Safety Office, the Directorate of Public Safety (DPS), and the Directorate of Operations and Training at least 30 days before the event.

(3) Safety Office personnel will be available for consultation during the preparation of all risk management worksheets and during range inspections to ensure that all hazards are identified and appropriate control measures are implemented. Risk management worksheets that have been assigned a residual overall risk level of medium or lower will be signed by the appropriate individual authorized to accept the risk.

g. **Preparation of Daily Risk Assessment Checklist.** The purpose of this document is to evaluate those conditions that may have changed since the worksheet was completed, to identify any new hazards not addressed on the worksheet, and to serve as a final check to ensure the safety of the operation.

(1) The daily risk assessment checklist will be completed immediately before the execution phase of the operation or training. For those operations conducted on a repetitive basis, the checklist will be done before each days training.

(2) The daily risk assessment checklist is to be used in conjunction with the risk management worksheet.

(3) The factors listed represent key concerns that may affect the risk level of an operation between the planning and execution phases, or that may change from iteration to iteration for those operations and training events of a repetitive nature. The using organization may tailor the factors and the point totals for categorizing the operation or

extreme, high, medium, or low criteria for one or more factors; or increase the point total requirements in the last row.

(4) The following conditions require consultation with, and approval by, the individual who signed the risk management worksheet before beginning the training or operation.

(a) The overall risk level for the operation or training as determined using the checklist is extreme or high.

(b) Any factors are rated as extreme risk or more than one factor is rated as high.

(c) Any controls listed on the worksheet are not in place.

(d) Hazards are present that are not listed on the worksheet.

Read risk level at intersection of probability and effect			PROBABILITY				
			Frequent	Likely	Occasional	Remote	Unlikely
			A	B	C	D	E
EFFECT	Catastrophic	I			High	High	
	Critical	II		High	High		Low
	Marginal	III	High			Low	Low
	Negligible	IV		Low	Low	Low	Low

EFFECT	
CATASTROPHIC	Death or permanent total disability, system loss, major property damage.
CRITICAL	Permanent partial disability, temporary total disability in excess of three months, major system damage, significant property damage.
MARGINAL	Minor injury, lost workday accident, compensable injury or illness, minor system damage, minor property damage.
NEGLIGIBLE	First aid or minor supportive medical treatment, minor system impairment.
PROBABILITY	
FREQUENT	Individual soldier/employee/item: Occurs often in career or equipment service life. All personnel or inventory: Continuously experienced.
LIKELY	Individual soldier/employee/item: Occurs several times in career/equipment life. All personnel or inventory: Occurs frequently.
OCCASIONAL	Individual soldier/employee/item: Occurs sometime in career/equipment life. All personnel or inventory: Occurs sporadically or several times in inventory life.
REMOTE	Individual soldier/employee/item: Possible to occur in career/equipment life. All personnel or inventory: Remote chance of occurrence; expected to occur sometime in inventory service life.
UNLIKELY	Individual soldier/employee/item: Can assume will not occur in career/equipment life. All personnel or inventory: Possible, but improbable; occurs only very rarely.

Figure D-1. Risk assessment matrix.

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APPENDIX E

RANGE PROCEDURES AND RANGE OPERATIONS CHECKLIST

This appendix contains procedures to conduct a live-fire training exercise. These procedures support Army regulations, local range regulations, and established unit training SOPs. Conduct of the training exercise should clearly define and establish details and equipment needed to open and operate the range so it does not have an adverse impact on the soldiers training time. The procedures outlined in this appendix should be followed in order to open the range and conduct effective training.

E-1. RANGE PROCEDURES

Before beginning a live-fire exercise, all personnel must receive an orientation on range operations. The orientation should outline the procedures for conducting the exercise to include the duties of the nonfiring orders. To provide a safe and efficient range operation and effective instruction, the following is an example of personnel and duties that may be required.

a. **OIC.** The OIC is responsible for the overall operation of the range before, during, and after live firing.

b. **Range Safety Officer.** The range safety officer (RSO) is responsible for the safe operation of the range to include conducting a safety orientation before each scheduled live-fire exercise. He ensures that a brass and ammunition check is made before the unit leaves the range. He ensures that all personnel comply with the safety regulations and procedures prescribed for the conduct of a live-fire exercise. He ensures that a dry-fire exercise is conducted and the weapon is rodded before a firer leaves the firing line. He ensures that all left-handed firers use left-handed firing devices. This officer should not be assigned any other duties.

c. **NCOIC.** The NCOIC assists the OIC and safety officer, as required; for example, by supervising enlisted personnel who are supporting the live-fire exercise.

d. **Ammunition Detail**. This detail is composed of one or more ammunition handlers whose responsibilities are to break down, issue, receive, account for, and safeguard live ammunition. The detail also collects expended ammunition casings and other residue.

e. **Unit Armorer.** The unit armorer repairs the rifles to include replacing parts, as required.

f. **Assistant Instructor.** One assistant instructor (AI) is assigned for each one to ten firing points. Each assistant ensures that all firers observe safety regulations and procedures, and he assists firers having problems.

g. **Medical Personnel**. They provide medical support as required by regulations governing live-fire exercises.

h. **Control Tower Operators.** They raise and lower the targets, time the exposures, sound the audible signal, and give the fire commands. If possible, two men should be chosen to perform these functions.

i. **Maintenance Detail.** This detail should be composed of two segments: one to conduct small-arms repair and one to perform minor maintenance on the target-holding mechanisms.

E-2. FIRING ORDER LINE UP

After the range cadre have given the safety and range briefings they will then assemble the soldiers in firing orders in correlation with the number of firing points on that range. After the firing order has been determined, firers will have their weapons rodded and move to the firing line where they will proceed to their assigned firing points keeping their weapons pointed up and downrange at all times.

E-3. TOWER COMMANDS

Simple, standard fire commands are needed to avoid confusion and misunderstanding during live-fire exercises. The following are recommended.

a. **General Commands.** The following are general commands and may be altered when necessary.

- "Firers, assume the _____ position."
- (Issue the firer ___ rounds of ammunition.)
- "Coach, secure ___ rounds of ammunition.
- "Lock one round, load"
- "Ready on the right?"
- "Ready on the left?"
- "Ready on the firing line?"
- "Commence firing when your targets appear."
- "Cease firing, lock and clear all weapons."

b. **Grouping Commands.**

- "Firers, assume a good supported prone position."
- "Lock one of three single rounds, load."
- "Ready on the right?"
- "Ready on the left?"
- "The firing line is ready."
- "Place your selector lever on semiautomatic."
- "Commence firing."
- "Cease-fire, lock and clear your weapons."
- "Clear on the right?"
- "Clear on the left?"
- "The firing line is clear."
- "Move down to your targets and triangulate your shot group."
- "After all personnel have triangulated their targets, move back to the firing line."
- "At this time, make adjustments to your sights."
- "Repeat all firing commands until grouping standards are met."

c. **Zero Commands.**

- Tower commands are the same as grouping commands.
- Repeat all firing commands until zeroing standards are met.

d. **Field Firing Exercises.** Simple, standard fire commands are needed to avoid confusion during field firing exercises. Commands for exercises from stationary positions are as follows:

- "Firers, assume a good _____ position."
- "Lock one magazine of ___ rounds, load."
- "Ready on the right?"
- "Ready on the left?"
- "The firing line is ready."
- "Place your selector lever on semiautomatic."
- "Scan your sector."
- "Cease fire, lock and clear your weapon." (Place the selector lever in the SAFE position.)

(1) Repeat the first seven commands above, or give the following commands.

(2) Commands for conduct of fire are minimal and standard. The proper commands are listed in the following paragraphs.

(3) The range officer relays his commands either by radio or telephone to the pit NCOIC so he can keep abreast of the conduct of fire. Before each firing exercise, the range officer informs the pit NCOIC of the next exercise and any special instructions for target operation; for example, "The next firing will be for zero. Mark targets after each three-round shot group." or for slow fire, "The next firing will be ten rounds, slow fire. Mark targets after each shot."

(4) RATELOs relay commands to the pit and pass on special instructions to target operators as requested by assistant instructors. RATELOs never identify a firer on a particular firing point. The command "Mark target number ___" indicates that the target has been fired upon but has not withdrawn for marking.

e. **Practice Record Fire and Record Fire.** Simple, standard fire commands are needed to avoid confusion and misunderstanding during practice record fire and record fire.

(1) ***Practice Record Fire.***

- "Firers, assume a good supported (prone unsupported) position."
- "Scorers, point out the limits of your lane."
- "Firers, lock your first magazine, load."
- "Scan your sector."
- "Cease fire."
- "Lock and clear all weapons."

(2) ***Record Fire.***

- "Firers, assume a good supported (prone unsupported) position."
- "Scorers, point out the limits of your sector."
- "Firers, lock your first 20-round magazine, load."
- "Scan your sector."
- "Cease fire."
- "Lock and clear all weapons."

f. **Rapid Fire Exercises.** The following commands are used for rapid-fire exercises:

- "Lock and clear all weapons."
- "Clear on the right?"

- "Clear on the left?"
- "The firing line is clear."
- "Firers, assume the _____ position."
- "Assistants, secure two magazines of five rounds each."
  ("Issue the firer one magazine of five rounds.")
- "Lock one magazine, load."
- "Ready on the right?"
- "Ready on the left?"
- "Ready on the firing line?"
- "Watch your targets."
  ("Firers assume the appropriate firing position and commence firing when the targets are presented.")

(1) When all the targets are withdrawn, the range officer checks for slow firers or malfunctions and then allows them to fire.

(2) The pit NCOIC organizes, orients, and provides safety for the pit detail. The success of KD firing depends on efficient operation of the targets and the close coordination between the pit NCOIC and range officer. All operators must know the proper procedure for operating and marking the target.

(a) *Marking Targets for Zeroing and Slow Fire.* Targets are marked quickly after each shot or group of shots without command. During slow fire, the firer has a time limit of one minute for each shot. Twenty seconds is considered the maximum time limit for marking. A marker (spotter) is placed in the hit regardless of its location on the target. Each time the target is marked, the marker is removed from the previous hit, and the hole is pasted. (3-inch markers are used for 100, 200, and 300 meters; 5-inch markers are used for 500 meters.)

(b) *Using Disk Markers.* The target markers are painted black on one side and white on the opposite side. They are available in three dimensions: 1 1/2 inches (NSN 6920-00-789-0864), 3 inches (NSN 6920-00-713-8255), and 5 inches (NSN 6920-00-713-8254). The disk spindle may also be procured through supply channels (NSN 6920-00-713-8257).

E-4. RANGE OPERATIONS CHECKLIST

This checklist consists of nine sections, each covering a different topic relating to range operations. The checklist should be modified to include local policy changes to the regulations or SOPs. The person responsible for the training must answer the questions in each section. Ask each question in order. Record each "Yes" answer by placing a check in the GO column. Record a "No" or "Don't know" by checking the NO-GO column. Refer to the checklist to find the GO and NO-GO columns.

When all the questions in a section are asked, look back over the NO-GOs. Contact the people who reported them and ask if they have corrected each problem. If so, change the answer to GO. If any NO-GO remains, analyze it and implement a countermeasure for the shortfall. Afterwards, check to ensure the countermeasures work. Before range operations start, be sure a workable countermeasure is implemented for each safety hazard presented by a NO-GO answer.

Section I. MISSION ANALYSIS

1. Who will be firing on the range?____
   Number of personnel_______________Units________________________________
2. What weapons and course will be used?
   Weapons_______________Course____
3. Where will the training be conducted?
   Range____
4. When is the range scheduled for operations?
   Date_______________Opens__________Closes__________

Section II. DOUBLE CHECK

	GO	NO-GO	REMARKS
1. Has sufficient ammunition been requested for the number of personnel?			
2. Are the range facilities adequate for the type of training to be conducted?			
3. Has enough time been scheduled to complete the training?			
4. Have conflicts that surfaced been resolved?			

Section III. BECOME AN EXPERT

	GO	NO-GO	REMARKS
1. Review TMs and FMs on the weapons to be fired.			
2. Talk with the armorer and other personnel experienced with the weapons to be fired.			
3. Review AR 385-63.			
4. Visit range control and read installation range instructions.			
5. Reconnoiter the range (preferably while it is in use).			
6. Check ARTEPs to see if training tasks can be integrated into the range training plan.			

Section IV. DETERMINE REQUIREMENTS

A. **PERSONNEL:**

1. OIC.
2. Safety officer.
3. Assistant safety officer.
4. NCOIC.
5. Ammunition NCO.
6. Ammunition personnel (determined by type of range).
7. Target detail and target operators.
8. Tower operator.
9. Concurrent training instructors.
10. Assistant instructors.
11. RATELO.
12. Guards (range requirements).
13. Medic(s).
14. Air guard.
15. Armorer.
16. Truck driver (range personnel and equipment).
17. Mechanic for vehicles.
18. Have you overstaffed your range?

B. **EQUIPMENT:**

1. Range packet and clearance form.
2. Safety fan and diagram if applicable.
3. Other safety equipment (aiming circle, compass).
4. Appropriate publications pertaining to the training that will be conducted.
5. Lesson plans, status reports, and reporting folder.
6. Range flag and light (night firing).
7. Radios.
8. Field telephone and wire.
9. 292 antenna, if necessary.
10. PA set with backup bullhorn(s).
11. Concurrent training markers.
12. Training aids for concurrent training stations.
13. Sandbags.
14. Tentage (briefing tent, warm-up tent).
15. Space heaters, if needed.
16. Colored helmets for control personnel.
17. Safety paddles and vehicle flag sets or lights.
18. Ambulance or designated vehicle.
19. Earplugs.
20. Water for drinking and cleaning.
21. Scorecards.
22. Master score sheet.
23. Armorers tools and cleaning equipment for weapons.
24. Brooms, shovels, and other cleaning supplies and equipment.

25. Tables and chairs, if needed.
26. Target accessories.
27. Fire extinguishers.
28. Tarp, stakes, and rope to cover the ammunition.
29. Toilet paper.
30. Spare weapons and repair parts as needed.
31. Tow bar and slave cables for vehicles.
32. Fuel and oil for vehicles and target mechanisms.

Section V. DETERMINE AVAILABLE RESOURCES

1. Fill personnel spaces.
2. Keep unit integrity.
3. Utilize NCOs.
4. Coordinate with supporting organizations:
    - Ammunition.
    - Transportation.
    - Training aids.
    - Medics.
    - Weapons.
    - Other equipment.

Section VI. FOOLPROOFING

1. Write an overall lesson plan for the range.
2. Organize a plan for firing:
    - Determine range organization.
    - Outline courses of fire to be used.
    - Have fire commands typed for use on the range.
    - Set rotation of stations.
3. Rehearse concurrent training instructors and assistants.
4. Brief RATELO on unique range control radio procedures.
5. Brief and rehearse reporting NCO on range operation and all his duties.
6. Collect and concentrate equipment for use on the range in one location.
7. Obtain training aids.
8. Pick up targets from range warehouse, if required.
9. Report to range control for safety briefing (if required) and sign for any special items.
10. Publish LOI:
    - Uniform of range and firing personnel (helmets and earplugs).
    - Mode of transportation, departure times and places.
    - Methods of messing to be used.
    - Any special requirements being placed on units.

Section VII. OCCUPYING THE RANGE AND CONDUCTING TRAINING

A. **OCCUPY THE RANGE:**

1. Request permission to occupy the range.
2. Establish good communications.
3. Have designated areas prepared:
   - Parking.
   - Ammunition point.
   - Medical station.
   - Water point.
   - Concurrent training.
   - Mess.
   - Helipad.
   - Armorer.
4. Inspect range for operational condition.
5. Raise flag when occupying or firing according to the local SOP.
6. Check ammunition to ensure it is correct type and quantity.
7. Ensure range personnel are in proper uniform and the equipment is in position.
8. Receive firing units.
9. Conduct safety checks on weapons.
10. Check for clean, fully operational weapons.
11. Conduct safety briefing (to include administrative personnel on range).
12. Organize personnel into firing orders (keep unit integrity if possible).
13. Request permission to commence firing from range control.

B. **CONDUCT OF FIRING:**

1. Are communications to range control satisfactory?
2. Commands from tower clear and concise?
3. Range areas policed?
4. Ammunition accountability maintained?
5. Master score sheet updated?
6. Personnel accountability maintained?
7. Vehicles parked in appropriate areas?
8. Air guard on duty and alert?
9. Personnel in proper uniform?
10. Earplugs in use?
11. Troops responding properly to commands?
12. On-the-spot corrections being made when troops use poor techniques or fail to hit the target?
13. Conservation of ammunition enforced?
14. Weapons cleared before they are taken from the firing line?
15. Personnel checked for brass or ammunition before they leave the range?
16. Anyone standing around not involved in training or support?

Section VIII. CLOSING OF RANGE

1. Close down range according to the local SOP.
2. Remove all equipment and ammunition from range.
3. Police range.
4. Re-paste and resurface targets as required by range instructions.
5. Perform other maintenance tasks as required by local SOP.
6. Request a range inspector from range control when ready to be cleared.
7. Submit after-action report to headquarters.
8. Report any noted safety hazards to proper authorities.

Section IX. KNOWN DISTANCE RANGE

A. **PERSONNEL:** In addition to those identified in Section 4.
   1. NCOIC of pit detail.
   2. Assistant safety officer for pit area.

B. **EQUIPMENT:** In addition to equipment identified in Section 4.
   1. Sound set for pit area.
   2. Positive communication from the firing line to the pit area.
   3. Pasters.
   4. Glue and brushes for resurfacing targets.
   5. Lubricant for target frames.
   6. Proper targets mounted in target frames.
   7. Briefing on how to operate a KD range.
   8. Procedure for marking targets.
   9. Procedure for pit safety.

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APPENDIX F
ACTIONS, CONDITIONS, AND STANDARDS

This appendix contains the actions, conditions, and standards extracted from the Basic Rifle Marksmanship (BRM) Program of Instruction (POI) prepared by the Advanced Infantry Marksmanship Committee, C Company 2/29th IN Regt of Fort Benning, GA.

F-1. INTRODUCTION TO BASIC RIFLE MARKSMANSHIP

ACTION: Perform a function check on an M16-/M4-series weapon.
CONDITIONS: Given an M16-/M4-series weapon.
STANDARDS: Perform a function check to ensure that the rifle operates properly when the selector lever is placed in each position.

ACTION: Load and unload an M16/M4 magazine.
CONDITIONS: Given a 30-round magazine and five rounds of dummy ammunition.
STANDARDS: load and unload the magazine properly.

ACTION: Load an M16-/M4-series weapon.
CONDITIONS: Given an M16-/M4-series weapon with a magazine loaded with ammunition.
STANDARDS: Load the weapon in such a manner that proper chambering of a round is accomplished.

ACTION: Unload an M16-/M4-series weapon.
CONDITIONS: Given a loaded M16-/M4-series weapon.
STANDARDS: Clear the rifle in such a manner that no ammunition remains in the rifle, and the rifle is on safe.

ACTION: Correct malfunction of an M16-/M4-series weapon.
CONDITIONS: Given an M16-/M4-series weapon that has a malfunction.
STANDARDS: Eliminate the malfunction using immediate action procedures in such a manner that firing is resumed within three to five seconds.

F-2. GROUPING

ACTION: Conduct shot grouping exercise (live fire).
CONDITIONS: Day; on a 25-meter firing range; given a 300-meter M16/M4 zero target placed on an E-silhouette, M16-/M4-series weapon, and 27 rounds of ammunition; while wearing helmet and LCE.
STANDARDS: From the supported firing position, fire up to 27 rounds in 3-round shot-groups and achieve two consecutive 3-round shot-groups within the same 4-centimeter circle using the plastic target box paddle template (DVC-T7-86).

F-3. ZERO THE M16/M4 SERIES WEAPONS

ACTION: Conduct 25-meter zeroing.

CONDITIONS: On a 25-meter range, given an M16-/M4-series weapon, from the supported firing position; 18 rounds of 5.56-mm ammunition, 300-meter M16/M4 zero target placed on a standard E-type silhouette; sandbags for support; with helmet and LCE.

STANDARDS: Each soldier must adjust the sights so five out of six rounds fired in two consecutive shot-groups strike within the 4-centimeter circle on the 25-meter zero targets.

F-4. KNOWN-DISTANCE RANGE

ACTION: Engage single targets with the M16-/M4-series weapon.

CONDITIONS: Day, given an M16-/M4-series weapon, with helmet and LCE, on a known-distance or modified field fire range. Engage F- and E-type silhouette targets at 75 meters (100 yards) with five rounds from the unsupported and five rounds from the supported firing positions. Engage the 175-meter (200-yard) target with ten rounds from the unsupported and ten rounds from the supported firing position. Engage the 300-meter (300-yard) target with five rounds from the unsupported and five rounds from the supported firing positions.

STANDARDS: Demonstrate consistent application of the four fundamentals in the integrated act of shooting. Obtain eight hits out of ten shots on the 75-meter (100-yards) target; fourteen hits out of twenty shots on the 175-meter (200-yard) target; and five hits out of ten shots on the 300-meter (300-yard) target.

F-5. FIELD FIRE I (SINGLE TIMED TARGETS AND TARGET DETECTION)

ACTION: Detect and engage single timed targets with the M16-/M4-series weapon.

CONDITIONS: Day, given an M16-/M4-series weapon, helmet, and LCE on a field fire range with timed single target exposures presented at 75, 175, and 300 meters; given 18 rounds of 5.56-mm ammunition for an introduction to field fire; and 36 rounds of ammunition and a requirement to engage all targets within the time exposure.

STANDARDS: Detect and achieve a total of 22 target hits out of 36 timed target exposures.

F-6. FIELD FIRE II (SINGLE AND MULTIPLE TIMED TARGETS).

ACTION: Detect and engage single and multiple timed targets with the M16-/M4-series weapon.

CONDITIONS: Day, given an M16-/M4-series weapon, helmet, and LCE on a field fire range with single and multiple timed target exposures presented at

	75, 175, and 300 meters; given 10 rounds of 5.56-mm ammunition for an introduction to field fire II, and 44 rounds of ammunition and a requirement to engage all targets within the time exposure.
STANDARDS:	Detect and achieve 27 target hits out of the 44 timed target exposures.

F-7. PRACTICE RECORD FIRE

ACTION:	Detect and engage timed targets with the M16-/M4-series weapon.
CONDITIONS:	Day, given an M16-/M4-series weapon on a record fire range, 40 timed target exposures at ranges from 50 to 300 meters, and 40 rounds of ammunition. Engage 20 targets with coaching allowed from the supported firing position and 20 targets from the unsupported firing position while wearing a helmet and LBE.
STANDARDS:	With assistance from a coach, the soldier detects and engages targets with the M16-/M4-series weapon, and achieves a minimum of 23 target hits out of 40 target exposures.

F-8. RECORD FIRE

ACTION:	Detect and engage timed targets with the M16-/M4-series weapon.
CONDITIONS:	Day, given an M16-/M4-series weapon on a record fire range, 40 timed target exposures at ranges from 50 to 300 meters, and 40 rounds of ammunition. Engage 20 targets from the supported firing position and 20 targets from the unsupported firing position while wearing a helmet and LCE.
STANDARDS:	Without assistance, the soldier detects and engages targets with the M16-/M4-series weapon, and achieves a minimum of 23 target hits out of 40 target exposures.

F-9. ZERO THE M68, CLOSE COMBAT OPTIC (CCO) ON AN M16-/M4-SERIES WEAPON

ACTION:	Conduct 25-meter zeroing with the M68 close combat optic (CCO).
CONDITIONS:	On a 25-meter range, given an M16-/M4-series weapon, CCO, from the supported position; 18 rounds of 5.56-mm ammunition, 300-meter M16/M4 zero target placed on a standard E-type silhouette; sandbags for support; and helmet and LCE.
STANDARDS:	Each soldier must adjust the CCO so five out of six rounds fired in two consecutive shot-groups strike within the 4-centimeter circle on the 25-meter zero targets.

F-10. PRACTICE RECORD FIRE WITH THE M68 CCO

ACTION:	Detect and engage timed targets with the M16-/M4-series weapon and CCO.

CONDITIONS: Day, given an M16-/M4-series weapon with CCO mounted, on a record fire range, 40 timed target exposures at ranges from 50 to 300 meters, and 40 rounds of ammunition. Engage 20 targets with coaching allowed from the supported firing position and 20 targets from the unsupported firing position while wearing a helmet and LBE.

STANDARDS: With assistance from a coach, the soldier detects and engages targets with the M16-/M4-series weapon with CCO mounted, and achieves a minimum of 23 target hits out of 40 target exposures.

F-11. RECORD FIRE WITH THE M68 CCO

ACTION: Detect and engage timed targets with the M16-/M4-series weapon and CCO.

CONDITIONS: Day, given an M16-/M4-series weapon with CCO mounted, on a record fire range, 40 timed target exposures at ranges from 50 to 300 meters, and 40 rounds of ammunition. Engage 20 targets from the supported firing position and 20 targets from the unsupported firing position while wearing a helmet and LCE.

STANDARDS: Without assistance, the soldier detects and engages targets with the M16-/M4-series weapon with CCO mounted, and achieves a minimum of 23 target hits out of 40 target exposures.

F-12. ZERO THE AN/PAS-13 (TWS) ON AN M16-/M4-SERIES WEAPON

ACTION: Conduct 25-meter zeroing with the AN/PAS-13.

CONDITIONS: On a 25-meter range, given an M16-/M4-series weapon, TWS, from the supported position; 36 rounds of 5.56-mm ammunition, two thermally prepared 300-meter M16/M4 zero targets placed on a standard E-silhouette with thermal blankets; sandbags for support with helmet and LCE.

STANDARDS: Zero the TWS to the weapon in 18 rounds or less in the wide field of view, and zero the TWS in 18 rounds or less in the narrow field of view. Each soldier must adjust the TWS reticles so five out of six rounds fired in two consecutive shot-groups strike within the 4-centimeter impact zone marked on the 25-meter zero targets.

F-13. PRACTICE RECORD FIRE WITH THE AN/PAS-13 (TWS)

ACTION: Detect and engage timed targets with the M16-/M4-series weapon and TWS.

CONDITIONS: A record fire range day or night, given an M16-/M4-series weapon, a TWS in either wide or narrow field of view, 40 timed target exposures at ranges from 50 to 300 meters, and 40 rounds of 5.56-mm ball ammunition. (Night firing is preferred.)

STANDARDS: Achieve at least 28 target hits out of 40 timed target exposures.

F-14. RECORD FIRE WITH THE AN/PAS-13 (TWS) (3 HOURS)

ACTION: Detect and engage timed targets with the M16-/M4-series weapon and TWS.

CONDITIONS: A record fire range day or night, given an M16-/M4-series weapon, a TWS in either wide or narrow field of view, 40 timed target exposures at ranges from 50 to 300 meters, and 40 rounds of 5.56-mm ball ammunition. (Night firing is preferred.)

STANDARDS: Achieve at least 23 target hits out of 40 timed target exposures.

F-15. ZERO AN M16-/M4-SERIES WEAPON WITH AN IR AIMING LASER

ACTION: Conduct 25-meter zeroing with IR aiming laser.

CONDITIONS: On a 25-meter range, given an M16-/M4-series weapon, IR aiming laser, night vision goggle from the supported position; 18 rounds of 5.56-mm ammunition, an IR prepared 300-meter M16/M4 zero target placed on a standard E-silhouette; sandbags for support with helmet and LCE.

STANDARDS: Each soldier must adjust the IR aiming laser so five out of six rounds fired in two consecutive shot-groups strike within the 4-centimeter impact zone marked on the 25-meter zero target with less than 18 rounds.

F-16. BORE SIGHT AN M16-/M4-SERIES WEAPON WITH AN IR AIMING LASER WITH A BORELIGHT

ACTION: Conduct boresighting with IR aiming laser at ten meters.

CONDITIONS: At 10 meters, given an M16-/M4-series weapon, IR aiming laser, borelight, night vision goggle, the proper 10-meter boresight offset for the weapon, laser, rail grabber and mounting location configuration, a stable platform for the weapon and offset.

STANDARDS: Each soldier must adjust the IR aiming laser so the aiming laser is centered on the crosshair and the borelight laser is centered on the circle.

F-17. FIELD FIRE II SCENARIO WITH AN IR AIMING LASER

ACTION: Detect and engage multiple timed targets with the M16-/M4-series weapon and aiming laser while viewing through night vision goggles and applying scanning, walking, and IR discipline.

CONDITIONS: Given an M16-/M4-series weapon, IR aiming laser, NVGs, borelight, field fire range at night, 36 timed target exposures at ranges from 50 to 250 meters, 36 rounds of 5.56-mm ammunition, and a coach enforcing scanning, walking, and IR discipline.

STANDARDS: While viewing through night vision goggles the soldier must scan his sector, acquire all exposed targets, activate and walk the aiming laser of the IR aiming laser from the base of the target up to center mass, apply the four fundamentals, engage the target while ensuring the aiming laser is only activated at the base of the target and shut off as soon as the target is engaged.

F-18. PRACTICE RECORD FIRE WITH AN IR AIMING LASER

ACTION: Detect and engage multiple timed targets with the M16-/M4-series weapon and aiming laser while viewing through night vision goggles and applying scanning, walking, and IR discipline.

CONDITIONS: Given an M16-/M4-series weapon, aiming laser, NVGs, borelight, record fire range at night, 40 timed target exposures at ranges from 50 to 250 meters, 40 rounds of 5.56-mm ammunition, and a coach enforcing scanning, walking, and IR discipline.

STANDARDS: Achieve at least 17 target hits out of 40 timed target exposures.

F-19. RECORD FIRE WITH AN IR AIMING LASER

ACTION: Detect and engage multiple timed targets with the M16-/M4-series weapon and aiming laser while viewing through night vision goggles and applying scanning, walking, and IR discipline.

CONDITIONS: Given an M16-/M4-series weapon, aiming laser, NVGs, borelight, record fire range at night, 40 timed target exposures at ranges from 50 to 250 meters, 40 rounds of 5.56-mm ammunition, and a coach enforcing scanning, walking, and IR discipline.

STANDARDS: Achieve at least 17 target hits out of 40 timed target exposures.

APPENDIX G

10-METER TARGET OFFSETS AND 25-METER ZERO OFFSETS

This section provides the 10-meter target offsets and the 25-meter zero offsets for the M16-/M4-series weapons mounted with iron sights, optics, MILES, or aiming lasers. A blank reproducible 10-meter target offset is provided and an example of each weapon configuration (Figures G-2 through G-6, pages G-2 through G-4). The M16A2 300-meter zero target will be used for 25-meter zeroing with all weapon configurations.

To mark the proper 10-meter target offsets—

- Find the correct template for your weapon configuration.
- Count the number of squares starting from center of the borelight circle on the offset to the desired point of aim. Each template also provides a number formula for the proper offset. Example (L2.0, U2.4): Starting from the center of the borelight circle (0.0, 0.0) move LEFT 2 squares and UP 2.4 squares.
- Place the appropriate symbol or mark (Figure G-1).

To mark the proper 25-meter zero offset—

- Use only a M16A2 300-meter zero target.
- Find the correct target template for the weapon configuration.
- Count the number of squares starting from the center of the 300-meter zeroing silhouette.
- Mark the designated strike point by drawing a small circle at the appropriate number of squares from the center of the 300-meter zeroing silhouette.
- Draw a 4-centimeter by 4-centimeter square keeping the designated strike point at the center.

To reproduce the 10-meter target offset, copy the blank 10-meter target offset and place the example of the weapon being used on the back. This reproducible copy can be laminated and used repeatedly. Table G-1 (page G-5) provides offset mounting information for various weapon configurations.

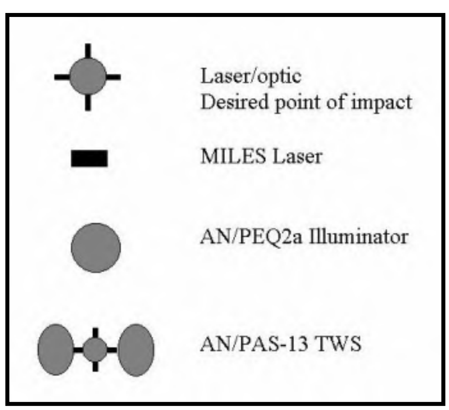
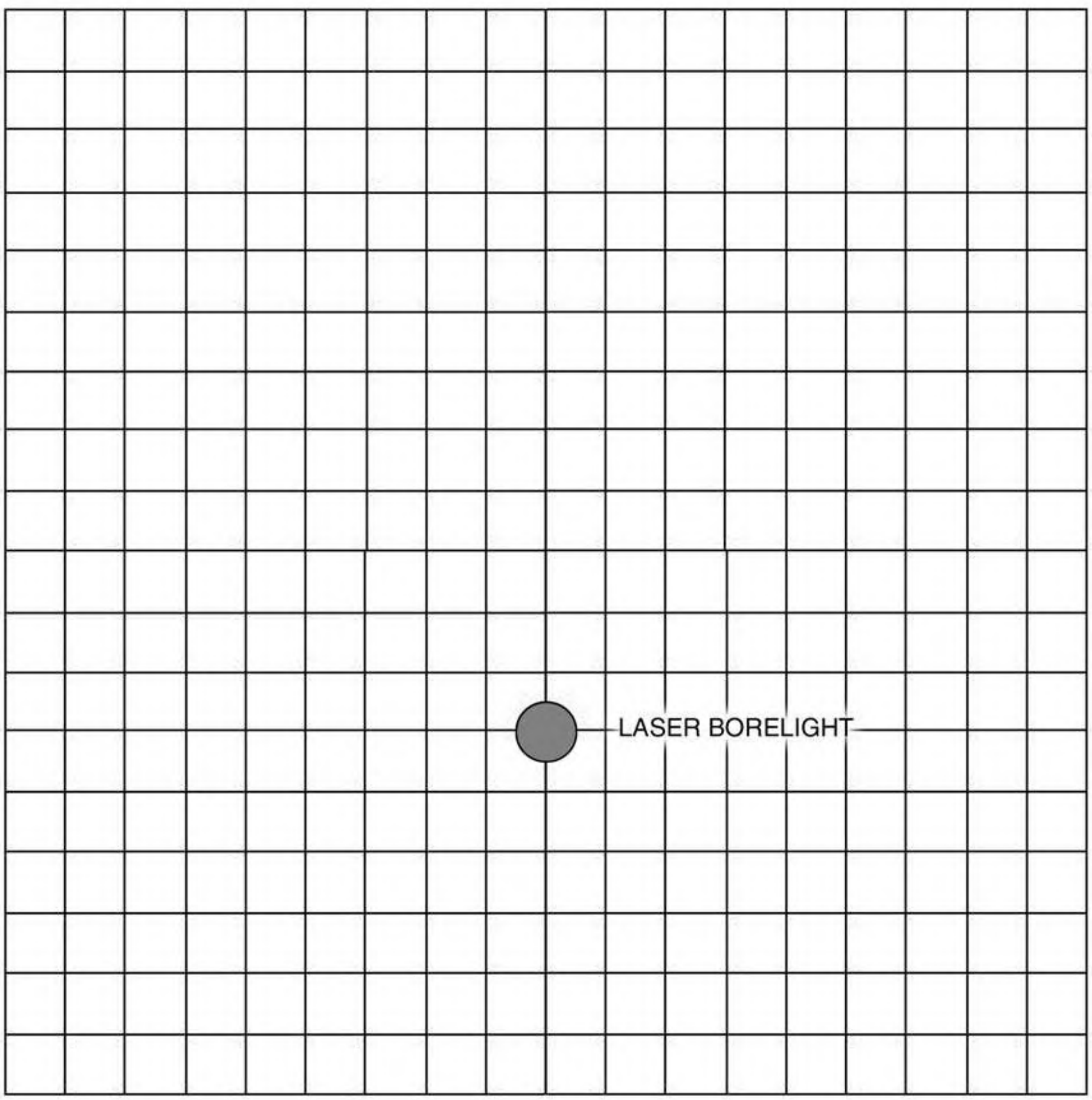


Figure G-1. 10-meter target offset symbols.

10-METER BORESIGHT TARGET



1 - USE THE CORRECT OFFSET FOR THE WEAPON, SIGHT AND LOCATION CONFIGURED
2 - STABILIZE THE WEAPON AND THE OFFSET
3 - ZERO BORELIGHT WHILE INSIDE THE BARREL OF THE WEAPON
4 - ALIGN THE LASER OF THE BORELIGHT WITH THE DOT ON THE 10M OFFSET
5 - ALIGH THE MILES LASER WITH THE MILES RECTANGLE ON THE 10M OFFSET (IF APPLICABLE)
6 - ADJUST AIMING LASER UNTIL CENTERED ON CROSS HAIR
7 - PLACE OPTIC AIMPOINT CENTERED ON CROSSHAIR AND MAKE ADJUSTMENTS ON OPTIC UNTIL THE BORELIGHT LASER IS ALIGNED WITH THE DOT ON THE 10M OFFSET
8 - RECONFIRM ALL DEVICES ARE STILL ALIGNED TO THEIR AIMING MARK

US Army ARDEC
AMSTA-AR-CCL-A
AMSTA-AR-FSF-R
Picatinny Arsenal, NJ 07089

Figure G-2. Blank reproducible 10-meter boresight target.

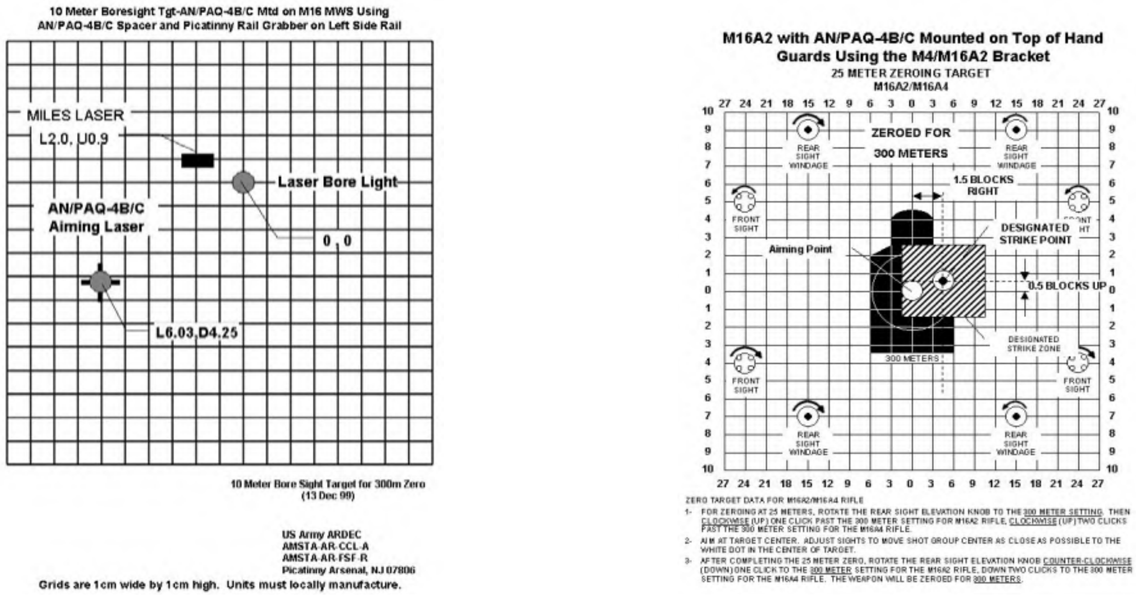


Figure G-3. M16A2 10-meter boresight target/25-meter zeroing target offsets.

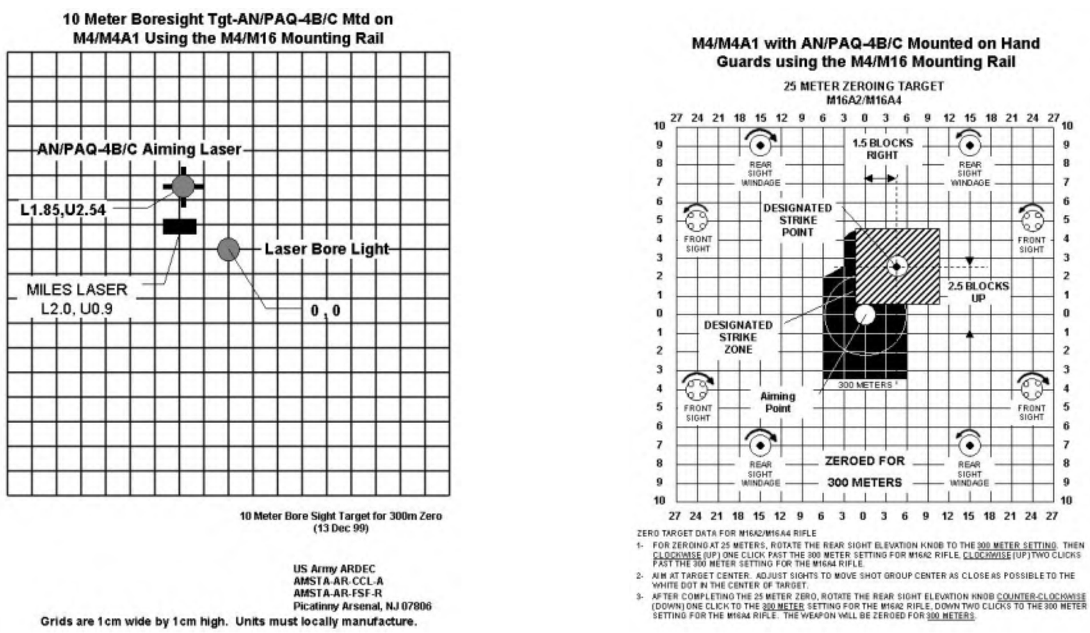
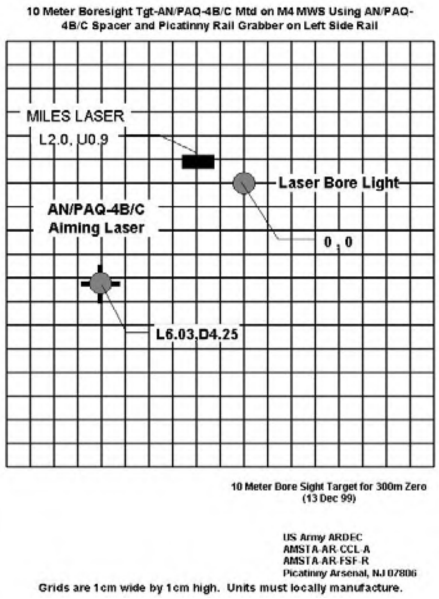


Figure G-4. M4/M4A1 10-meter boresight target/25-meter zeroing target offsets.



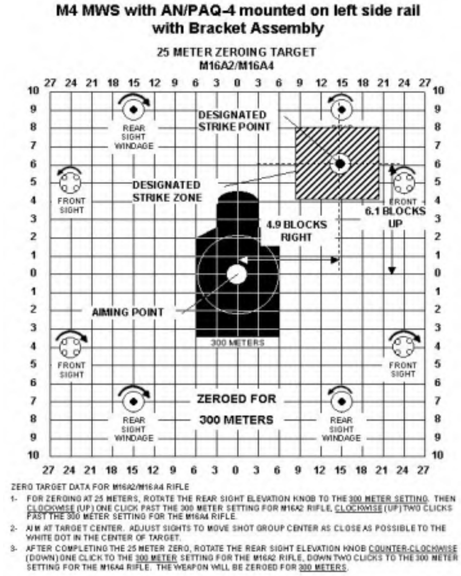
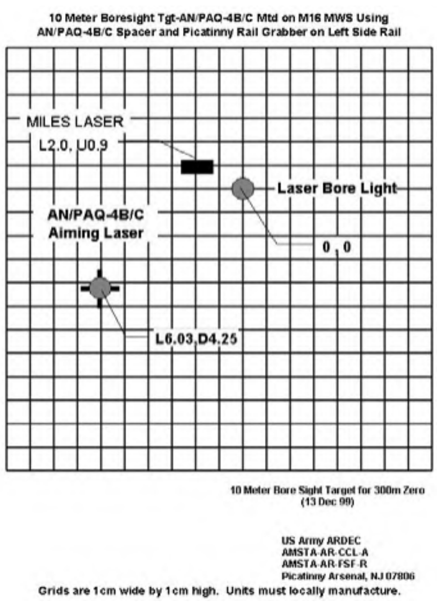


Figure G-5. M4 MWS 10-meter boresight target/25-meter zeroing target offsets.



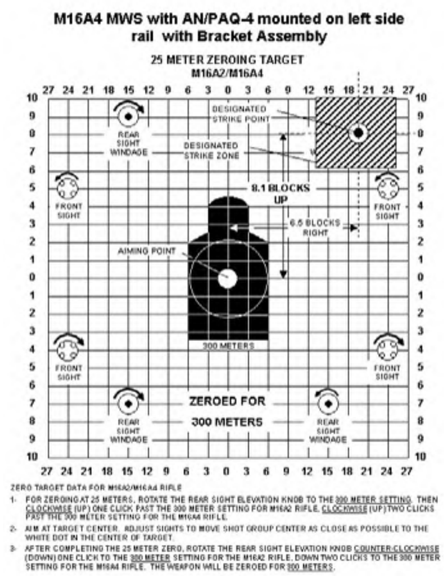


Figure G-6. 10-meter boresight target/25-meter zeroing target offsets.

Weapon	Accessory	Rail Grabber	Mount	Location	Range To Zero	Zero Offset	Boresight Target	MILES Offset
M16A2	Iron sight	N/A	N/A	N/A	300m	0.0 0.0	0.0 4.2U	2.0L 0.9U
M16A2	M68	N/A	M68 gooseneck bracket	Carrying handle	300m	0.0 1.4 cm DN	0.0 5.2U	2.0L 2.4U
M16A2	LTWS	TWS	TWS bracket assembly	Carrying handle	300m	0.0 10D	0.0 13.4U	2.0L 2.4U
M16A2	TWS	N/A	TWS bracket assembly	Carrying handle	300m	0.0 8.1D	0.0 11.5U	2.0L 2.4U
M16A2	AN/PVS-4	N/A	AN/PVS-4 mounting knob	Carrying handle	300m	0.0 7.0D	0.0 9.4U	2.0L 0.9U
M16A2	AN/PAQ-4B/C	N/A	M4/M16 bracket	Hand guards	300m	1.5R 0.5U	1.85L 2.54U	2.0L 0.9U
M16A2	AN/PEQ-2A	N/A	M4/M16 bracket	Hand guards	300m	1.5L 0.5U	1.8R 2.4U	2.0L 0.9U
M16/M203	AN/PAQ-4B/C	N/A	Spacer and AN/PVS-4 mounting knob	Carrying handle	300m	1.85R 2.6D	1.85L 8.6U	2.0L 3.9U
M16/M203	AN/PVS-4	N/A	AN/PVS-4 mounting bracket assembly	Carrying handle	300m	4.2R 9.8D	TBD	2.0L 0.9U
M4/M4A1	BIS	N/A	N/A	Upper receiver	300m	0.0 0.0	0.0 4.01U	2.0L 0.9U
M4/M4A1	AN/PAQ-4B/C	N/A	M4/M16 bracket	Hand guards	300m	1.5R 2.5U	1.85L 2.54U	2.0L 0.9U
M4/M4A1	LTWS	TWS	N/A	Upper receiver	300m	0.0 4.5D	0.0 7.9U	TBD
M4/M4A1	TWS	Picatinny	TWS spacer and rail grabber	Upper receiver	300m	0.0 5.7D	0.0 9.4U	2.0L 2.4U
M4/M4A1	AN/PEQ-2A	N/A	M4/M16 bracket	Hand guards	300m	1.0L 0.3U	1.8R 2.4U	2.0L 0.9U
M4/M4A1	AN/PVS-4	Picatinny	Spacer and rail grabber	Upper receiver	300m	0.0 3.4D	0.0 7.6U	2.0L 0.9U
M4/M4A1	M68	M68	Half-moon spacer	Upper receiver	300m	0.0 1.4 cm DN	0.0 5.63U	2.0L 2.4U
M4/M203	BIS	N/A	N/A	Upper receiver	300m	0.0 0.0	0.0 6.01U	2.0L 0.9U
M4/M203	AN/PAQ-4B/C	N/A	Spacer and AN/PVS-4 mounting knob	Carrying handle	300m	1.3R 1.9D	1.85L 8.6U	2.0L 0.9U
M4/M203	AN/PVS-4	Picatinny	Spacer and rail grabber	Upper receiver	300m	0.0 3.4D	0.0 9.6U	2.0L 3.9U
M4 MWS	BIS	N/A	N/A	Upper receiver	300m	0.0 0.0	0.0 4.01U	2.0L 0.9U
M4 MWS	AN/PVS-4	Picatinny	Spacer and rail grabber	Upper receiver	300m	0.0 3.4D	0.0 7.6U	2.0L 0.9U
M4 MWS	M68	M68	Rail grabber	Upper receiver	300m	0.0 1.4 cm DN	0.0 5.63U	2.0L 2.4U
M4 MWS	LTWS	TWS	N/A	Upper receiver	300m	0.0 4.5D	0.0 7.9U	2.0L 2.4U
M4 MWS	TWS	TWS	Spacer	Upper receiver	300m	0.0 5.7D	0.0 9.4U	2.0L 2.4U
M4 MWS	ANPEQ-2A	Insight	N/A	Left	300m	TBD	4.5L 1.0D	2.0L 0.9U
M4 MWS	AN/PEQ-2A	Insight	N/A	Right	300m	N/A	5.5R 5.4D	2.0L 0.9U
M4 MWS	AN/PEQ-2A	Insight	N/A	Top	300m	1.5L 0.5D	2.9R 2.3U	2.0L 0.9U

***Table G-1. Offset mounting.**

Weapon	Accessory	Rail Grabber	Mount	Location	Range To Zero	Zero Offset	Boresight Target	MILES Offset
M4 MWS	ANPEQ-2A	Picatinny	Spacer	Top	300m	N/A	1.95R 4.1U	2.0L 0.9U
M4 MWS	AN/PEQ-2A	Picatinny	Spacer	Right	300m	N/A	6.35R 4.4D	2.0L 0.9U
M4 MWS	AN/PEQ-2A	Picatinny	Spacer	Left	300m	6.9R 2.0U	6.2L 0.60D	2.0L 0.9U
M4MWS	AN/PEQ-2A	Insight	Training adapter	Top	300m	2.0L 1.5D	N/A	2.0L 0.9U
M4 MWS	AN/PAQ-4B/C	Picatinny	AN/PAQ-4B/C bracket adapter	Top	300m	4.9R 6.1U	1.75L 3.9U	2.0L 0.9U
M4 MWS	AN/PAQ-4B/C	Picatinny	AN/PAQ-4B/C bracket adapter (spacer)	Right	300m	N/A	6.9R 0.9D	2.0L 0.9U
M4 MWS	AN/PAQ-4B/C	Insight	N/A	Top	300m	N/A	1.75L 2.15U	2.0L 0.9U
M4MWS	AN/PAQ-4B/C	Insight	N/A	Right	300m	N/A	4.35R 0.65D	2.0L 0.9U
M4MWS	AN/PAQ-4B/C	Insight	N/A	Left	300m	N/A	4.30L 4.25D	2.0L 0.9U
M4 MWS M203	BIS	N/A	N/A	Upper receiver	300m	0.0 0.0	0.0 6.01U	2.0L 0.9U
M4 MWS M203	AN/PAQ-4B/C	Picatinny	Bracket adapter (spacer	Left	300m	4.9R 6.1U	6.0L 4.0D	2.0L 3.9U
M4 MWS M203	AN/PVS-4	Picatinny	Spacer	Upper receiver	300m	0.0 3.4D	0.0 9.6U	2.0L 3.9U
M16A4 MWS	BIS	N/A	N/A	Upper receiver	300m	0.0 0.0	0.0 4.01U	2.0L 0.9U
M16A4 MWS	AN/PAQ-4B/C	Picatinny	AN/PAQ-4B/C bracket adapter (spacer)	Left	300m	6.5R 8.1U	6.03L 4.25D	2.0L 0.9U
M16A4 MWS	TWS	TWs	Spacer	Upper receiver	300m	0.0 6.0D	0.0 9.4U	2.0L 2.4U
M16A4 MWS	M68	M68	N/A	Upper receiver	300m	0.0 0.0	0.0 5.63U	2.0L 2.4U
M16A4 MWS	AN/PEQ-2A	Insight	N/A	Left	300m	3.0R 3.0U	4.5L 1.0D	2.0L 0.9U
M16A4 MWS	AN/PVS-4	Picatinny	Spacer	Upper receiver	300m	0.0 4.6D	0.0 7.6U	2.0L 0.9U
M16A4 MWS M203	BIS	N/A	N/A	Upper receiver	300m	0.0 0.0	0.0 6.01U	2.0L 0.9U
M16A4 MWS M203	AN/PAQ-4B/C	Picatinny	AN/PAQ-4B/C bracket adapter (spacer	Left	300m	6.5R 8.1U	6.0L 4.0D	2.0L 3.9U
M16A4 MWS M203	AN/PVS-4	Picatinny	Spacer	Upper receiver	300m	0.0 4.6D	0.0 9.6U	2.0L 3.9U
M16A4 MWS	AN/PEQ-2A	Picatinny	Spacer	Left	300m	6.0R 2.0U	6.2L 0.60D	2.0L 0.9U
M16A4 MWS	AN/PEQ-2A	Picatinny	Spacer	Right	300m	TBD	6.35R 4.4D	2.0L 0.9U
M16A4 MWS	AN/PEQ-2A	Picatinny	Spacer	Top	300m	TBD	1.95R 4.1U	2.0L 0.9U
M16A4 MWS	AN/PEQ-2A	Insight	N/A	Right	300m	TBD	5.5R 5.4 D	2.0L 0.9U
M16A4 MWS	AN/PEQ-2A	Insight	N/A	Top	300m	1.5L 0.5D	2.0R 2.3U	2.0L 0.9U
M16A4 MWS	AN/PEQ-2A	Insight	Training adapter	Top	300m	2.0L 1.5D	TBD	2.0L 0.9D

***Table G-1. Offset mounting (continued).**

Weapon	Accessory	Rail Grabber	Mount	Location	Range To Zero	Zero Offset	Boresight Target	MILES Offset
M16A4 MWS	AN/PAQ-4B/C	Picatinny	AN/PAQ-4B/C bracket adapter	Top	300m	4.9R 6.1U	1.75L 3.9U	2.0L 0.9U
M16A4 MWS	AN/PAQ-4B/C	Picatinny	AN/PAC-4B/C bracket adapter	Right	300m	N/A	6.0R 0.9D	2.0L 0.9U
M16A4 MWS	AN/PAQ-4B/C	Insight	N/A	Top	300m	N/A	1.75L 2.15U	2.0L 0.9U
M16A4 MWS	AN/PAQ-4B/C	Insight	N/A	Right	300m	N/A	4.35R 0.65D	2.0L 0.9U
M16A4 MWS	AN/PAQ-4B/C	Insight	N/A	Left	300m	N/A	4.30L 4.25D	2.0L 0.9U

Table G-1. Offset mounting (continued).

NOTE: Target offsets not yet developed are indicated by TBD (to be developed).

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APPENDIX H

NIGHT FIGHTING

The 1990s saw an increased emphasis on night operations within the Army. An integral part of this effort was research to improve the dismounted soldiers ability to see and hit targets at night. Today, night equipment, including night vision goggles (NVGs), aiming lights, and thermal sights, is becoming relatively common within the Infantry and other branches for the Army.

Commanders of dismounted forces emphasize the lethality of individual riflemen. Individual training focuses on maintaining high levels of marksmanship and successful tactics rely on getting proficient riflemen into the battle. With the Army's emphasis on night operations, commanders must be sure that riflemen are lethal at night as well as during the day. That lethality depends largely on whether riflemen can fire effectively with today's technology, NVGs, aiming lights and thermal weapon sights.

This appendix provides a better understanding of how your eyes are able to adapt to the night, as well as increased information on night devices and how they work. The information has been provided through continuous observation during operational testing by the test trainers, the Army Research Institute, and lessons learned by individual soldiers across the Army. Be it with the naked eye or with night devices you must learn what it takes to increase your ability not only to see better at night but also to increase your ability to "own the night."

H-1. UNAIDED NIGHT VISION

Although operating at night has definite advantages, it is also difficult. Your eyes do not work as well as during the day, yet they are crucial to your performance. You need to be aware of constraints your eyes place upon you at night, because 80 percent of your sensory input comes through them. Some of these constraints are:

- Your ability to see crisp and clear images, your visual acuity, is reduced.
- Under certain conditions, you cannot distinguish one color from another.
- Your depth perception is reduced.
- You have "night blind spot," which makes it difficult to see objects at certain distances.
- Lights can cause you to lose your dark adaptation.
- Your eyes may seem to play tricks on you.

a. **Normal Blind Spots.** The "normal blind spot" is always present, day and night. It is caused by the lack of light receptors where the optic nerve inserts into the back of the eye. The "normal blind spot" occurs when you use just one eye. When you close the other eye, objects about 12 to 15 degrees away from where you are looking will disappear. When you uncover your eye, the objects will reappear.

b. **Night Blind Spots and Viewing Techniques.** When you stare at an object at night, under starlight or lower levels of illumination, it can disappear or fade away. This is a result of the "night blind spot," and you need to know what you can do to overcome it. It affects both eyes at the same time and occurs when using the central vision of both eyes. Consequently, larger and larger objects are missed as the distances increase. A hand grenade 2 meters away from your eyes might not be seen; an enemy soldier at 50 meters may be missed. An M1 tank at 300 meters can even be missed. So, if you are looking directly at something at night, you may miss it because of the "night blind spot."

(1) In order to avoid the "night blind spots," look to all sides of objects you are trying to find or follow. **DO NOT STARE**. This is the only way to maximize your night vision.

(2) A good technique for peripheral viewing is called "diamond viewing." It is similar to the off-center vision technique taught in rifle marksmanship. Diamond viewing means that you move your eyes just slightly, a few degrees, in a diamond pattern around the object you wish to see. You do not have to move your head—use your peripheral vision.

c. **Stages Of Adaptation.** There are three stages of dark adaptation that help to explain how the eye works at night.

(1) ***Daylight Vision.*** The first stage is daylight vision, which occurs under maximum lighting conditions such as when the sun is shining or in a well-lit room. Under these conditions, both your central and peripheral vision are used, which provides your best visual acuity—20/10, 20/15, and 20/20 vision. You also have your best color vision—colors look most vivid under daylight conditions. You also have your quickest reaction time.

(2) ***Twilight Vision.*** The next stage of adaptation is twilight vision. Twilight vision occurs during many military night operations and when driving around in a car at night. It occurs at dawn and dusk, down to full moonlight. It also occurs when there is artificial illumination and when snow is on the ground at night. It can occur in the daytime with several layers of jungle canopy.

(a) Because of the lower light levels at dawn, dusk, and full moon conditions, your visual acuity is poorer. Visual acuity can be as poor as 20/100. In fact, the best visual acuity you can hope to obtain under twilight conditions is between 20/50 and 20/100.

(b) You also have poorer color vision. You can still see colors but they won't be as vivid. You also have slower reaction times because of the reduced lighting levels.

(3) ***Night Vision.*** The final vision is night vision. Night vision occurs under starlight, as well as on moonless and cloudy nights when there are no stars or cultural lighting. Remember there is a "night blind spot" as discussed earlier.

(a) Under night conditions, everyone has the worst visual acuity—from 20/200 to 20/400 and possibly much worse. You can recognize silhouettes, but not the details of the objects. This is why knowing the silhouettes of vehicles and critical natural man-made objects is important.

(b) Under night vision conditions you cannot see colors—only various shades of gray can be seen. With night vision, the longer wavelengths of light, such as the reds and oranges, are hard to see and will appear dark. Unless a dark color is bordered by two lighter colors, it becomes totally invisible. Reds will be almost invisible at night. The reason red crosses are on white backgrounds on tents or vehicles are so they can be seen more easily at night. On the other hand, greens and blues will appear brighter, although you may not be able to determine their color.

d. **Dark Adaptation.** In order for your visual system to work efficiently at night, you need to dark-adapt. It takes about 30 to 45 minutes to fully dark-adapt or get your eyes used to seeing things under low light conditions, when going from a brightly lighted area into the dark. It takes longer to dark-adapt than many people think. It's similar to walking into a movie theater when it's very dark. You can't see things at first. Yours eyes will gradually adapt, enabling you to see more and more as time goes on. In addition, people dark-adapt at varying rates. People who are older, people who smoke, or people who may not be in great physical shape will take longer to dark-adapt or see things under low light conditions.

(1) ***Protecting (Before Operation).*** It is very important to protect your eyes before night operations so you can dark-adapt in an efficient manner. The following suggestions will help you dark-adapt more efficiently.

- Don't smoke before nighttime operations. Not smoking four to six hours before night operations will aid in dark adaptation.
- Wear sunglasses if you are going to spend time in the sun. Without sunglasses it will take longer to dark-adapt.
- Watch what you eat. Good nutrition is important in order to maintain adequate levels of Vitamin A.
- Use dim white lighting or red lighting before night operations.

(2) ***Protecting (During operation).*** Once you are dark-adapted, it is also important to maintain that dark adaptation.

- Minimize your use of unnecessary lighting to maintain your dark adaptation during operations at night.
- Close one eye before being flashed by flares and other bright lights to preserve your dark adaptation.

e. **Illusion (Apparent Movement of Light).** The illusion of movement, which a static light exhibits when stared at in the dark, is related to the loss of surrounding visual references that normally serve to stabilize visual perceptions. Consequently, very small eye movements are perceived by the brain as movement of the light. Under such conditions, the best thing to do is to begin a scan pattern and control the eye movement. Use large movements and scan to control illusions. Try to find another light and shift your gaze back and forth between the lights.

H-2. AIDED NIGHT VISION

There are three devices available to dismounted soldiers that will help increase his lethality at night: night observation devices (NODs), aiming lasers, and thermal weapon sights. Each provides the dismounted soldier with different views of the infrared (IR) spectrum. Before soldiers are able to fully operate these devices they must receive training on how the systems work within the IR range and the electromagnetic (light) spectrum. The soldiers must also know what constraints and advantages each piece of equipment provides so that they can determine when to employ each device.

a. **Electromagnetic (Light) Spectrum.** The electromagnetic spectrum is simply energy (light). Within this spectrum of energy or light you can find x-rays, gamma rays, radio waves, cosmic rays, and ultra violet rays, to name a few. Also within this spectrum of light is visible light, visible light being what we are able to see with the naked eye. Just beyond red visible light is IR light, meaning just beyond. IR light is broken down into three different ranges: near IR, middle IR, and far IR. This is important for the soldier to know because it will give him an understanding of why some night devices cannot be used in conjunction with other night devices.

(1) There are two different types of night devices that will increase the soldier's vision into the IR range. The first one is image intensifiers (I^2), which rely on ambient light and energy within the near IR range emitted from natural and artificial light sources such as moonlight or starlight. Image intensifiers include the AN/PVS-4, PVS-5, PVS-7A/B/C/D, and PVS-14s. The Army also has devices that emit near IR energy in a colliminated beam, which are used as aiming devices such as the AN/PAQ-4B/C and the AN/PEQ-2A. Since both the image intensifiers and aiming lasers work within the same range of near IR energy they are able to work in conjunction with each other.

(2) The second device that uses IR light is the thermal sight. In the past thermal technology has been solely reserved for tanks, fighting vehicles, and antiarmor specialists such as TOW and Dragon gunners. These devices were very bulky, heavy and not very practical for the dismounted soldier. Now, the Army has a thermal device made for the dismounted soldier that can be mounted on his weapon or handheld. The TWS operates within the middle/far IR range. It is able to detect IR light emitted from friction, combustion, or from objects that are radiating natural thermal energy. Since the TWS and other thermal devices operate within the middle/far IR range they cannot be used in conjunction with image intensifiers or other I^2 devices at this time.

b. **Image Intensification (I^2) Devices.** As the name implies, image intensification devices are designed to amplify light. To be effective, some degree of light must be available. When light enters the image intensifier tube, the light releases electrons, which the tube accelerates repeatedly until the light is much brighter. Under optimum conditions, second-generation devices, such as the PVS-5-series, intensifies ambient light up to about 1,500 times. Third-generation devices, such as the PVS-7/14-series NODS, doubles that level of intensification.

(1) ***Adjustments***. Making the proper adjustments to your image intensification devices is crucial to your ability to acquire and engage a target at night. First, you must understand that you will not be able to obtain the same acuity level as you do during the day. Under optimum night conditions a soldier with 20/20 vision during daylight can expect no better than 20/50 with second generation NODs, and 20/40 with third generation NODs. But in order to approach these levels of acuity you must be able to adjust your NODs for optimum clarity.

NOTE: During an Army Research Institute (ARI) study on night vision devises, they compared the hit probabilities for riflemen who used good NOD acuity settings (20/35 to 20/50) with the same riflemen who used poor NOD acuity settings (20/60 to 20/70). With good NOD acuity, soldiers had a hit probability at 75 meters of 76 percent; with poor acuity, the hit probability at 75 meters dropped to 47 percent.

(a) *Mount the night observation device.* Mount the head mount or helmet mount IAW the appropriate TM. If using the helmet mount, ensure that the tilt is adjusted until you have a comfortable viewing angle. The use of the nape strap is crucial to maintaining proper acuity with the NODs.

NOTE: If the mounting bracket is permanently attached to the helmet, ensure that the nape strap rear bracket is also permanently attached (See TM 11-5855-306-10, AN/PVS-14). The use of the nape strap will prevent the weight of the NODs from pulling the helmet downward causing the NODs to rest on the bridge of your nose. The nape strap will allow for proper acuity of the sight and will allow you to engage targets with more ease and accuracy.

(b) *Set eye-relief.* Move the goggles so that the eyecups cover the eye but not so close that the eyepiece touches your eyelashes or glasses.

(c) *Turn the goggles on.*

(d) *Set inner-pupillary distance (AN/PVS-7 series).* Move each eyepiece until they are centered over each eye. Close one eye and make adjustments until the eye that is open is viewing a complete circle and not an oval. Continue to make adjustments to the other eye.

(e) *Adjust the diopter ring.* Adjust the diopter ring before adjusting the objective focus ring. The diopter adjustment ring focuses the display lens to your eye, while the objective lens focus ring focuses the target. You cannot focus the sight to the target without your eye being focused to the display first. Close one eye and with the eye that is open take the diopter ring and turn in one direction until the diopter is totally out of focus. Then turn the diopter ring back the opposite direction until the display is focused to your eye. Follow the same procedures for the other eye if using the AN/PVS-7 series. No further adjustment to the diopter adjustment ring should have to be made.

(f) *Objective focus ring.* While looking at an object, turn the objective focus ring until the objective lens is out of focus and then slowly turn the objective focus ring in the opposite direction until the object becomes as clear as possible. Adjustments will have to be made for targets at different ranges using the objective focus ring.

(g) *Variable gain control (AN/PVS-14 only).* The AN/PVS-14 has a variable gain control that controls the illumination input to the eye. Keeping the variable gain turned up will cause your brain to form two separate images, one darker and one very bright. With the variable gain turned down to the point that both eyes are almost receiving the same amount of light, the brain will produce one image making it seem like both eyes are looking through the same sight.

c. **Aiming Lasers.** Aiming lasers, AN/PAQ-4-series and the AN/PEQ-2A, also operate within the electromagnetic spectrum, specifically near IR range, and are seen through image intensification devices. The aiming lasers cannot be used in conjunction with the TWS since it operates within the middle/far IR spectrum. The aiming lasers emit a highly colliminated beam of IR energy that allows for quick "point and shoot" capability at night. Even though the aiming lasers provide a quick and easy means of engaging the enemy at night special attention must be given to the following:

- Proper adjustments to the image intensifiers.
- 10-meter boresight procedures or 25-meter zeroing procedures.
- Scanning.
- Walking.
- IR discipline.

(1) ***Proper Adjustments to NVGs.*** Making the proper adjustments to the image intensifiers are crucial. It has been found, Army wide, that leaders and soldiers do not

have a working knowledge of I^2 devices and that the majority do not know how to make the proper adjustments in order to get the best possible picture. Since the aiming lasers cannot be seen with the unaided eye, and can only be seen with I^2 devices, it is paramount that every soldier is made aware of how these devices work and how to maximize the quality of what is being viewed by making the proper adjustments to these devices.

(2) ***10-Meter Boresight/25-Meter Zero.*** As aiming lights were being introduced to units, increasing attention was given to the difficulty in zeroing them to weapons, a problem identified in the initial Army tests. The basic problem with traditional 25-meter live-fire zeroing procedures is that the beam of an aiming light "blooms" when viewed through NVGs. Because this "bloom" covers up the silhouette in the center of the 25-meter target, a precise point of aim is almost impossible to achieve when zeroing.

(a) One solution to the 25-meter zeroing problem was the introduction of the bore light. The bore light allows you to zero your weapon system without the use of ammunition. A 25-meter zeroing allows the round to hit somewhere within a 19-inch circle at a 300-meter target, not center mass of the target. With the bore light, if boresighting procedures are done correctly and without human error, the strike of the round will impact a target at 300 meters very close to center mass. The other advantage to the use of the bore light is that a 25-meter zero is no longer necessary with aiming lights; if the boresighting procedures are done correctly, you will be able to engage targets out to 300 meters, dependant upon ambient light conditions.

(b) If a 25-meter zeroing is to be conducted, modifications to the M16A2 zero target must take place. A 3-centimeter circle is cut out of the center of the 300-meter zeroing silhouette. As you align the laser with the 3-centimeter cutout, the bloom will disappear ensuring that your point of aim is center mass of the 300-meter zero silhouette.

(3) ***Scanning***. The night vision devices have a 40-degree field of view leaving the average shooter to miss easy targets of opportunity, more commonly the 50-meter left or right target. You must train to aggressively scan your sector of fire for targets. Target detection at night is only as good as you practice. Regular blinking during scanning, which must be reinforced during training, relieves some of the eyestrain from trying to spot far targets. After you have mastered the art of scanning, you will find that targets are easier to detect by acknowledging the flicker or movement of a target.

(4) ***Walking***. Once a target has been located, you must be aware of the placement of the aiming laser. Laser awareness is a must. If you activate your laser and it is pointing over the target into the sky, you will waste valuable time trying to locate exactly where your laser is pointing. Also, it increases your chances of being detected and fired upon by the enemy. When engaging a target, aim the laser at the ground just in front of the target, walk the aiming laser along the ground and up the target until you are center mass, and then engage the target. Walking your laser to the target is a quick and operationally secure means of engaging the enemy with your aiming laser.

(5) ***IR Discipline***. Once a target has been located and engaged with the aiming laser, the laser must be deactivated. While on the range IR discipline is active scanning with the laser off. Once a target is located, walk the laser to the target and engage. After the target has been engaged, the laser goes off.

d. **Thermal Weapon Sight.** Knowing about the electromagnetic spectrum and the range of IR in which the TWS operates will make it easier to understand how the TWS is able to take this energy and convert it into an image suitable for viewing. The TWS is able to absorb all available light into the lens, and then filters out all light except for middle/far IR (thermal light). The TWS then converts the thermal light into an image and creates a video that is displayed on the raster for viewing. The TWS is able to convert thermal energy that is reflected, radiated, or generated from an object. All objects, such as trees, metal, plastic, and living creatures, display a quality that allows them to be seen with the thermal technology. How well the objects display these qualities will determine how well they are seen.

- *Absorption.* During the day all inanimate objects absorb thermal energy from the sun to varying degrees. Metal objects have a much higher rate of absorption than wood, leaves, or grass; therefore, a metal object sitting in the sun will stand out more than the grass surrounding it when viewed through the TWS.
- *Exposure.* The amount of time an object is exposed to thermal energy determines how well that object will be seen. Naturally, an object with a long exposure time will have absorbed more thermal energy than an object exposed to the same thermal energy for a shorter period of time.
- *Emissivity.* Emissivity is the rate at which an object emits the thermal energy it has absorbed or generates. Usually, most objects that have a high absorption rate will have a high *emissivity* factor. Although the human body does not have a high *absorption* rate, it does have a high emissivity factor due to the fact that it generates a high amount of thermal energy. An object that has a high emissivity factor will be much hotter, and, therefore, when seen through the TWS, much easier to see and recognize.
- *Reflection.* Items such as glass and water have virtually no *absorption* rate. Instead they reflect the thermal energy, which makes it very difficult to see objects through glass and water. Snow and ice have the same effect, especially during the day with no clouds present. The snow or ice reflect most of the thermal energy from the sun, so it will be difficult to acquire a good thermal image on objects that are really close to the ground.

(1) ***Diurnal Cycle.*** There are two times during the day when motionless objects that do not generate their own thermal energy, such as trees, rocks, and man-made objects, become the same temperature as the surrounding air. This is known as the *diurnal cycle*. These times usually occur once in the morning and once in the evening. The specific times that this cycle will take effect is based on the time of the year, but it usually occurs shortly after sunrise and shortly after sunset. These two times during the day can be referred to as "crossover points." During the day, a motionless object will *absorb* thermal energy from the sun; the crossover point is the time when that object stops absorbing thermal energy and starts radiating thermal energy (night). As the night goes on, that same object will come to a point where it stops radiating thermal energy and will once again start absorbing thermal energy (day). During the diurnal cycle objects can be difficult to see, so adjustments must be made to the TWS in order to refine your thermal image.

(2) ***Adjustments.*** In order to maximize the use of the TWS, you must be able to make adjustments to the sight to obtain the optimal thermal image. Rain, snow, fog, smoke, and the diurnal cycle are just a few environmental or combat situations that may affect your thermal image. The TWS is equipped with a diopter focus ring, an objective focus ring,

brightness knob, auto and manual contrast, and polarity switch that will allow you to maximize the capability of the sight.

(a) *Diopter Focus Ring.* When first making adjustments to the sight, start with the diopter focus ring. The diopter focus ring will focus the display screen (raster) to your eye. This is best done with the objective lens cover closed. Simply adjust the diopter focus ring until everything on the display screen is clear and easily read. Once you have adjusted the diopter focus to your eye, no other adjustments to the diopter focus ring should be necessary.

(b) *Field of View (FOV).* The TWS has two operating FOVs—wide and narrow. The wide field of view (WFOV) has the least magnification, but a greater FOV and is great for scanning. The narrow field of view (NFOV) has greater magnification, but less degrees of FOV. The soldier should be allowed to select the FOV that suits him best. Each soldier will learn, through use, which FOV to use under different combat situations.

NOTE: When selecting a FOV, make sure that the FOV ring is turned completely to the left or to the right. If the FOV ring is turned only halfway, you will not be able to see through the sight.

(c) *Objective Focus Ring.* The objective focus ring will focus the sight to the target. Adjustments to the objective focus ring will be based on the range of the object being viewed. Make adjustments to the objective focus ring only after focusing the diopter focus ring.

NOTE: Over-adjustment to the objective focus ring will lock the FOV ring to the point that the FOV cannot be changed.

(d) *Brightness.* The brightness knob is a dual-function knob that turns on the TWS and adjusts the brightness of the raster, and is used to refine the thermal image. Used in conjunction with the contrast knob, it helps combat the effects of the diurnal cycle, and other conditions that might require fine-tuned adjustment to the thermal image.

(e) *Contrast.* The contrast is a dual-function switch with an auto contrast and manual contrast mode. The auto contrast is used under normal operating conditions. The manual contrast is used under conditions other than normal such as during 10-meter boresighting during 25-meter zeroing; during rain, fog, smoke, or snow; during the diurnal cycle; or when trying to obtain as much detail of a target as possible. Used in conjunction with the brightness knob, the contrast allows you to obtain the best possible thermal image.

(f) *Polarity.* The polarity switch allows you to select between *white-hot* or *black-hot*. When in white-hot mode, the hotter objects will appear white while cooler objects will have shades of gray to black. When using black-hot, the hotter objects will be black while the cooler objects will be shades of gray to white. Use of the polarity switch is a users preference. Through continued use you will decide which polarity setting works best under different combat or environmental conditions.

GLOSSARY

AAR	after action review
AC	alternate course
AI	assistant instructor
AIM	advanced infantry marksmanship
AMU	Army marksmanship unit
AN/PAQ-4B/C	IR aiming light
AN/PAS-13 (V2)/(V3)	thermal weapon sight (medium/heavy)
AN/PEQ-2A	target pointer illuminator/aiming light
AN/PVS-4	night vision sight
AN/PVS-14	night vision goggles
AN/PVS-7	night vision goggles
AR	Army regulation
ARI	Army Research Institute
ARM	advanced rifle marksmanship
*ACH	Army combat helmet
ARTEP	Army Training and Evaluation Program
ATC	Army Training Center
BCT	basic combat training
BIS	backup iron sight
BOI	basis of issue
BRM	basic rifle marksmanship
BT	basic training
*CBRN	chemical, biological, radiological, and nuclear
CCO	close combat optic
cm	centimeter
CS	combat support
CSS	combat service support
DA	Department of the Army
DOT	Directorate of Training
DPS	Directorate of Public Safety
DS	direct support
DVC	device
EST	engagement skills trainer
FBI	Federal Bureau of Investigation
FF	field fire
FM	field manual
FOV	field of view
fps	feet per second

FPF	final protective fire
FSN	Federal stock number
FTX	field training exercise
GS	general support
GTA	graphic training aid
Hz	hertz
HTWS	heavy thermal weapon sight
I^2	image intensifying
IAW	in accordance with
*IBA	Interceptor body armor
ICCC	Infantry Captain's Career Course
ID	identification
IET	initial entry training
IOBC	Infantry Officer's Basic Course
IR	infrared
KD	known distance
KDAC	known distance alternate course
LBE	load bearing equipment
LCE	load carrying equipment
LFX	live-fire exercise
LLLSS	low-light level sight system
LMTS	Laser Marksmanship Training System
LOI	letter of instruction
LOMAH	location of misses and hits
m	meter
MACOM	major command
MACS	Military Arcade Computer System
MAIT	maintenance assistance and instruction team
METL	mission-essential task list
MILES	Multiple Integrated Laser Engagement System
mm	millimeter
MOPP	mission oriented protective posture
MOS	military occupational specialty
mph	miles per hour
MPRC	multipurpose range complex
MTOE	modified table of organizational equipment
MTWS	medium thermal weapon sight
MWS	modular weapon system
NATO	North Atlantic Treaty Organization

NBC	nuclear biological chemical
NCO	noncommissioned officer
NCOES	Noncommissioned Officer Education System
NCOIC	noncommissioned officer in charge
NFOV	narrow field of view
NG	Army National Guard
NOD	night observation device
NSN	national stock number
NVD	night vision device
OIC	officer in charge
OPFOR	opposing forces
OSUT	one-station unit training
*OTV	outer tactical vest
PA	public address
*PASGT	personnel armor system for ground troops
PH	probability of hit
PMCS	preventive maintenance checks and services
PMI	preliminary marksmanship instruction
POC	point of contact
POI	program(s) of instruction
PPA	plastic practice ammunition
PRI	preliminary rifle instruction
RAS	rail adapter system
RATELO	radiotelephone operator
RETS	remote electronic target system
RF	record fire
RFA	rimfire adapter
RND	round
ROE	rules of engagement
ROTC	Reserve Officer's Training Corps
RSO	range safety officer
*SAPI	small arms protective insert
SAW	squad automatic weapon
SDM	squad designated marksman
SEC	second(s)
SME	subject matter expert
SOP	standing operating procedure
SPORTS	acronym for immediate action procedures
SRC	short-range combat
SRM	short-range marksmanship
SRT	special reaction teams
SRTA	short-range training ammunition

STRAC	standards in training commission
STX	situational training exercise
TASC	Training and Audiovisual Support Center
TC	training circular
T&EO	training and evaluation outline
TF	training film
TM	technical manual
TPIAL	target pointer illuminator/aiming light
TRADOC	Training and Doctrine Command
TSC	training support center
TTP	tactics, techniques and procedures
TVT	television tape
TWS	thermal weapon sight
UO	urban operations
US	United States
USAIS	United States Army Infantry School
USAMU	US Army Marksmanship Unit
USAR	United States Army Reserve
WFOV	wide field of view

DEFINITIONS:

Active Army: All Regular Army (RA) forces in the Active Army.

adjusted aiming point: An aiming point that allows for gravity, wind, target movement, zero changes, and MOPP firing.

advanced marksmanship: Normally refers to marksmanship skills taught during ARM.

advanced rifle marksmanship: Normally refers to the formal marksmanship instruction received by infantrymen upon completion of BRM during OSUT.

aiming: A marksmanship fundamental; refers to the precise alignment of the rifle sights with the target.

aiming card: The M15A1 aiming card is a cardboard sleeve with a moveable insert. The rear sight aperture, front sight post, and target are pictured. This training device is used in conjunction with aiming instructions.

aiming point: A place on a target in which the rifle sights are aligned normally the target center of mass.

alibi target: A target or additional target a soldier is allowed to engage during qualification firing when unable to complete a record fire scenario due to circumstances beyond his control; for example, a target mechanism, weapon, or ammunition malfunction.

alternate course: Alternatives to standard qualification courses.

ammunition lot: A quantity of cartridges, each of which is made by one manufacturer under uniform conditions and is expected to work in a uniform manner.

ammunition lot number: Code number that identifies a particular quantity of ammunition from one manufacturer.

aperture: The hole in the rear sight.

armorer: One who services and makes repairs on small arms and performs similar duties to keep small arms ready for use.

Army Training and Evaluation Program: A guide for the training and evaluation of critical unit combat missions – crew/squad through battalion/task force echelon.

Army Training Center: Conducts OSUT and BRM. Locations are Fort Benning, Ga; Fort Jackson, SC; Fort Knox, Ky.

artificial illumination: Any light from a man-made source.

assault course: An area of ground used for training soldiers in attacking an enemy in close combat.

automatic fire: A firing mode that causes the weapon to continue firing as long as the trigger is held or until all ammunition has been expended.

ball: The projectile; the bullet.

ball ammunition: General-purpose standard service ammunition with a solid core bullet.

ball and dummy: An exercise that substitutes a dummy round for a live round without the firer knowing it. An excellent exercise for identifying and correcting trigger jerks.

ballistics: A science that deals with the motion and flight characteristics of projectiles.

barrel erosion: Wearing away of the surface of the bore due to the combined effects of gas washing, coring, and mechanical abrasion.

basic marksmanship: Fundamental marksmanship skills taught in BRM during IET and OSUT.

basic rifle marksmanship: The formal course of marksmanship instruction received by all soldiers.

battlesight zero: A sight setting that soldiers keep on their weapons. It provides the highest probability of hitting most high-priority combat targets with minimum adjustment to the aiming point, a 250 meter sight setting as on the M16A1 rifle, and a 300 meter sight setting as on the M16A2 rifle.

blank ammunition: A complete cartridge without the bullet used to simulate weapon firing.

blank firing adapter: A device that fits in the muzzle of the rifle; used only with blank ammunition.

brass: An alloy of copper and zinc used to make cartridge cases and bullet jackets. Also, a common name for expended cases.

breath control: The third marksmanship fundamental; refers to the control of breathing to help keep the rifle steady during firing.

bullet: The projectile or ball; the part that goes downrange. It may also be used to refer to the complete cartridge.

bull's-eye target: Any target with a round black circle and scoring rings. Normally used in competitive marksmanship training.

buttplate: Metal or rubber covering of the end of the stock on the rifle.

cadre coach: A trainer with expertise and knowledge exceeding that of the firer.

caliber: Diameter of the bore; for example, the M16-series rifle bore is 5.56mm (.223 inch).

cartridge: A complete round of ammunition.

center of mass: A point that is horizontally (left and right) and vertically (up and down) at the center of the target.

chambering: The step in the cycle of operation that refers too fully seating the round in the chamber of the rifle.

chamber plug: A range safety device that is a small plastic plug designed to fit into the chamber of the M16. A handle extends out the ejection port so safety personnel can see at a glance that the rifle is clear of ammunition.

clock method: Method of calling shots by referring to the figures on an ordinary clock dial assumed to have the target at its center. Also a method of determining the strength and direction of wind.

coach: Any individual who assists firers on the firing line.

coach-and-pupil method: Method of training in which pairs of pupils take turns practicing a procedure explained by the instructor/trainer.

cocking: The step in the cycle of operation that refers to the rearward movement of the bolt riding over the hammer, resetting the weapon for subsequent firing.

collective firing proficiency: Units delivering effective fire in a tactical setting. It requires individual skill plus command and control to engage all targets within an assigned sector.

concurrent training: Training that occurs at the same time that other unit members are using the primary training facilities.

cookoff: A round that fires as a result of a hot chamber without the trigger being pulled. It can occur any time until the weapon is cooled.

crack and thump: A method to determine the general direction and distance to an enemy firer who is shooting at you.

cradle: A vise-like mechanism that holds a weapon in a secure position for test firing.

cross dominance: A soldier with a dominant hand and a dominant eye that are not the same; for example, a right-hander firer with a dominant left eye.

cycle of operation: The eight steps involved in firing a round of ammunition: feeding, chambering, locking, firing, unlocking, extracting, ejecting, and cocking.

cyclic rate of fire: The maximum rate at which a weapon will fire in the automatic mode.

dime-washer exercise: A dry-fire exercise used to practice trigger squeeze.

downrange feedback: Used to describe any training technique that provides precise knowledge of bullet strike (whether hit or miss).

dry fire: A technique used to simulate the firing of a live round with an empty weapon. Any application of the fundamentals of marksmanship without live ammunition may be referred to as dry fire.

dry-fire moving target trainer: A small-motorized scaled target device used to teach the engagement of moving personnel targets.

dummy ammunition: A cartridge without a primer or powder. Primarily used for ball-and-dummy exercises on the live-fire line.

effective wind: The average of all the varying winds encountered.

ejection: The step in the cycle of operation that removes the expended cartridge from the weapon out of the ejection port.

elevation adjustment: Rotating the front sight post to cause the bullet to strike higher or lower on the target.

expert: The highest qualification rating.

external ballistics: What happens to the bullet between the time it leaves the rifle and the time it arrives at the target.

extraction: The step in the cycle of operation that pulls the round from the chamber.

eye relief: The distance from the firing eye to the rear sight. Eye relief is a function of stock weld.

feedback: Obtaining knowledge of performance.

feedback target: Targets designed for use at 75, 175, or 300 meters; includes an overprinted grid similar to a zero target.

feeding: The step in the cycle of operation that is the forward movement of the bolt, stripping the top round from the magazine and moving it toward the chamber.

field firing: Training on the standard field firing range with target banks at 75, 175, and 300 meters.

firing: The step in the cycle of operation that refers to pulling the trigger, releasing the hammer to strike the firing pin, which strikes the primer. The primer ignites and, in turn, ignites the powder charge within the cartridge case.

firing hand: The right hand of a right-handed firer. The left hand of a left-handed firer.

firing pin: Plunger in the bolt of a rifle that strikes the primer.

fleeting target: A moving target remains within observing or firing distance for such a short period that it affords little time for deliberate adjustment and fire against it.

functioning: (See cycle of operation.)

fundamentals of rifle marksmanship: The four essential elements needed to hit targets: steady position, aiming, breath control, and trigger squeeze.

gravity: The natural pull of all objects to the center of the earth.

grouping: A live-fire exercise with the objective of shooting tight shoot groups.

gun bore line: A reference line established by the linear extension of the bore axis of a gun.

headspace: The distance between the face of the bolt(fully closed) and the face of a fully chambered cartridge.

hold-off: (See adjusted aiming point.)

horizontal dispersion: The left-to-right displacement of bullets on a target.

immediate action: procedures applied to rapidly reduce any rifle stoppage without determining its cause.

individual firing proficiency: Individual firing skills; for example, an individual's performance on the record fire course.

Infantry Remoted Target System (IRETS): (See RETS.)

infrared aiming light: A unique night sighting system that uses infrared light to assist in the aiming process.

initial entry training: Indicates the first training received by a new soldier, includes the MOS-producing portion of his training such a one-station unit training (OSUT).

initial pressure: The applications of about half of the total trigger pressure it takes to fire a rifle.

instructor-trainer ratio: The number of soldiers for which each instructor/trainer is responsible.

internal ballistics: What happens to the bullet before it leaves the muzzle of the rifle.

***Interceptor body armor:** Multi-threat body armor system made up of two modular components: the outer tactical vest and small-arms protective inserts, or plates. Will stop 7.62-mm rounds. Weight: 16.4 pounds.

known distance: Describes the older range complexes with large target frames behind a large berm and firing lines at 100 yards or 100-meter increments. (See FM 25-7.)

laser: Light amplification by simulated emission of radiation.

lead: Distance ahead of a moving target that a rifle must be aimed to hit the target.

lead rule: Provides the soldier guidance on how to adjust his aiming point to hit moving targets.

line of sight: A line between the rifle and the aiming point, extending from the firing eye through the center of the rear aperture, across the tip of the front sight post, and onto the target.

location of misses and hits : A projectile location system that provides immediate and precise information to the firer concerning bullet strike (hit or miss).

locking: The step in the cycle of operation that is a counterclockwise rotation of the bolt, securing it into the barrel locking lugs.

long-range sight: The aperture marked L on the M16A1 rifle equipped with standard sights; provides for a zero at 375 meters. The M16A1 rifle equipped with LLLSS has an aperture marked L, but it is a regular sight.

Low-Light Level Sight System (LLLSS): A sighting system for low visibility firing that replaces the standard front and rear sights on the M16A1 rifle.

marksman: The designation given to the lowest qualification rating.

maximum effective range: The greatest distance at which a soldier may be expected to deliver a target hit.

maximum effective rate of fire: The highest rates of fire that can be maintained and still achieve target hits.

maximum range: The longest distance a projectile will travel when fired from a weapon held at the optimum angle.

minute of angle: A angle that would cover 1 inch at a distance of 100 yards, 2 inches at 200 yards, and so on. Each click of sight adjustment on the M16A1 rifle with standard sights is equal to one minute of angle.

Multiple Integrated Laser Engagement System (MILES): A tactile shooting device that uses a low-powered laser to activate detectors placed on people and vehicles.

Multipurpose Arcade Combat Simulator (MACS): A pert-task weapons trainer that is under development. The system consists of a light pen attached to the weapon, video monitor, and microcomputer.

muzzle velocity: The speed of a projectile as it leaves the muzzle of the weapon.

natural point of aim: The direction of the body/rifle combination is oriented while in a stable, relaxed firing position.

natural respiratory pause: The temporary cessation of breathing between an exhale and inhale.

night firing: Firing performed under all conditions of limited visibility.

nonfiring hand: The opposite of the firing hand.

optical sight: Sight with lenses, prisms, or mirrors used in lieu of iron sights.

Paige sighting device: A device with a small-scaled target that fits into the muzzle of the weapon, allowing the soldier to practice aiming.

pasters: Small white or black gum-backed paper used for covering bullet holes.

peep sight: The rear sight; a sight with a small aperture (hole).

peer coach: A soldier with shooting experience and knowledge equal to that of the firer he is coaching.

pit: The target area behind the large berm of a KD range.

plastic practice ammunition: Ammunition with a plastic projectile, high-muzzle velocity (the light weight causes it to lose velocity rapidly with a maximum range of 250 meters or less) designed for use in close-in training areas; frangible bullet.

point of aim: The exact spot on a target the rifle sights are aligned with.

point of impact: The point that a bullet strikes; usually considered in relation to point of aim.

pop, no kick: A firing condition when the primer ignites and the powder charge does not. This normally results in lodging the bullet inside the barrel.

pop-up target: A silhouette target that is activated remotely so it can suddenly appear and fall when struck by a bullet.

practice record: Firing conducted on a qualification course for practice.

predetermined fire: A technique of aligning the rifle during good visibility so the rifle can be aligned and fired on designated areas when they cannot be seen due to darkness, smoke, or fog.

preparatory marksmanship training: All marksmanship training that takes place before live fire.

primer: A small explosive device in the center base of the cartridge case that is struck by the firing pin to fire the round.

probability of hit: Ranging from 0 to 1.0, it refers to the odds of a given round hitting the target at a given range.

qualification firing: Firing on any authorized course that results in meeting qualification requirements; may also be called record fire. (See record fire.)

quick fire: A technique of fire used to engage surprise targets at close range.

range card: Small chart on which ranges and directions to various targets and other important points in the area under fire are recorded.

rapid semiautomatic fire: A firing procedure that results in an accurate shot being fired every one or two seconds.

receiver: That portion of a firearm that holds the barrel and houses the bolt and firing mechanism.

recoil: The rearward motion or kick of a gun upon firing.

record fire: Any course of fire used to determine if qualification standards are met. The standard record fire course consists of 40 target exposures at ranges between 50 and 300 meters. The standard course requires 23 hits to qualify as marksman, 30 for sharpshooter, and 36 for expert.

reduced range ammunition: Ammunition that is designed to be a ballistic match with service ammunition to an appropriate range for training (may be less than maximum effective range) and a reduced maximum range.

regular rear sight: The M16A1 rifle rear sight that is zeroed for 250 meters (the unmarked aperture on rifles with standard sights and the aperture marked L on rifles equipped with LLLSS).

reinforcement training: Training conducted that is over and above scheduled training.

remedial action: A procedure applied after immediate action has failed to correct a malfunction, which determines the cause of the malfunction.

remedial training: Additional training presented to soldiers who have demonstrated special shooting problems.

Remote Electronic Target System: Range complexes. Some ranges include moving targets.

Reserve Components: Includes Army National Guard and Army Reserve forces.

ricochet fire: Fire in which the projectile glances from a surface after impact.

Riddle sighting device: A small magnetic device with a scaled target that attaches to the front sight assembly, allowing the soldier to practice aiming.

rifle cant: Any leaning of the rifle to the left or right from a vertical position during firing.

rim-fire adapter: The caliber .22-rim fire adapter (M261) consists of a bolt and a magazine insert, which allows standard .22 caliber ammunition to be fired in the M16 rifle.

round: May refer to a complete cartridge or to a bullet.

scaled-silhouette target: Any target that is reduced in size. When it is observed from 25 meters, it looks the same size as though at a greater range.

sector of fire: An area assigned to an individual, weapon, or unit to be covered by fire.

semiautomatic fire: A mode of fire that allows one round to be fired each time the trigger is pulled.

serviceability checks: A technical inspection of the rifle to determine if it is safe to fire and in working condition. (May not ensure accuracy.)

service ammunition: Standard ammunition used by the military. Ammunition designed for combat.

service rifle: The primary rifle of a military force.

service school: Branch schools such as the US Army Infantry School at Fort Benning, Ga. and the Armor School at Fort Knox, Ky.

sharpshooter: The middle rating of qualification.

shot group: A number of shots fired using the same aiming point, which accounts for rifle, ammunition, and firer variability. Three shots are enough, but any number of rounds may be fired in a group.

shot group analysis: A procedure for analyzing the size of shot groups on a target to determine firer error.

sight alignment: Placing the center tip of the front sight post in the exact center of the rear aperture.

sighter rounds: Rounds fired that allow the bullet strike to be observed in relation to the aiming point.

sight picture: Placing correct sight alignment on a selected aiming point on a target.

sight radius: The distance from the front sight post to the rear sight aperture of a rifle.

sighting device (M16): A small metal device with a tinted square of glass that is placed on the carrying handle, allowing a coach to see what the firer sees through the sights.

silhouette target: A target that represents the outline of a man.

spotters: A round cardboard disk placed in bullet holes with a small wooden peg so the bullet strike can be observed from the firing line.

squad automatic weapon: A lightweight, one-man, 5.56mm machine gun.

starlight scope: A weapon scope that amplifies ambient light so targets can be seen and effectively engaged during darkness. The AN/PVS-2 and AN/PVS-4 are used on the M16 rifle.

steady position: The first marksmanship fundamental, which refers to the establishment of a position that allows the weapon to be held still while it is being fired.

stock weld: The contact of the cheek with the stock of the weapon.

supported position: Any position that uses something other than the body to steady the weapon (artificial support).

suppressive fire: Any engagement that does not have a definite or visible target. Firing in the general direction of known or suspected enemy location.

sustained rate of fire: Rate of fire that a weapon can continue to deliver for an indefinite period without overheating.

terminal ballistics: What happens to the bullet when it comes in contact with the target.

tight shot group: A shot group with all bullet holes close together.

tracer ammunition: Ammunition with a substance at the rear of the bullet that ignites soon after firing. It burns brightly so the trajectory of the bullet can be seen.

tracking: Engaging moving targets where the lead is established and maintained; moving with the target as the trigger is squeezed.

train the trainer: Describes any training that is designed to train marksmanship instructors or coaches.

trainfire: A marksmanship program using pop-up targets in a realistic environment.

trajectory: The flight path the bullet takes from the rifle to the target.

trapping: A technique for engaging moving targets. The aiming point is established forward of the target. The rifle is held stationary and fired as the target approaches the aiming point.

trigger squeeze: The fourth fundamental; squeezing the trigger so that the movement of firing is a surprise, the lay of the weapon is not disturbed, and a large target hit can be expected.

unit marksmanship: All marksmanship training that is conducted by units.

unlocking: The step in the cycle of operation that refers to the clockwise rotation of the bolt after firing, freeing the bolt from the barrel locking lugs.

unsupported position: Any position that requires the firer to hold the weapon steady using only his body (bone support).

vertical dispersion: The up-and-down displacement of bullets on a target.

Weaponeer: A training device that simulates the firing of the M16 rifle to provide performance feedback.

windage adjustment: Moving the rear sight aperture to cause the bullet to strike left or right on the target.

wind value: The effect the wind will have on the trajectory of the bullet.

wobble area: The natural movement of the weapon/sight on and around an aiming point when the weapon is being held in a steady position.

zero criterion: The standard or requirement for zeroing; 4cm or smaller group at 25 meters.

zeroing: Adjusting the rifle sights so bullets hit the aiming point at a given range.

zero target: A scaled-silhouette target with a superimposed grid for use at 25 meters.

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REFERENCES

DOCUMENTS NEEDED

These documents must be available to the intended users of this publication.

*AR 210-21	Ranges and Training Land Program. 01 May 1997.
AR 350-41	Training in Units, 19 March 1993.
*AR 385-10	The Army Safety Program. 23 May 1988.
DA Form 2028	Recommended Changes to Publications and Blank Forms. 01 February 1974.
DA Form 2404	Equipment Inspection and Maintenance Work Sheet. 01 April 1979.
DA Form 3595-R	Record Fire Scorecard. June 1989.
DA Form 3601-R	Single Target Field Firing Scorecard. June 1989.
DA Form 5239-R	75-, 175-, and 300-Meter Down Range Feedback Scorecard. June 1989.
DA Form 5241-R	Single and Multiple Targets - Field Firing Scorecard. June 1989.
DA Form 5789-R	Record Firing Scorecard - Known Distance Course. June 1989.
DA Form 5790-R	Record Firing Scorecard - Scaled Target Alternate Course. June 1989.
*DA Pam 350-38	Standards in Weapons Training. 03 July 1997.
FM 25-100	Training the Force, 18 November 1988.
*FM 100-14	Risk Management, 23 April 1998.
TC 7-9	Infantry Live-Fire Training, 30 September 1993.
TC 25-8	Training Ranges, 25 February 1992.

*This source was also used to develop this manual.

*TM 7-6920-703-14&P	Trainer, Rifle Marksmanship (Weaponeer) (US Navy)
*TM 9-1005-249-10	Operator's Manual for Rifle, 5.56-mm, M16, Rifle 5.56-mm, M16A1. 11 February 1985.
*TM 9-1005-319-10	Operator's Manual for Rifle, 5.56-mm, M16A2; Rifle 5.56-mm, M16A3; Rifle, 5.56-mm, M16A4; Carbine, 5.56-mm, M4; Carbine, 5.56-mm, M4A1. 01 October 1998.
TM 9-1240-413-12&P	Operator's and Unit Maintenance Manual Including Repair Parts and Special Tools List for M68 Sight, Reflex, w/Quick Release and Mount. 20 October 1997.
TM 11-5855-203-10	Operator's Manual for Night Vision Sight, Individual Served Weapon AN/PVS-2, AN/PVS-2A, and AN/PVS-2B. 29 August 1974.
TM 11-5855-213-10	Operator's Manual for Night Vision Sight, Individual Served Weapon, AN/PVS-4. 01 February 1993.
TM 11-5855-238-10	Operator's Manual for Night Vision Goggles Ground Use: AN/PVS-5 and AN/PVS-5A. 15 May 1993.
TM 11-5855-261-10	Operator's Manual for Infrared Aiming Light, AN/PAQ-4. 28 May 1981.
TM 11-5855-301-12&P	Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) Light, Aiming, Infrared, AN/PAQ-4B, AN/PAQ-4C.15 May 2000.
TM 11-5855-302-12&P	Operator's and Unit Maintenance Manual, Sight-Thermal, AN/PAS-13 (V) 2&3), 1 January 1997.
TM 11-5855-306-10	Operator's Manual for Monocular Night Vision Device, AN/PVS-14. 01 June 2000.
TM 11-5855-308-12&P	Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List), Target Pointer Illuminator/Aiming Light AN/PEQ-2A. 15 May 2000.
TRADOC Reg 385-2	TRADOC Safety Program, 10 October 2000.

*This source was also used to develop this manual.

READINGS RECOMMENDED

These readings contain relevant supplemental information.

AR 190-11	Physical Security of Arms, Ammunition, and Explosives, 2 December 1998.
AR 385-63	Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat. 15 October 1983.
FM 3-06.11(FM 90-10-1)	Combined Arms Operations in Urban Terrain. 28 February 2002.
FM 3-4	NBC Protection. 29 May 1992.
FM 20-3	Camouflage, Concealment, and Decoys. 30 August 1999.
FM 21-10	Field Hygiene and Sanitation. 21 June 2000
FM 21-11	First Aid for Soldiers. 27 October 1988.
FM 21-75	Combat Skills of the Soldier. 03 August 1984.
FM 22-6	Guard Duty. 17 September 1971.
FM 25-4	How to Conduct Training Exercises. 10 September 1984.
FM 25-101	Battle Focused Training. 30 September 1990.
FM 90-10	Military Operations on Urbanized Terrain (MOUT). 15 August 1979.
FM 101-5-1	Operational Terms and Graphics. 30 September 1997.
STP 21-1-SMCT	Soldier’s Manual of Common Tasks, Skill Level 1. 1 October 2001.
STP 21-24-SMCT	Soldier’s Manual of Common Tasks, Skill Levels 2-4. 1 October 2001.
STP 7-11BCHM1-SM	Soldier’s Manual for MOS 11B, 11C, 11H, and 11M Infantry, Skill Level 1. 01 March 2000.
STP 7-11BCHM24-SM-TG	Soldier’s Manual and Trainer’s Guide for MOS 11B, 11C, 11H, and 11M Infantry, Skill Levels 2/3/4. 19 June 2000.

TC 25-20	A Leader's Guide to After-Action Reviews. 30 September 1993.
TC 90-1	Training for Military Operations on Urbanized Terrain. 30 September 1993.
TM 9-1005-249-23&P	Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) for Rifle, 5.56-mm, M16; Rifle, 5.56-mm, M16A1. 19 June 1991.
TM 9-1005-319-23&P	Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) for Rifle, 5.56-mm, M16A2. 01 May 1991.
TM 9-6920-363-12&P	Operator's and Organizational Maintenance Manual (Including Repair Parts and Special Tools List) for Conversion Kit (Cal. .22 Rimfire Adapter) M261 for Rifle: 5.56-mm, M16 and M16A1. 29 September 1980.

INDEX

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RECORD FIRE SCORECARD

For use of this form see, FM 3-22.9; proponent agency is TRADOC

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g)/Executive Order 9397.
PRINCIPAL PURPOSE(S): Facilitates individual's transition to distant target and provides feedback.
ROUTINE USE(S): Evaluate individual proficiency: SSN is used for positive identification purpose only.
DISCLOSURE: Voluntary. Individuals not providing information cannot be rated/scored on mass basis.

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. LAST 4 SSN	3. GRADE	4. UNIT	5. ROSTER NO.

6. TABLE 1 - PRONE SUPPORTED OR FOXHOLE SUPPORTED

RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE	RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE
1	50	3				11	100	8			
2	200	6				12	200				
3	100	4				13	150	10			
4	150	5				14	300				
5	300	8				15	100	9			
6	250	7				16	250				
7	50	3				17	200	6			
8	200	6				18	150	5			
9	150	5				19	50	6			
10	250	7				20	100				
		TOTAL						TOTAL			

7. TABLE 2 - PRONE UNSUPPORTED

RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE
1	200	6			
2	250	8			
3	150	6			
4	300	10			
5	200				
6	150	12			
7	200				
8	250	9			
9	150				
10	150	6			
		TOTAL			

8. TABLE 3 - KNEELING

RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE
1	150	8			
2	50	4			
3	100	5			
4	150	6			
5	100	5			
6	50	4			
7	100	5			
8	150	6			
9	50	4			
10	100	5			
		TOTAL			

9. SCORE

TABLE	HIT	MISS	NO FIRE
1			
2			
3			
TOTAL			

10. QUALIFICATION SCORES/RATINGS *(Check One)*

☐ 36-40 EXPERT ☐ 30-35 SHARPSHOOTER ☐ 23-29 MARKSMAN ☐ 22-BELOW UNQUALIFIED

11. FIRER'S QUALIFICATION SCORE

12. REMARKS

13. NIGHT FIRE EXERCISE

DATE	HIT	MISS	GO	NO GO

14. CBRN FIRE EXERCISE

DATE	HIT	MISS	GO	NO GO

15. CHECK WHICH AIMING DEVICE WAS USED

☐ IRON SIGHT ☐ AN/PAS-13 (DAY)
☐ BACK UP IRON SIGHT ☐ AN/PAS-13 (NIGHT)
☐ MGS

16. DATE SIGNED *(YYYYMMDD)*

17. SCORER'S SIGNATURE

18. DATE SIGNED *(YYYYMMDD)*

19. OFFICER'S SIGNATURE

Conduct of Record Fire Range

The Record Fire Course provides for the engagement of one 20-round exercise, and two 10-round exercises. Twenty single or multiple targets are engaged from the prone supported or foxhole supported firing position; 10 targets are engaged from the prone unsupported position; and 10 targets are engaged from the kneeling position. Once firing begins, no cross-loading of ammunition is allowed. The uniform for qualification is helmet, LBE/LBV, and Interceptor body armor with both SAPI plates; one in front, one in back. No other armor is required.

(1). Table 1
Prone Supported Firing Position (or at the unit commander's discretion) **Foxhole Supported Firing Position.** The firer is given one 20-round magazine to engage 20 targets at various ranges.

(2). Table 2
Prone Unsupported Firing Position. The firer is given one 10-round magazine to engage 10 targets at various ranges.

(3). Table 3
Kneeling Unsupported Firing Position. The firer is given one 10-round magazine to engage 10 targets at various ranges.

(A). Credit for target hits should not be given when rounds are "saved" from difficult targets for use on easier targets. (Example: not firing at the 300-meter target so an additional round can be fired at the 150-meter target.) When double targets are exposed, the soldier should fire two rounds. If the first target is missed, he may fire at that same target with the second round.

(B). Engage the target that poses the greatest threat first (normally assumed to be the closer target). No scoring distinction is made between near and far targets or the sequence in which they are engaged. Credit is not given if unused ammunition from one 20-round table is added to a magazine provided for the next table.

(C). Soldiers who fail to qualify on the first attempt should be given appropriate remedial training and allowed to refire in a few days. When a soldier refires the course, he remains unqualified with a score of 22 target hits or less. A rating of marksman is awarded for a score of 23 to 40 target hits. When automated scoring procedures are available that allow the performance of the soldier to be stored and retrieved before a weapon malfunction, his performance is added to the score of his first attempt after weapon repair and refire. If a soldier's weapon becomes inoperable and his performance before a malfunction precludes qualification, he is considered unqualified and must refire.

(D). Alibi firing is reserved for soldiers who encounter a malfunctioning target, ammunition, or rifle. A soldier will not be issued more than 20 rounds for Table 1, 10 rounds for Table 2, or 10 rounds for Table 3. Soldiers who fire 20 rounds despite a target malfunction will not be issued additional alibi rounds. There are no alibis for soldier-induced weapon malfunctions or for targets missed during application of immediate action. These procedures must be strictly adhered to when a malfunction occurs.

SINGLE TARGET
FIELD FIRING SCORECARD

For use of this form, see FM 3-22.9. The proponent agency is TRADOC.

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g)/Executive Order 9397. PRINCIPAL PURPOSE(S): Facilitates individual's transition to distant target and provides feedback. ROUTINE USE(S): Evaluate individual proficiency; SSN is used for positive identification purposes only. MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION: Voluntary individuals not providing information cannot be rated/scored on a mass basis.

1 NAME (LAST FIRST MIDDLE INITIAL)	2 SSN	3 GRADE	4 UNIT	5 ROSTER NO

6. INTRODUCTION TABLE 1 - SUPPORTED FIGHTING POSITION					7. TABLE 2 - SUPPORTING FIGHTING POSITION					8. TABLE 3 - PRONE POSITION					9. SCORE		
RD	RANGE (M)	TIME (SEC)	HIT	MISS	RD	RANGE (M)	TIME (SEC)	HIT	MISS	RD	RANGE (M)	TIME (SEC)	HIT	MISS	TABLE	HIT	MISS
1	75	6			1	75	6			1	75	7			2		
2	75	6			2	175	8			2	175	9			3		
3	75	6			3	300	10			3	300	11					
4	75	6			4	175	8			4	175	9					
5	75	6			5	75	6			5	75	7					
6	175	8			6	300	10			6	300	11					
7	175	8			7	300	10			7	300	11					
8	175	8			8	75	6			8	75	7					
9	175	8			9	175	8			9	175	9					
10	175	8			10	175	8			10	175	9					
11	175	8			11	300	10			11	300	11					
12	75	8			12	175	8			12	175	9					
13	300	10			13	75	6			13	75	7					
14	300	10			14	300	10			14	300	11					
15	300	10			15	175	8			15	175	9					
16	300	10			16	75	6			16	75	7					
17	300	10			17	300	10			17	300	11					
18	300	10			18	75	8			18	75	7					
		TOTAL					TOTAL					TOTAL			TOTAL		

10 REMARKS

11 DATE SIGNED	12 SCORER'S SIGNATURE

DA FORM 3601-R, JUN 89

75-, 175- AND 300-METER DOWN RANGE FEEDBACK SCORECARD

For use of this form , see FM 3-22.9. The proponent agency is TRADOC.

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g)/Executive Order 9397. PRINCIPAL PURPOSE(S): Facilitates individual's training on silhouette targets at varying ranges. ROUTINE USE(S): Evaluate individual proficiency; SSN is used for positive identification purposes only. MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION: Voluntary. Individuals not providing information cannot be rated/scored on a mass basis.

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. SSN	3. GRADE	4. UNIT

5. ZERO CONFIRMATION

RANGE (M)	HIT	MISS
175		

6. ZERO CONFIRMATION REFIRE

RANGE (M)	HIT	MISS
175		

7. TABLE 1 - DOWN RANGE SILHOUETTES, SUPPORTED FIGHTING POSITION

RDS	RANGE (M)	HIT	MISS
5	75		
10	175		
5	300		
	TOTAL		

8. TABLE 2 - DOWN RANGE SILHOUETTES, PRONE POSITION

RDS	RANGE (M)	HIT	MISS
5	75		
10	175		
5	300		
	TOTAL		

9. SCORE

TABLE	HIT	MISS
1		
2		
TOTAL		

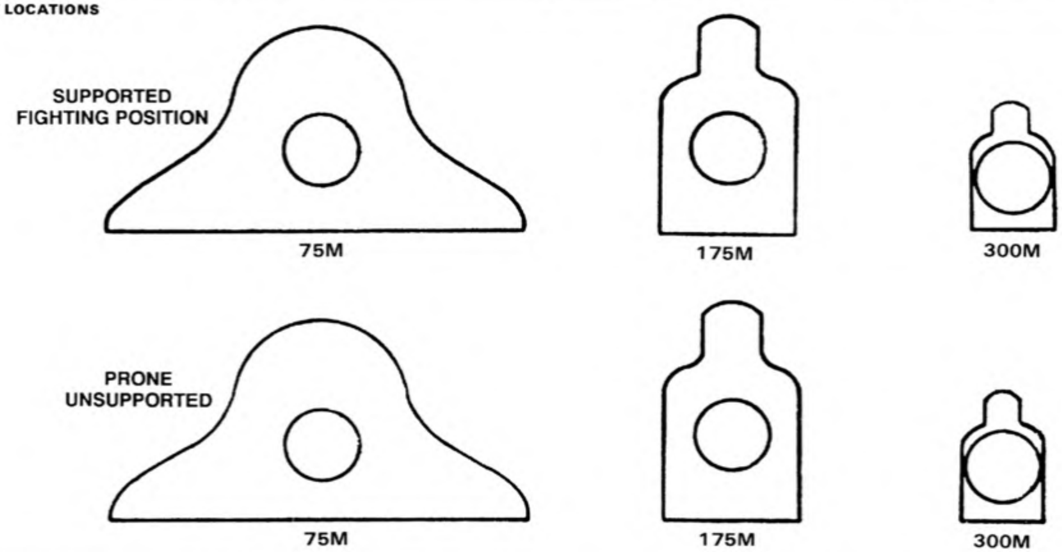
10. ZERO-SHOT LOCATIONS

175M

WIND SPEED: (MPH)

WIND DIRECTION: (USE ARROW)

11. SHOT LOCATIONS



12. DATE	13. SCORER'S SIGNATURE

DA FORM 5239-R, JUN 89

SINGLE AND MULTIPLE TARGETS FIELD FIRING SCORECARD

For use of this form , see FM 3-22.9. The proponent agency is TRADOC.

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012/(g)/Executive Order 9397. PRINCIPAL PURPOSE(S): Facilitates individual's transition to distant target and provides feedback. ROUTINE USE(S): Evaluate individual proficiency; SSN is used for positive identification purposes only. MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION: Voluntary. Individual not providing information cannot be rated/scored on a mass basis.

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. SSN	3. GRADE	4. UNIT	5. ROSTER NO.

6. INTRODUCTION
TABLE 1 - SUPPORTED FIGHTING POSITION

RD	RANGE (M)	TIME (SEC)	HIT	MISS
1	75	5		
2	175	7		
3	75	11		
4	300			
5	75	9		
6	175			
7	75	10		
8	300			
9	175	11		
10	300			
		TOTAL		

7. TABLE 2 - SUPPORTING FIGHTING POSITION

RD	RANGE (M)	TIME (SEC)	HIT	MISS
1	175	7		
2	75	10		
3	300			
4	75	9		
5	175			
6	300	9		
7	75	9		
8	175			
9	175	11		
10	300			
11	75	9		
12	175			
13	175	11		
14	300			
15	75	5		
16	175	11		
17	300			
18	75	9		
19	175			
20	75	10		
21	300			
22	175	7		
		TOTAL		

8. TABLE 3 - PRONE POSITION

RD	RANGE (M)	TIME (SEC)	HIT	MISS
1	75	6		
2	175	8		
3	75	13		
4	300			
5	75	11		
6	175			
7	75	12		
8	300			
9	175	13		
10	300			
11	75	11		
12	175			
13	175	8		
14	75	6		
15	75	11		
16	175			
17	75	12		
18	300			
19	75	11		
20	175			
21	175	13		
22	300			
		TOTAL		

9. SCORE

TABLE	HIT	MISS
2		
3		
TOTAL		

10. REMARKS

11. DATE SIGNED	12. SCORER'S SIGNATURE

DA FORM 5241-R, JUN 89

RECORD FIRING SCORECARD * KNOWN DISTANCE COURSE

For use of this form , see FM 3-22.9. The proponent agency is TRADOC.

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g)/Executive Order 9397. **PRINCIPAL PURPOSE(S)**: Records individual's performance on record fire range. **ROUTINE USE(S)**: Evaluation of individual's proficiency and basis for determination of award of proficiency badge; SSN is used for positive identification purposes only. **MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION**: Voluntary. Individuals not providing information cannot be rated/scored on a mass basis.

1 NAME (LAST, FIRST, MIDDLE INITIAL)	2 SSN	3 GRADE	4 UNIT	5. FIRING POINT AND ORDER

6 TABLE 1 - PRONE SUPPORTED

ROUND	RANGE 300	HIT	MISS
1	E-SIL		
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
TIME 120 SEC	TOTAL		

7 TABLE 2 - PRONE UNSUPPORTED

ROUND	RANGE 200	HIT	MISS
1	E-SIL		
2			
3			
4			
5			
6			
7			
8			
9			
10			
TIME 60 SEC	TOTAL		

8. TABLE 3 - PRONE UNSUPPORTED

ROUND	RANGE 100	HIT	MISS
1	F-SIL		
2			
3			
4			
5			
6			
7			
8			
9			
10			
TIME 60 SEC	TOTAL		

9. SCORE

- ☐ 38-40 EXPERT
- ☐ 33-37 SHARPSHOOTER
- ☐ 26-32 MARKSMAN
- ☐ 25-BELOW UNQUALIFIED

11 REMARKS

NIGHT FIRE EXERCISE

DATE	HIT	MISS	GO	NO GO

NBC FIRE EXERCISE

DATE	HIT	MISS	GO	NO GO

10.

LIGHT: 12, 3, 6, 9 — DIRECTION

WIND: 12, 3, 6, 9 — MPH

ZERO			
ELEV			
WIND			

*FIRER ISSUED 40 ROUNDS. THE ROUNDS WILL BE PRELOADED IN FOUR 10-ROUND MAGAZINES - TWO FOR TABLE 1, ONE FOR EACH REMAINING TABLE. ALL ROUNDS WILL BE FIRED WITH THE M16A1 SHORT RANGE SIGHT.

12 DATE SIGNED	13. DATE SIGNED
14 SCORER'S SIGNATURE	15. OFFICER'S SIGNATURE

DA FORM 5789-R, JUN 89

This scorecard is used to score Known Distance Course record fire qualification when the Known Distance Range is used. This course is used only when the standard record fire course is not available.

NOTE: If zeroing/grouping exercises are not performed on the day of record fire, 6 rounds of training/sustainment ammunition are fired from the 300 yard/meter line for confirmation of zero prior to conducting the Qualification Course.

CONDUCT OF FIRE

For Table 1, the firer is given two 10-round magazines to engage an E-silhouette at 300 yards within 120 seconds in the prone supported position. Table 2 is fired with a 10-round magazine at an E-silhouette at 200 yards within 60 seconds in the prone unsupported position. Table 3 is fired with a 10-round magazine at an F-silhouette at 100 yards within 60 seconds in the prone unsupported position.

SCORING

Scoring is conducted in the pits, with the results provided after each table. One point is awarded for each round hitting the target. A hit is scored for any bullethole that is within or touches some part of the silhouette facing.

RECORD FIRING SCORECARD * SCALED TARGET ALTERNATE COURSE

For use of this form, see FM 3-22.9. The proponent agency is TRADOC

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g)/Executive Order 9397.
PRINCIPAL PURPOSE(S): Facilitates individual's transition to distant target and provides feedback.
ROUTINE USE(S): Evaluate individual proficiency: SSN is used for positive identification purpose only.
DISCLOSURE: Mandatory or voluntary disclosure and effect on individual not providing information. Voluntary. Individuals not providing information cannot be rated/scored on mass basis.

1. NAME (LAST FIRST MIDDLE INITIAL)	2. LAST 4 SSN	3. GRADE	4. UNIT	5. ROSTER NO	6. DATE *(YYYYMMDD)*

7. TABLE 1 - PRONE SUPPORTED OR FOXHOLE SUPPORTED

TARGET	RANGE (M)	HIT
1	300	
2	300	
3	250	
4	250	
5	200	
6	200	
7	200	
8	200	
9	150	
10	150	
11	150	
12	150	
13	100	
14	100	
15	100	
16	100	
17	100	
18	100	
19	50	
20	50	
TIME 120 SEC	HITS	

8. TABLE 2 - PRONE UNSUPPORTED

TARGET	RANGE (M)	HIT
1	300	
2	250	
3	200	
4	200	
5	150	
6	150	
7	100	
8	100	
9	100	
10	50	
TIME 60 SEC	HITS	

9. TABLE 3 - KNEELING

TARGET	RANGE (M)	HIT
1	300	
2	250	
3	200	
4	200	
5	150	
6	150	
7	100	
8	100	
9	100	
10	50	
TIME 60 SEC	HITS	

10. REMARKS

11. QUALIFICATION SCORES/RATING *(Check one)*

☐ 38-40 EXPERT
☐ 33-37 SHARPSHOOTER
☐ 26-32 MARKSMAN
☐ 25-BELOW UNQUALIFIED

TOTAL HITS TABLES 1, 2 AND 3 =

NIGHT FIRE EXERCISE

HIT	MISS	GO	NO GO

CBRN FIRE EXERCISE

HIT	MISS	GO	NO GO

*FIRER ISSUED 40 ROUNDS TO ENGAGE 10 TARGETS - NO MORE THAN 4 RDS PER TARGET. THE ROUNDS WILL BE PRELOADED IN 1, 20 ROUND MAGAZINE FOR TABLE ONE, 1, 10 ROUND MAGAZINE FOR TABLE TWO, AND 1, 10 ROUND MAGAZINE FOR TABLE THREE. ALL ROUNDS WILL BE FIRED WITH THE LONG RANGE SIGHT ON THE M4/M16 RIFLE SERIES. HITS ARE DENOTED BY AN "X" MARK. MISSES ARE DENOTED BY A ZERO "0".

12. DATE SIGNED *(YYYYMMDD)*	13. DATE SIGNED *(YYYYMMDD)*
14. SCORER'S SIGNATURE	15. OFFICER'S SIGNATURE

This scorecard will be used to score Alternate Course Record Fire Qualification when the 25m (NSN 6920-01-167-1398) or 15m (NSN 6920-01-167-1396) scaled silhouette target is used. The Alternate Course will be used only when standard Record Fire and known distance ranges are unavailable.

NOTE: If zeroing/grouping exercises are not performed on the day of Record Fire, six rounds of training/sustainment ammunition will be fired for 25 meter zero confirmation prior to conducting the Qualification Course.

CONDUCT OF FIRE

Table 1. Prone Supported or Foxhole Supported Firing Position. The firer is given one 20-round magazine to engage 10 silhouettes on the target. Table includes two rounds for each silhouette from the prone supported position. Firing must be completed within 120 seconds. No more than two hits for each silhouette are scored.

*The foxhole supported firing position may be substituted for the prone supported position at the unit commander's discretion.

Table 2. Prone Unsupported Position. The firer is given one 10-round magazine to engage 10 silhouettes on the same target sheet. Table includes one round for each silhouette from the prone unsupported position. Firing must be completed within 60 seconds. No more than one hit for each target will be scored from the prone unsupported position.

Table 3. Kneeling Position. The firer is given a final 10-round magazine to engage 10 silhouettes on the same target sheet. Table includes one round for each silhouette from the kneeling position. Firing must be completed within in 60 seconds. No more than one hit for each target is scored from the kneeling position.

NOTE: Alternate Course Qualification firers will have one 20-round magazine and two 10-round magazines. Firers should engage targets on the sheet from left to right, and nearest to farthest (50m, 100m left, 100m center, 100m right, 150m left, 150m right, 200m left, 200m right, 250m, and 300m last). This "guideline" for target engagement is intended to ensure firers do not forget which targets they engaged during qualification. It also alleviates the possibility of shooting each target more than the prescribed amount of times.

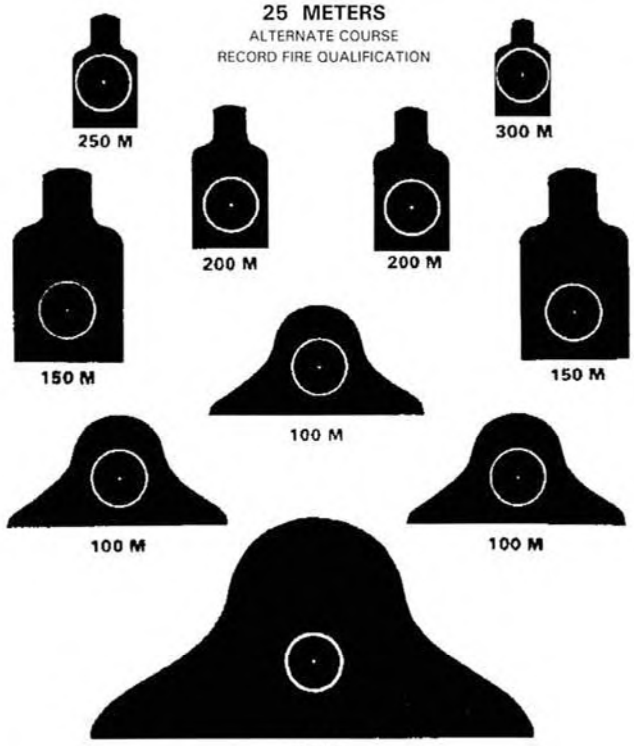
Though the time between each firing position is not specified, enough time should be allotted to allow the firer to clear his weapon, quickly change firing positions, and reload before the beginning of the next firing table. The range RSO will ensure enough time is given between each change in firing positions to facilitate the timely flow of the Record Fire Qualification table.

SCORING

The same target sheet is used for every 40-round qualification table a firer completes. One hit is awarded for each round that strikes within or touches some part of the silhouette. A maximum of four hits for each silhouette on the same target sheet are scored.

25 METERS

ALTERNATE COURSE
RECORD FIRE QUALIFICATION



THE WHITE DOT ON EACH TARGET SHOWS THE CENTER OF MASS AIMING POINT. BULLETS SHOULD HIT WITHIN THE CIRCLE, BUT ARE SCORED AS HITS IF THEY HIT ANY PART OF THE SILHOUETTE.

RECORD NIGHT FIRE SCORECARD

For use of this form see, FM 3-22.9; proponent agency is TRADOC

DATA REQUIRED BY PRIVACY ACT OF 1974

AUTHORITY: 10 USC 3012(g)/Executive Order 9397.
PRINCIPAL PURPOSE(S): Facilitates individual's transition to distant target and provides feedback.
ROUTINE USE(S): Evaluate individual proficiency: SSN is used for positive identification purpose only.
DISCLOSURE: Voluntary. Individuals not providing information cannot be rated/scored on mass basis.

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. SSN	3. GRADE	4. UNIT	5. ROSTER NO.

6. **TABLE 1 - FOXHOLE SUPPORTED FIRING POSITION**

RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE	RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE
1	50L	3				11	100	8			
2	200	6				12	200				
3	100	4				13	150	8			
4	150	5				14	50R				
5	100	4				15	100	8			
6	150	5				16	150				
7	50R	3				17	200	6			
8	200	6				18	150	5			
9	150	5				19	50L	9			
10	250	7				20	250				
		TOTAL						TOTAL			

7. **TABLE 2 - PRONE UNSUPPORTED FIRING POSITION**

RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE	RD	RANGE (M)	TIME (SEC)	HIT	MISS	NO FIRE
1	100	5				11	150	8			
2	200	8				12	50R	5			
3	150	6				13	100	12			
4	50L	12				14	200				
5	200					15	150	12			
6	150	12				16	50L				
7	100					17	100	12			
8	50R	12				18	150				
9	100					19	200	12			
10	100	8				20	100				
		TOTAL						TOTAL			

8. **SCORE**

TABLE	HIT	MISS	NO FIRE
1 (Rounds 1-10)			
1 (Rounds 11-20)			
2 (Rounds 1-10)			
2 (Rounds 11-20)			
TOTAL			

9. QUALIFICATION SCORES/RATINGS *(Check One)*

☐ 35-40 EXPERT ☐ 24-34 SHARPSHOOTER ☐ 17-23 MARKSMAN ☐ 16-BELOW UNQUALIFIED

10. FIRER'S QUALIFICATION SCORE

11. REMARKS

12. CHECK WHICH AIMING DEVICE WAS USED

☐ AN/PEQ-2A
☐ AN/PAQ-4B/C
☐ AN/PVS-4

13. DATE SIGNED *(YYYYMMDD)*	14. SCORER'S SIGNATURE
15. DATE SIGNED *(YYYYMMDD)*	16. OFFICER'S SIGNATURE

DA FORM 7489-R, NOV 2002

USAPA V1.00ES

SQUAD DESIGNATED MARKSMAN
Record Fire I and II

Name:	
Rank:	
SSN:	
Unit:	
Date:	

Record Fire I. Mechanical Sight Adjustment

Target Range/Position	**Hit**	**Miss**	**Target Range/Position**	**Hit**	**Miss**
100 M Unsupported			300 M Unsupported		
100 M Unsupported			300 M Unsupported		
100 M Unsupported			400 M Supported		
100 M Unsupported			400 M Supported		
200 M Supported			400 M Supported		
200 M Supported			400 M Supported		
200 M Unsupported			500 M Supported		
200 M Unsupported			500 M Supported		
300 M Supported			500 M Supported		
300 M Supported			500 M Supported		
Total			**Total**		

Circle Pass or Fail

14 - 20 Pass	**13 - Below Fail**

Record Fire II. Adjusted Aiming Points/Optic

Target Range/Position	**Hit**	**Miss**	**Target Range/Position**	**Hit**	**Miss**
100 M Unsupported			300 M Unsupported		
100 M Unsupported			300 M Unsupported		
100 M Unsupported			400 M Supported		
100 M Unsupported			400 M Supported		
200 M Supported			400 M Supported		
200 M Supported			400 M Supported		
200 M Unsupported			500 M Supported		
200 M Unsupported			500 M Supported		
300 M Supported			500 M Supported		
300 M Supported			500 M Supported		
Total			**Total**		

Circle Pass or Fail

14 - 20 Pass	**13 - Below Fail**

Scorer:	**Signature:**
Range NCOIC/OIC:	**Signature:**

SQUAD DESIGNATED MARKSMAN POSITION EVALUATION (SUPPORTED)

Name: ______ Rank: ______ SSAN: ______ Unit: ______ Date: ______ Evaluator: ______

PHASE	EYE RELIEF	TRIGGER FINGER	ELBOWS	NON-FIRING HAND	LEGS
EXAMPLE:	How far is nose from charging handle?	What part of 1st joint (tip, middle, joint)	Stable platform	Where is it located? Soldiers choice, stable	Where are they located? Stability for upper body
Phase I - Steady Position					
Phase II - Borelight Dry Fire					
Phase V - Practice Qualification					
100M					
200M					
300M					
400M					
500M					
Phase VI - Record Qualification					
100M					
200M					
300M					
400M					
500M					

SQUAD DESIGNATED MARKSMAN
POSITION EVALUATION (UNSUPPORTED)

Name: ---------------- Rank: ---------------- SSAN: ---------------- Unit: ---------------- Date: ---------------- Evaluator: ----------------

PHASE	EYE RELIEF	TRIGGER FINGER	ELBOWS	NON-FIRING HAND	LEGS
EXAMPLE:	How far is nose from charging handle?	What part of 1st joint (tip, middle, joint)	Stable platform	Where is it located? Soldiers choice, stable	Where are they located? Stability for upper body
Phase I - Steady Position					
Phase II - Borelight Dry Fire					
Phase V - Practice Qualification					
100M					
200M					
300M					
400M					
500M					
Phase VI - Record Qualification					
100M					
200M					
300M					
400M					
500M					

FM 3-22.9(FM 23-9)
24 APRIL 2003

By Order of the Secretary of the Army:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
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Exhibit U

TC 3-22.9

Rifle and Carbine

MAY 2016

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*This publication supersedes FM 3-22.9, 12 August 2008.

Headquarters, Department of the Army

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Change 3

Headquarters
Department of the Army
Washington, DC, 20 November 2019

Rifle and Carbine

1. Change TC 3-22.9, 13 May 2016, as follows:

Remove old pages:	**Insert new pages:**
iii through x	iii through ix
1-1 through 1-9	1-1 through 1-13
F-1 through F-22	F-1 through F-10
References-1 through References-2	References-1 through References-2
Index-1	Index-1

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TC 3-22.9
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TC 3-22.9, C2

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cover	cover
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3-7 through 3-8	3-7 through 3-8
3-15 through 3-16	3-15 through 3-16
8-11 through 8-12	8-11 through 8-12
E-5 through E-6	E-5 through E-6
F-11 through F-12	F-11 through F-12
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Glossary-3	Glossary-3
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Department of the Army
Washington, DC, 10 January 2017

Rifle and Carbine

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iii through viii	iii through viii
3-13 through 3-14	3-13 through 3-14
3-15 through 3-16	3-15 through 3-16
7-7 through 7-20	7-7 through 7-20
8-1 through 8-2	8-1 through 8-2
A-9 through A-10	A-9 through A-10
	F-1 through F-22
References-2 to References-3	References-2 to References-3
Index-1 to Index-2	Index-1 to Index-2

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TC 3-22.9 (FM 3-22.9)

*Training Circular
No. 3-22.9

Headquarters
Department of the Army
Washington, DC, 13 May 2016

Rifle and Carbine

Contents

Distribution Restriction: Approved for public release, distribution is unlimited.

***This publication supersedes FM 3-22.9, 12 August 2008.**

Figures

Tables

Preface

Training Circular (TC) 3-22.9 provides Soldiers with the critical information for their rifle or carbine and how it functions, its capabilities, the capabilities of the optics and ammunition, and the application of the functional elements of the shot process.

TC 3-22.9 uses joint terms where applicable. Selected joint and Army terms and definitions appear in both the glossary and the text. Terms for which TC 3-22.9 is the proponent publication (the authority) are italicized in the text and are marked with an asterisk (*) in the glossary. Terms and definitions for which TC 3-22.9 is the proponent publication are boldfaced in the text. For other definitions shown in the text, the term is italicized and the number of the proponent publication follows the definition.

The principal audience for TC 3-22.9 is all members of the profession of arms. Commanders and staffs of Army headquarters serving as joint task force or multinational headquarters should also refer to applicable joint or multinational doctrine concerning the range of military operations and joint or multinational forces. Trainers and educators throughout the Army will also use this publication.

Commanders, staffs, and subordinates ensure that their decisions and actions comply with applicable United States, international, and in some cases host-nation laws and regulations. Commanders at all levels ensure that their Soldiers operate in accordance with the law of war and the rules of engagement. (See FM 6-27/MCTP 11-10C.)

This publication applies to the active Army, the Army National Guard (ARNG)/Army National Guard of the United States (ARNGUS), and the United States Army Reserve (USAR). Unless otherwise stated in this publication, masculine nouns and pronouns do not refer exclusively to men.

Uniforms depicted in this manual were drawn without camouflage for clarity of the illustration.

The proponent of this publication is United States (U.S.) Army Maneuver Center of Excellence (MCoE). The preparing agency is the MCoE, Fort Benning, Georgia. You may submit comments and recommended changes in any of several ways—U.S. mail, e-mail, fax, or telephone—as long as you use or follow the format of DA Form 2028, (*Recommended Changes to Publications and Blank Forms*). Contact information is as follows:

E-mail:	usarmy.benning.mcoe.mbx.doctrine@mail.mil
Phone:	COM 706-545-7114 or DSN 835-7114
Fax:	COM 706-545-8511 or DSN 835-8511
U.S. mail:	Commander, MCoE Directorate of Training and Doctrine (DOTD) Doctrine and Collective Training Division ATTN: ATZB-TDD Fort Benning, GA 31905-5410

Introduction

This manual is comprised of nine chapters and five appendices, and is specifically tailored to the individual Soldier's use of the M4- or M16-series weapon. This TC provides specific information about the weapon, aiming devices, attachments, followed by sequential chapters on the tactical employment of the weapon system.

The training circular itself is purposely organized in a progressive manner, each chapter or appendix building on the information from the previous section. This organization provides a logical sequence of information which directly supports the Army's training strategy for the weapon at the individual level.

Chapters 1 through 4 describe the weapon, aiming devices, mountable weapons, and accessories associated with the rifle and carbine. General information is provided in the chapters of the manual, with more advanced information placed in appendix A, Ammunition, and appendix B, Ballistics.

Chapters 5 through 9 provide the employment, stability, aiming, control and movement information. This portion focuses on the Solider skills needed to produce well aimed shots. Advanced engagement concepts are provided in appendix C of this publication. Appendix D of this publication provides common tactical drills that are used in training and combat that directly support tactical engagements. Finally, appendix E of this publication, is provided at a common location in this and future weapons publications to provide a common location for reference.

This manual does not cover the specific rifle or carbine training strategy, ammunition requirements for the training strategy, or range operations. These areas will be covered in separate training circulars.

Conclusion

TC 3-22.9 applies to all Soldiers, regardless of experience or position. This publication is designed specifically for the Soldier's use on the range during training, and as a reference while deployed.

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Chapter 1

Overview

This TC is designed to provide Soldiers the critical information on their rifle or carbine to properly and effectively engage and destroy threats in a direct fire engagement. It relies on the Soldier's understanding of the weapon, how it functions, its capabilities, the capabilities of the optics and ammunition, and how to properly employ those capabilities to achieve mastery through the application of the functional elements of the shot process.

This chapter describes the principles of proper weapons handling, tactical applications and control measures for handling the weapons, and an overview of the concepts of overmatch as it pertains to a Soldier's individual weapon.

1-1. Each Soldier is responsible for placing accurate and effective fires on threat targets with their individual weapon. This manual defines the functional elements of the shot process, the principles of operation of the weapon, the characteristics and description of ballistics and ammunition, and the various engagement techniques that are essential to build Soldier proficiency with their weapon. It includes standard drills and techniques that assist the Soldier to build, improve, and sustain their skills to achieve accurate and precise shots consistently during combat operations (see figure 1-1).

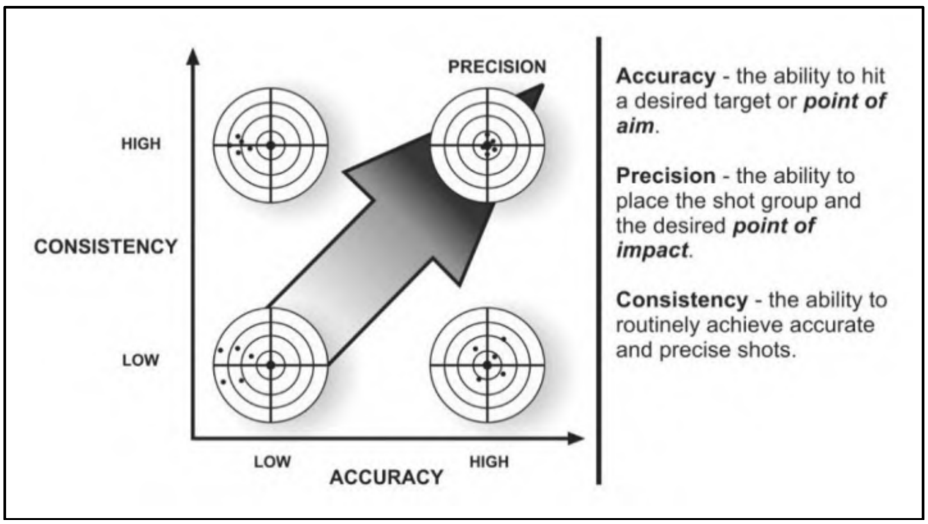


Figure 1-1. Employment skills

SAFE WEAPONS HANDLING

1-2. Safe weapons handling procedures are a consistent and standardized way for Soldiers to handle, operate, and employ the weapon safely and effectively. Weapons handling is built on three components; the Soldier, the weapon, and the environment:

- The **Soldier** must maintain situational understanding of friendly forces, the status of the weapon, and the ability to evaluate the environment to properly handle any weapon. The smart, adaptive, and disciplined Soldier is the primary safety mechanism for all weapons under his control.
- The **weapon** is the primary tool of the Soldier to defeat threats in combat. The Soldier must know of and how to operate the mechanical safeties built into the weapons they employ, as well as the principles of operation for those weapons.
- The **environment** is the Soldier's surroundings. The Soldier must be aware of muzzle discipline, the nature of the target, and what is behind it.

1-3. To safely and effectively handle weapons, Soldiers must be cognitively aware of three distinct weapons handling measures:

- **The rules of firearms safety**.
- **Weapons safety status**.
- **Weapons control status**.

1-4. These measures directly support the components of safe weapons handling. They are designed to provide redundant safety measures when handling any weapon or weapon system, not just rifles and carbines.

1-5. This redundancy allows for multiple fail-safe measures to provide the maximum level of safety in both training and operational environments. A Soldier would have to violate two of the rules of firearms safety or violate a weapon safety status in order to have a negligent discharge.

Note. Unit standard operating procedures (SOPs), range SOPs, or the operational environment may dictate additional safety protocols; however, the rules of firearms safety are always applied. If a unit requires Soldiers to violate these safety rules for any reason, such as for the use of blank rounds or other similar training munitions during training, the unit commander must take appropriate risk mitigation actions.

RULES OF FIREARMS SAFETY

1-6. The Rules of Firearms Safety are standardized for any weapon a Soldier may employ. Soldiers must adhere to these precepts during training and combat operations, regardless of the type of ammunition employed, except as noted above.

Rule 1: Treat Every Weapon as if it is Loaded

1-7. Any weapon handled by a Soldier must be treated as if it is loaded and prepared to fire. Whether or not a weapon is loaded should not affect how a Soldier handles the weapon in any instance.

1-8. Soldiers must take the appropriate actions to ensure the proper weapon status is applied during operations, whether in combat or training.

Rule 2: Never Point the Weapon at Anything You Do Not Intend to Destroy

1-9. Soldiers must be aware of the orientation of their weapon's muzzle and what is in the path of the projectile if the weapon fires. Soldiers must ensure the path between the muzzle and target is clear of friendly forces, noncombatants, or anything the Soldier does not want to strike.

1-10. When this is unavoidable, the Soldier must minimize the amount of time the muzzle is oriented toward people or objects they do not intend to shoot, while simultaneously applying the other three rules of fire arms safety.

Rule 3: Keep Finger Straight and Off the Trigger Until Ready to Fire

1-11. Soldiers must not place their finger on the trigger unless they intend to fire the weapon. The Soldier is the most important safety feature on any weapon. Mechanical safety devices are not available on all types of weapons. When mechanical safeties are present, Soldiers must not solely rely upon them for safe operation knowing that mechanical measures may fail.

1-12. Whenever possible, Soldiers should move the weapon to mechanical safe when a target is not present. If the weapon does not have a traditional mechanical safe, the trigger finger acts as the primary safety.

Rule 4: Ensure Positive Identification of the Target and its Surroundings

1-13. The disciplined Soldier can positively identify the target and knows what is in front of and what is beyond it. The Soldier is responsible for all bullets fired from their weapon, including the projectile's final destination.

1-14. Application of this rule minimizes the possibility of fratricide, collateral damage, or damage to infrastructure or equipment. It also prepares the Soldier for any follow-on shots that may be required.

WEAPON SAFETY STATUS

1-15. The readiness of a Soldier's weapon is termed as its ***weapon safety status (WSS)***. It is a standard code that uses common colors (green, amber, red, and black) to represent the level of readiness for a given weapon.

1-16. Each color represents a specific series of actions that are applied to a weapon. They are used in training and combat to place or maintain a level of safety relevant to the current task or action of a Soldier, small unit, or group.

1-17. The WSS ratings are evaluated by the level of safety measures applied to the weapon itself. Table 1-1 describes the general safe condition of the weapon for each WSS, based on the standard color scheme found in ADP 1-02.

> ***Note.*** If the component, assembly, or part described is unclear, refer to the weapon's technical manual (TM) or chapter 2 of this publication.

Table 1-1. General safe condition of the weapon for each weapon safety status

Weapon Safety Status	General Description	Color Amplifier
GREEN	Fully Safe	
AMBER	Substantially Safe	
RED	Marginally Safe	
BLACK	Not Safe	

1-18. All firers and leaders must be fluent in the general meaning of each WSS, how it pertains to the weapon being employed, and the responsibilities of the firer to own each shot or burst. The following are the basic definitions for each WSS:

- Green, "Fully Safe" – the weapon is clear, no ammunition is present the chamber is empty, and the fire selector switch is set to SAFE.
- Amber, "Substantially Safe" – a leader must clear and verify that the weapon's bolt is forward, the chamber is empty, and ammunition is introduced to the weapon. This is an administrative or preparatory WSS. Leaders use amber primarily for mounted operations and during combat operations when directed to maintain a substantially safe weapon with the ability to rapidly transition and escalate to red or black, based on the situation.

> ***Note.*** WSS amber is not used in the live-fire events described in this publication.

- Red, "Marginally Safe" – the fire selector switch is set to SAFE, the magazine is locked in the magazine well, a round is in the chamber, and the bolt is locked in the forward position.
- Black, "Not Safe" – Indicates when the weapon is fully prepared to fire, the firer has positively identified the target, the fire selector switch is set to FIRE, and the firer's finger is on the trigger, and the fire is in the process of engaging the target.

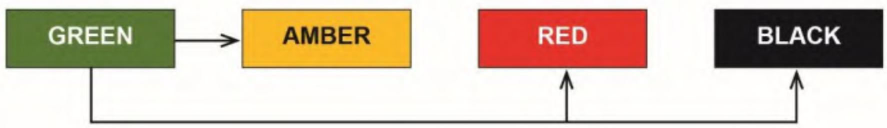
Note. WSS black is used to describe the actions of the firer when in a red status and entering an engagement sequence. WSS black describes the distinct difference between red and actively and deliberately engaging a threat.

1-19. Figures 1-2 through 1-5 on pages 1-6 through 1-9 describe the standard color code for the M4-series/M16-series rifle and carbine. The Soldier performs actions described in figures 1-2 through 1-5 to move from one color code to the next.

△

M4-Series/M16-Series/Sniper Weapon Systems

GREEN STATUS



GREEN
- Selector lever is set to **SAFE**.
- Magazine is removed from the weapon.
- Chamber is empty.
- Bolt is locked open or forward (based upon the situation).

Go from **GREEN** to **AMBER**.
- Firer is directed to **PREPARE AMBER**.
- Verify **GREEN and CLEAR**.
- Bolt is **FORWARD**.
- Ammunition is introduced to the weapon; magazine locked into the magazine well.

Go from **GREEN** to **RED**.
- Firer is directed to **MAKE READY**.
- Selector switch is set to **SAFE**.
- Magazine is locked into the magazine well.
- Bolt is forward and locked (a round in the chamber).
- Ejection port cover should be closed.

Go from **GREEN** to **BLACK**.
- Firer is authorized to enter the **SHOT PROCESS**.
- Magazine is locked into the magazine well.
- Weapon is charged (racked).
- A round is chambered, bolt is forward and locked.
- Firer enters the **SHOT PROCESS**.
- Weapon is on **FIRE**.

Command given to direct a GREEN weapon safety status:

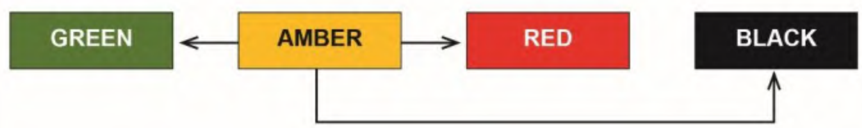
GREEN AND CLEAR or GO GREEN

Figure 1-2. M4-/M16-series weapons, green weapon safety status

△

M4-Series/M16-Series/Sniper Weapon Systems

AMBER STATUS



AMBER
- Firer is directed to PREPARE AMBER.
- Verify **GREEN and CLEAR**.
- Slide is **FORWARD**.
- Ammunition is introduced to the weapon; magazine locked into the magazine well.

Go from AMBER to **GREEN** .
- Clear weapon.

Go from AMBER to **RED.**
- Firer is directed to **MAKE READY**.
- Place the weapon on **SAFE**.
- Charge or rack the weapon.
- Round is chambered.
- Bolt is **FORWARD**.

Go from AMBER to **BLACK**.
- Firer is authorized to enter the **SHOT PROCESS**.
- Charge or rack the weapon.
- Round is chambered.
- Bolt is **FORWARD**.
- Firer enters the **SHOT PROCESS**.
- Weapon is on **FIRE**.

AMBER is a preparatory status and is ony used at the discretion of the commander.

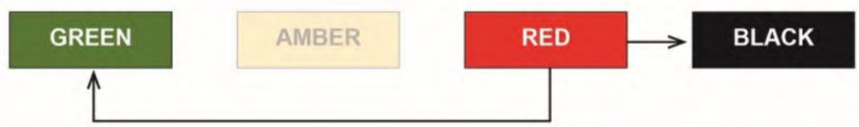
Command given to direct an AMBER weapon safety status:

PREPARE AMBER

Figure 1-3. M4-/M16-series weapons, amber weapon safety status

M4-Series/M16-Series/Sniper Weapon Systems

RED STATUS



RED
- Firer is directed to **MAKE READY**.
- Selector switch is set to **SAFE**.
- Magazine is locked into the magazine well.
- Bolt is **FORWARD** and locked, a round is in the chamber.
- Ejection port cover may be closed.

Go from **RED** to **GREEN**.
- Clear weapon.

Go from **RED** to **BLACK**.
- Firer is authorized to enter the **SHOT PROCESS**.
- Firer enters the **SHOT PROCESS**.
- Selector switch is set to **FIRE**.

The weapon cannot go from **RED** directly to **AMBER**.

The weapon must go **GREEN AND CLEAR** first, then **PREPARE AMBER**.

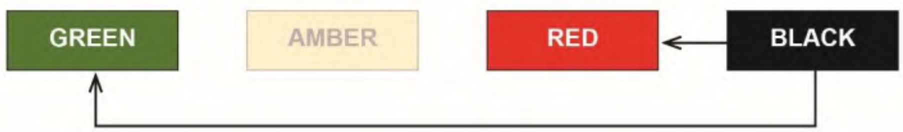
Command given to direct a RED weapon safety status:

MAKE READY

Figure 1-4. M4-/M16-series weapons, red weapon safety status

M4-Series/M16-Series/Sniper Weapon Systems

BLACK STATUS



BLACK
- The magazine is locked into the magazine well.
- Bolt is **FORWARD** and locked, a round is in the chamber.
- Ejector port cover may be closed.
- Firer is authorized to enter the **SHOT PROCESS**.
- Selector switch is set to **FIRE**.

Go from **BLACK** to **GREEN**.
- Clear weapon.

Go from **BLACK** to **RED**.
- Firer is directed to **CEASE FIRE** or **MAKE READY.**
- Selector switch is set to **SAFE**.

The weapon cannot go from **BLACK** directly to **AMBER**.

The weapon must go **GREEN AND CLEAR** first, then **PREPARE AMBER**.

The rules of engagement (ROE) or command of execution authorize a firer to enter the **SHOT PROCESS** in a **BLACK** weapon safety status.

CONDITIONS OF THE ROE HAVE BEEN MET

Figure 1-5. M4-/M16-series weapons, black weapons safety status

△

WEAPONS CONTROL STATUS

1-20. A ***weapons control status (WCS)*** is a tactical method of fire control given by a leader that incorporates the tactical situation, rules of engagement for the area of operations, and expected or anticipated enemy contact. The WCS outlines the target identification conditions under which friendly elements may engage a perceived threat with direct fire.

1-21. Table 1-2 provides a description of the standard WCS used during tactical operations, both in training and combat. They describe when the firer is authorized to engage a threat target once the threat conditions have been met.

Table 1-2. Weapons Control Status

WEAPONS CONTROL STATUS	DESCRIPTION
WEAPONS HOLD	Engage only if engaged or ordered to engage.
WEAPONS TIGHT	Engage only if target ***is positively identified*** as ***enemy***.
WEAPONS FREE	Engage targets ***not positively identified*** as ***friendly***.

1-22. A weapon control status and a weapons safety status are both implemented and available to leaders to prevent fratricide and limit collateral damage. These postures or statuses are typically suited to the area of operation or type of mission and should always be clearly outlined to all Soldiers, typically in the operations order (OPORD), warning order (WARNORD), or fragmentary order (FRAGORD).

OVERMATCH

1-23. Overmatch is the Soldier applying their learned skills, employing their equipment, leveraging technology, and applying the proper force to create an unfair fight in favor of the Soldier. To achieve and maintain overmatch against any threat, this publication focuses on providing information that develops the Soldier's direct fire engagement skills using the following attributes:

- **Smart** – the ability to routinely generate understanding through changing conditions.
- **Fast** – the ability to physically and cognitively outmaneuver adversaries.
- **Lethal** – deadly in the application of force.
- **Precise** – consistently accurate in the application of power to ensure deliver of the right effects in time, space, and purpose.

1-24. This requires the Soldier to understand the key elements that build the unfair advantage and exploit them at every opportunity during tactical operations. The components of overmatch are:

- **Target detection, acquisition, and identification** – the ability of the Soldier to detect and positively identify any suspected target as hostile at greater distances than their adversary. This relies upon Soldier training and their ability to leverage the capabilities of their optics, thermals, and sensors.
- **Engagement range** – provide the Soldier with weapons, aiming devices, and ammunition capable of striking and defeating a threat at a greater range than the adversary can detect or engage the friendly force with effective fires.
- **Limited visibility** – provide the Soldier to make operations during limited visibility an advantage through technology and techniques, and compound their adversary's disadvantages during those conditions.
- **Precision** – provide a weapon and ammunition package that enhances the Soldier's consistent application of shots with a level of precision greater than the adversary's.
- **Speed** – the weapon, aiming devices, and accessories a Soldier employs must seamlessly work in unison, be intuitive to use, and leverage natural motion and manipulations to facilitate rapid initial and subsequent shots during an engagement at close quarters, mid-, and extended ranges.
- **Terminal performance** – ensures that precise shots delivered at extended ranges provide the highest probability to defeat the threat through exceptional ballistic performance.

1-25. Although not a component of overmatch, exceptional training is critical to create smart, fast, lethal, and precise Soldiers. Training builds proficiency in a progressive, logical, and structured manner and provides Soldiers the skills necessary to achieve overmatch against any adversary. This requires the training program to provide experience to the Soldier in all the components of overmatch to their fullest extent possible in the shortest amount of time.

TARGET DETECTION, ACQUISITION, AND IDENTIFICATION

1-26. The first component of overmatch at the Soldier level is the ability to detect targets as far away as possible during limited and low visibility conditions. This manual describes the aiming devices for the service rifle that enhance the Soldier's target detection and acquisition skills. The Soldier must be able to detect, acquire, and identify targets ***at ranges beyond*** the maximum effective range of their weapon and ammunition.

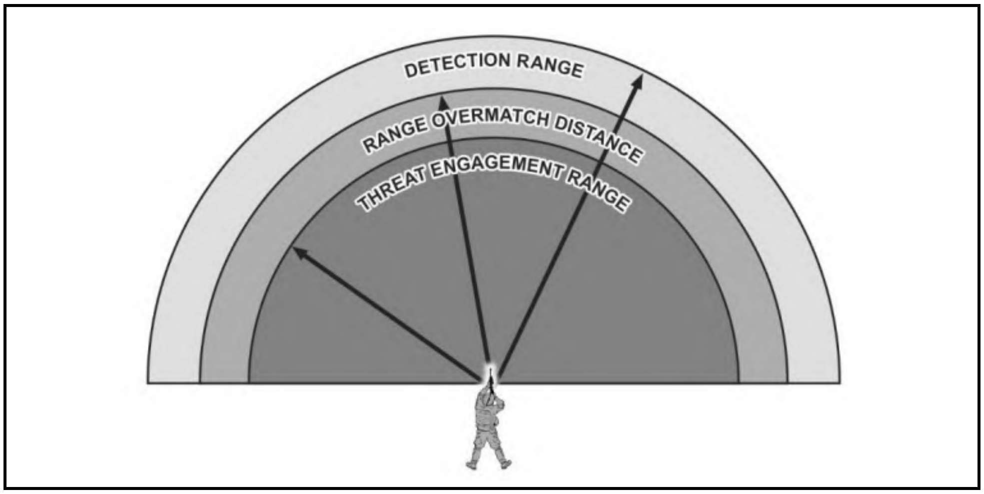
1-27. This publication also provides key recognition information to build the Soldier's skills in correctly identifying potential targets as friend, foe, or noncombatant (neutral) once detected.

ENGAGEMENT RANGE

1-28. To ensure small unit success, the Soldier requires weapon systems that can effectively engage threats at ranges greater than those of their adversaries. This creates a standoff distance advantage that allows friendly forces to destroy the target outside the threat's maximum effective range.

1-29. Range overmatch provides a tactical engagement buffer that accommodates the Soldier's time to engage with precision fires. For example, a Soldier that has the capability to effectively engage personnel targets at a range of 500 meters will have range overmatch of 10 to 20 percent over a threat rifleman. That 10 to 20 percent range difference is equivalent to a distance of 40 to 80 meters, which is approximately the distance a maneuvering threat can traverse in 15 to 40 seconds.

△ 1-30. Figure 1-6 portrays the battlefield from the Soldier's perspective. With mobile, maneuvering threats, the target acquisition capabilities must compliment the engagement of those threats at the maximum effective range of the weapon, optic, and ammunition.



△ **Figure 1-6. Small unit range overmatch**

LIMITED VISIBILITY

1-31. Soldiers must be able to detect, acquire, identify, and engage threats in all light conditions, regardless of the tactical situation. To provide that capability, aiming devices are provided that minimize the effects of limited visibility, but not completely.

1-32. Image intensifiers and thermal optics provide a significant overmatch capability, but they also have limitations and disadvantages. A general discussion of their capabilities, particularly what those systems can view within the spectrum of light is provided. Soldiers must understand what can be "seen" or viewed and what cannot when using their assigned equipment. Understanding the advantages and limitations of their equipment has a direct impact on force protection, fratricide and collateral damage prevention, and maintaining overmatch during tactical operations.

PRECISION

1-33. The Army standard service rifle is designed with a specific level of accuracy out to its maximum effective range. This level of accuracy is more consistent and reliable through the use of magnified aiming devices and superior ammunition. The Soldier must build the skills to use them effectively to deliver precision fires during tactical engagements.

SPEED

1-34. The close fight requires rapid manipulations, a balance of speed and accuracy, and very little environmental concerns. Soldiers must move quickly and efficiently through their manipulations of the fire control to maintain the maximum amount of muzzle orientation on the threat through the shot process. This second-nature efficiency of movement only comes from regular practice, drills, and repetition.

1-35. The foundation of speed of action is built through understanding the weapon, ammunition, ballistics, and principles of operation of the associated aiming devices. It is reinforced during drills (appendix D), and the training program of the unit.

1-36. The goal of training to overmatch is to increase the speed at which the Soldier detects a threat, identifies it as hostile, and executes the shot process with the desired target effect. This manual is constructed to provide the requisite information in a progressive manner to build and reinforce Soldier understanding, confidence, and ability to execute tactical operations with speed and smooth fluidity of motion.

TERMINAL BALLISTIC PERFORMANCE

1-37. Terminal ballistic performance is the actions of a projectile from the time it strikes an object downrange until it comes to rest. The ammunition used with the service rifle performs exceptionally well out to its maximum effective range and beyond. This manual provides information on the various munition types available for training and combat, their capabilities and purpose, and the service (combat) round’s terminal ballistic performance (see appendix A, Ammunition, and appendix B, Ballistics).

1-38. Soldiers must understand the capabilities of their ammunition, whether designed for training or combat use. That understanding creates a respect for the weapon and ammunition, reinforces the precepts of safe weapons handling, and an understanding of the appropriate skills necessary to deliver lethal fires.

1-39. Soldiers that understand the “how” and “why” of their weapon system, aiming devices, ammunition, and procedures work or function develops a more comprehensive understanding. That level of understanding, coupled with a rigorous training program that builds and strengthens their skills create more proficient Soldiers. The proficiencies and skills displayed during training translate into smart, fast, lethal and precise Soldiers for the small unit during decisive action combat operations.

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Chapter 2

Rifle and Carbine Principles of Operation

This chapter provides the general characteristics, description, available components, and principles of operation for the M4- and M16-series weapons. It provides a general overview of the mechanics and theory of how weapons operate, key terms and definitions related to their functioning, and the physical relationship between the Soldier, the weapon, and the optics/equipment attached to the weapon.

ARMY STANDARD SERVICE RIFLE

2-1. The Army standard service rifle is either the M16-series rifle or M4-series carbine. These weapons are described as a lightweight, 5.56-mm, magazine-fed, gas-operated, air-cooled, shoulder-fired rifle or carbine. They fire in semiautomatic (single-shot), three-round burst, or in automatic mode using a selector lever, depending on the variant. The weapon system has a standardized mounting surface for various optics, pointers, illuminators, and equipment, to secure those items with common mounting and adjustment hardware.

2-2. Each service rifle weapon system consists of components, assemblies, subassemblies, and individual parts. Soldiers must be familiar with these items and how they interact during operation.

- **Components** are uniquely identifiable group of fitted parts, pieces, assemblies or subassemblies that are required and necessary to perform a distinctive function in the operation of the weapon. Components are usually removable in one piece and are considered indivisible for a particular purpose or use.
- **Assemblies** are a group of subassemblies and parts that are fitted to perform specific set of functions during operation, and cannot be used independently for any other purpose.
- **Subassemblies** are a group of parts that are fitted to perform a specific set of functions during operation. Subassemblies are compartmentalized to complete a single specific task. They may be grouped with other assemblies, subassemblies and parts to create a component.
- **Parts** are the individual items that perform a function when attached to a subassembly, assembly, or component that serves a specific purpose.

2-3. Each weapon consists of two major components: the upper receiver and the lower receiver. These components are described below including their associated assemblies, subassemblies, and parts.

UPPER RECEIVER

2-4. An aluminum receiver helps reduce the overall weight of the rifle/carbine and allows for mounting of equipment and accessories. The upper receiver consists of the following (see figure 2-1):

- Barrel assembly.
  - **Barrel**. The bore and chamber of the barrel are chrome-plated to reduce wear and fouling over the life of the weapon.
  - **Flash hider or compensator**. Located at the end of the barrel, is provided to reduce the signature of the weapon during firing and reduce barrel movement off target during firing.
  - **Sling swivel**. The attachment hardware for the sling system used to properly carry the weapon.
  - **Front sight assembly**. Includes an adjustable front sight post that facilitates zeroing the weapon, serves as the forward portion of the iron sight or back up iron sight, and assists with range determination.
  - **Adapter rail system (ARS)**. Provided in varying lengths, depending on the variant applied. Used to attach common aiming devices or accessories.
  - **Slip ring**. Provides a spring loaded locking mechanism for the weapon's hand guards.
  - **Ejection port**. Provides an opening in the upper receiver to allow ammunition or spent casing ejection from the weapon.
  - **Ejection port cover**. Provides a dust cover for the ejection port, protecting the upper receiver and bolt assembly from foreign objects.
  - **Forward assist assembly**. Provides a Soldier applied mechanical assist to the bolt assembly during operations.

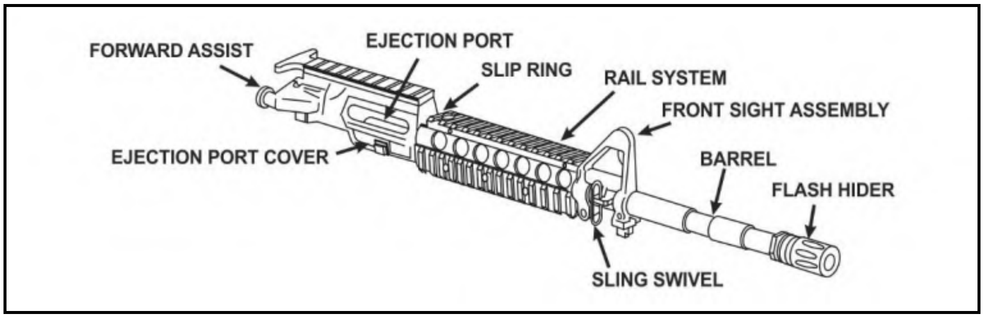


Figure 2-1. Upper receiver

LOWER RECEIVER

2-5. The lower receiver shown in figure 2-2, on page 2-3, consists of the following components, assemblies, and parts:

- **Trigger assembly**. Provides the trigger, pins, springs, and other mechanical components necessary to fire the weapon.
- **Bolt catch**. A mechanical lever that can be applied to lock the bolt to the rear by the Soldier, or automatically during the cycle of function when the magazine is empty (see page 2-4).
- **Rifle grip**. An ambidextrous pistol-type handle that assists in recoil absorption during firing.
- **Magazine catch assembly**. Provides a simple, spring-loaded locking mechanism to secure the magazine within the magazine well. Provides the operator an easy to manipulate, push-to-release textured button to release the magazine from the magazine well during operation.
- **Buttstock assembly**. Contains the components necessary for proper shoulder placement of the weapon during all firing positions, returning the bolt assembly to battery, and managing the forces of recoil during operation.
  - The M4-/M4A1-series carbine has a four position collapsible buttstock assembly: Closed, ½ open, ¾ open, and fully-open.
  - M16-series rifles have a fixed buttstock with cleaning kit compartment or an applied modified work order (MWO) collapsible buttstock.
- **Action spring**. Provides the stored energy to return the bolt carrier assembly back into battery during operation.
- **Lower receiver extension**. Provides space for the action spring and buffer assembly during operation.

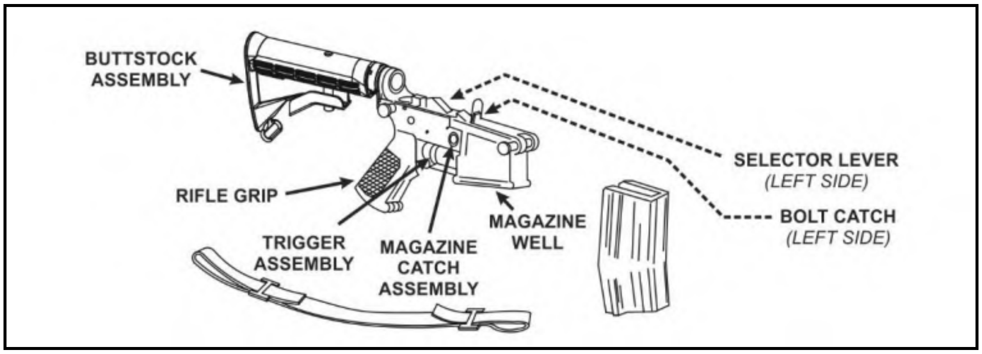


Figure 2-2. Lower receiver

2-6. Additional information on the characteristics and components of the M4-/M4A1-/M16-series weapons can be found in technical manual (TM) 9-1005-319-10. Soldiers will use the technical manual for preventative maintenance checks and services (PMCS), and operation under normal conditions, as well as more detailed information on the principles of operation.

2-7. Each variant of the rifle and carbine have subtle capabilities differences. The primary differences are shown in table 2-1, and are specific to the weapon's selector switch, buttstock, and barrel length.

Table 2-1. Model Version Firing Methods Comparison

Weapon	Selector Switch Position			Buttstock	Barrel Length
M16A2	SAFE	SEMI	BURST	Full	20 inches
M16A3	SAFE	SEMI	AUTO	Full	20 inches
M16A4	SAFE	SEMI	BURST	Full	20 inches
M4	SAFE	SEMI	BURST	Collapsible	14.5 inches
M4A1	SAFE	SEMI	AUTO	Collapsible	14.5 inches
Legend: SEMI: semi-automatic firing selection AUTO: fully automatic firing selection BURST: three-round burst firing selection					

CYCLE OF FUNCTION

2-8. The ***cycle of function*** is the mechanical process a weapon follows during operation. The information provided below is specific to the cycle of function as it pertains specifically to the M4- and M16-series weapons.

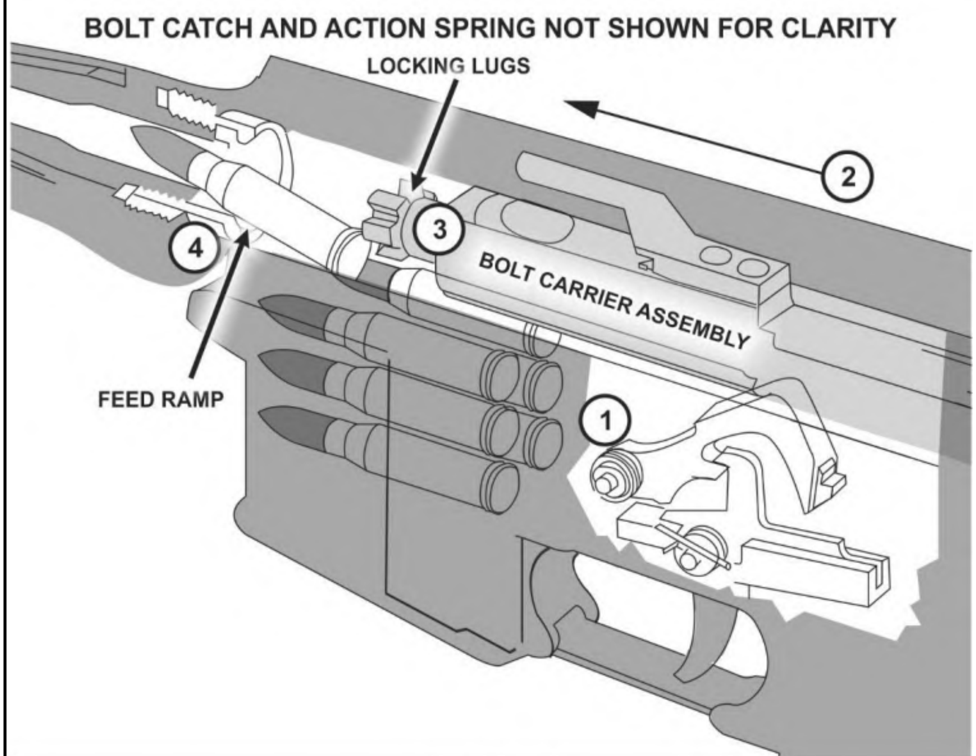
2-9. The cycle starts when the rifle is ready with the bolt locked to the rear, the chamber is clear, and a magazine inserted into the magazine well with at least one cartridge. From this state, the cycle executes the sequential phases of the cycle of functioning to fire a round and prepare the weapon for the next round. The phases of the cycle of function in order are—

- Feeding.
- Chambering.
- Locking.
- Firing.
- Unlocking.
- Extracting.
- Ejecting.
- Cocking.

2-10. For the weapon to operate correctly, semiautomatic and automatic weapons require a ***system of operation*** to complete the cycle of functioning. The M4- and M16-series weapons use a direct impingement gas operating system. This system uses a portion of the high pressure gas from the cartridge being fired to physically move the assemblies and subassemblies in order to complete the cycle of function.

FEEDING

2-11. Feeding is the process of mechanically providing a cartridge of ammunition to the entrance of the chamber (see figure 2-3).

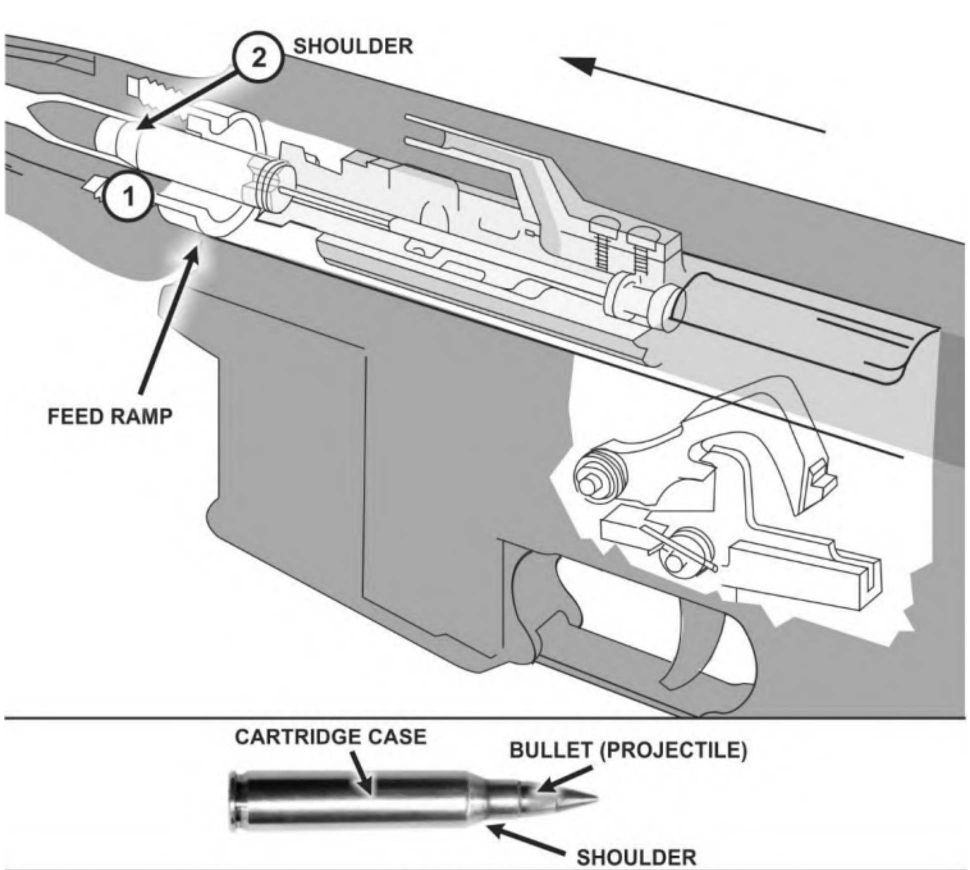


FEEDING
1. Bolt catch is released, either physically by the firer or automatically during operation. 2. The action spring exerts its force, pushing the bolt carrier assembly forward. 3. One of the two bottom locking lugs on the bolt face strike the uppermost round in the magazine, pushing it by the cartridge case head. 4. The front bottom edge of the bullet (projectile) is guided to the chamber area by following the corresponding feed ramp.

Figure 2-3. Feeding example

CHAMBERING

2-12. Chambering is the continuing action of the feeding round into the chamber of the weapon (see figure 2-4).



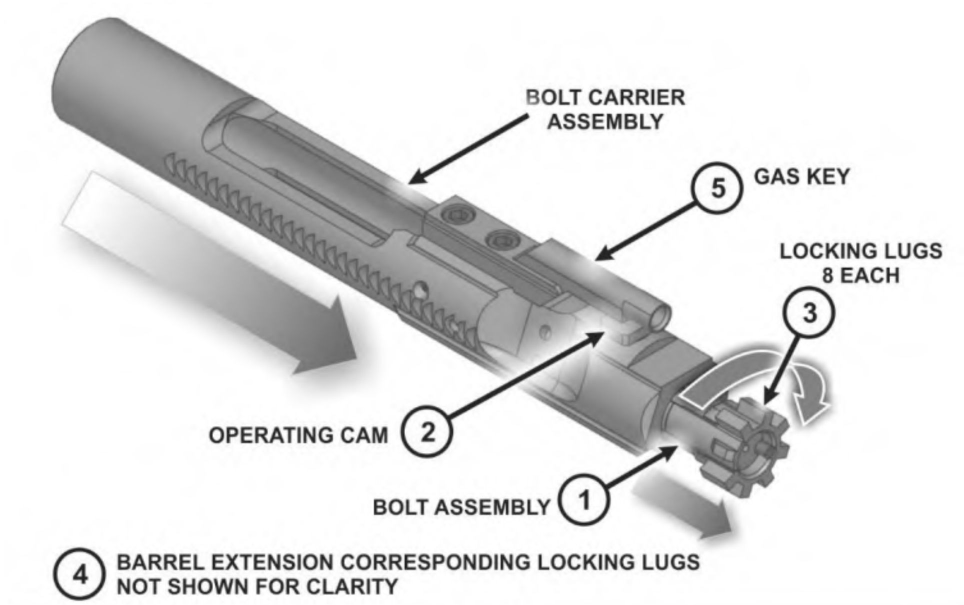
CHAMBERING

1. The cartridge is driven up the corresponding feed ramp and enters the chamber.
2. Chambering is completed when the shoulder of the cartridge (where the case tapers) and makes contact with the corresponding shoulder area of the chamber.

Figure 2-4. Chambering example

LOCKING

2-13. Locking is the process of creating a mechanical grip between the bolt assembly and chamber with the appropriate amount of headspace (clearance) for safe firing (see figure 2-5). With the M4- and M16-series weapons, locking takes place simultaneously with the final actions of chambering.



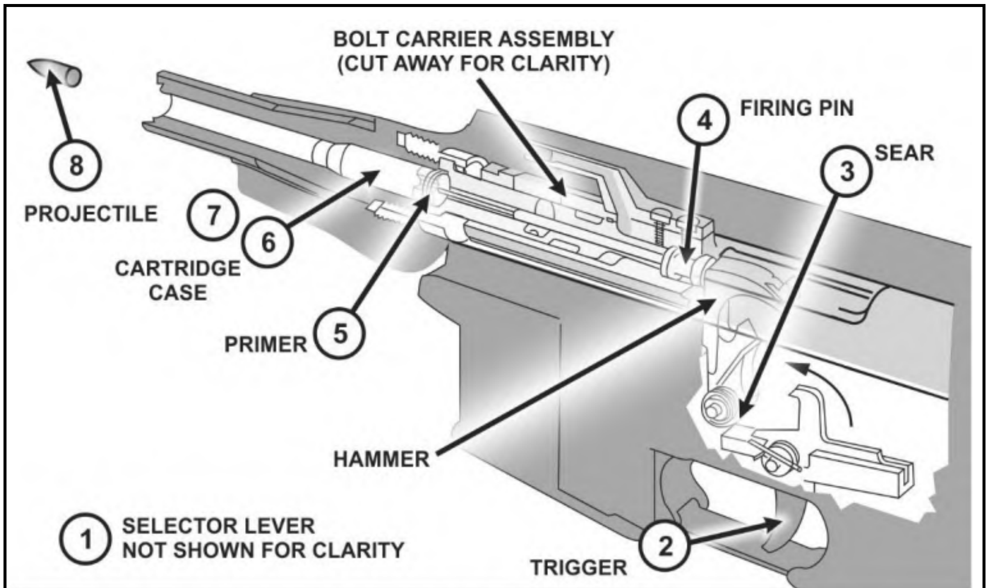
LOCKING

1. At the end of the chambering phase, the bolt assembly stops forward movement at the face of the chamber.
2. Although the bolt assembly has stopped its forward movement, the bolt carrier assembly continues to travel forward, causing the operating cam to follow the operating cam groove.
3. The operating cam is guided by a slow rotational groove in the bolt assembly, and rotates the bolt and locking lugs counter-clockwise.
4. As the operating cam rotates, the bolt assembly's locking lugs rotate behind corresponding lugs in the barrel extension at the face of the chamber.
5. As the bolt carrier assembly finishes its forward movement, the gas key creates a seal around the gas tube fitting.

Figure 2-5. Locking example

FIRING

2-14. Firing is the finite process of initiating the primer detonation of the cartridge and continues through shot-exit of the projectile from the muzzle (see figure 2-6).



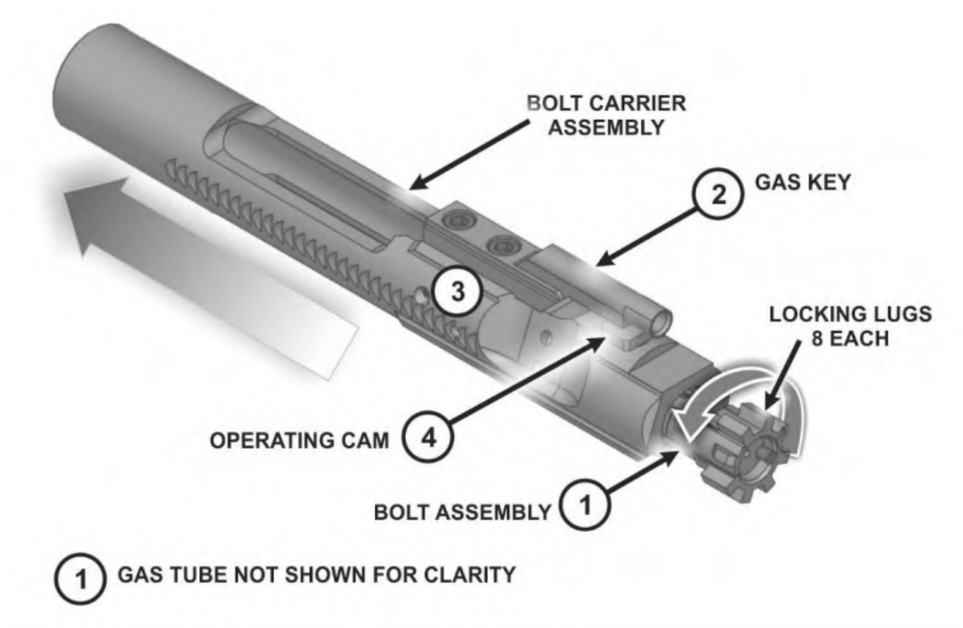
FIRING

1. Firing is initiated when the weapon is on SEMI or BURST/AUTO, a round is chambered, and the trigger is pressed.
2. Once the trigger is pressed, the sear releases the hammer.
3. As the sear releases the hammer, the hammer spring exerts its force rotating the hammer forward through the bolt carrier assembly opening.
4. The hammer strikes the firing pin, pushing the loaded firing pin forward to the primer of the cartridge case.
5. The firing pin crushes the cartridge primer, igniting the primer's charge.
6. The burning primer charge ignites the round's propellant.
7. As the propellant burns, the cartridge case expands to the fullest extent of the chamber area and to the face of the bolt, sealing the gases within the bore.
8. The expending gas propels the projectile down the length of the bore.

Figure 2-6. Firing example

UNLOCKING

2-15. Unlocking is the process of releasing the locking lugs on the bolt face from the corresponding recesses on the barrel extension surrounding the chamber area (see figure 2-7).



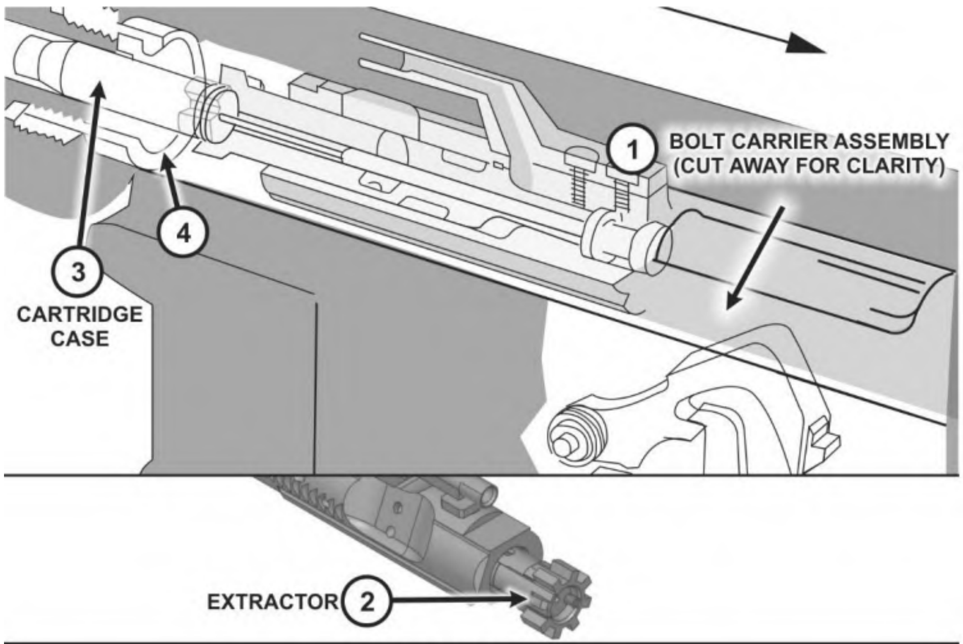
UNLOCKING

1. Once the round has fired and the projectile passes the gas port inside the bore, the impinged gases follow the path of least resistance up and rearward down the gas tube.
2. The rearward gases traveling down the gas tube apply their force through the gas key, filling the area inside the bolt carrier assembly behind the gas rings on the bolt assembly.
3. The expanding gas pushes the bolt carrier assembly rearward while the gas seal rings retain the bolt forward.
4. While the bolt carrier assembly moves rearward, the operating cam follows the operating cam groove, and rotates the bolt and its locking lugs clockwise.

Figure 2-7. Unlocking example

EXTRACTING

2-16. Extracting is the removal of the expended cartridge case from the chamber by means of the extractor (see figure 2-8).



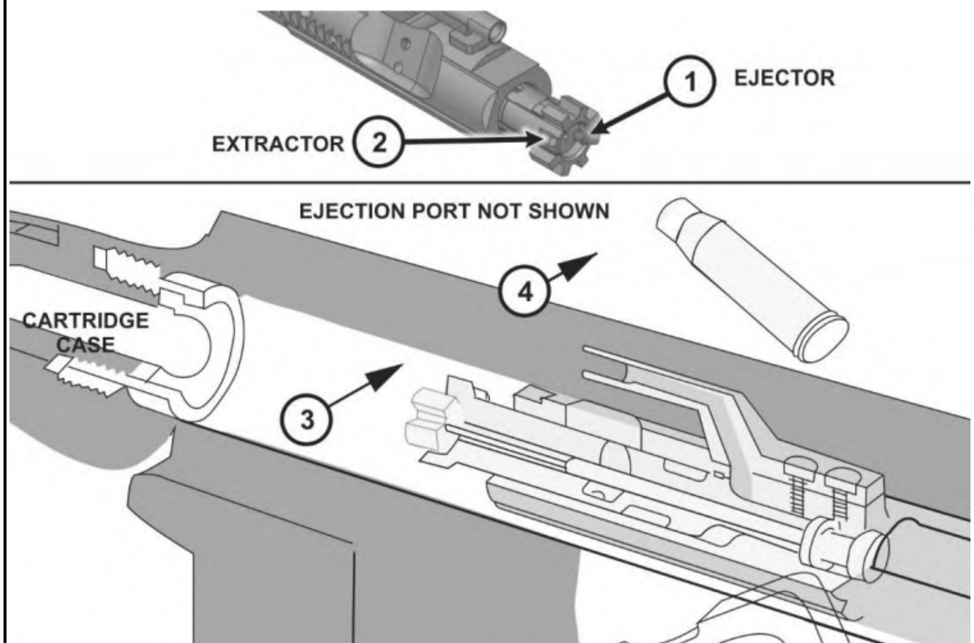
EXTRACTING

1. The bolt carrier assembly and bolt continue to move rearward.
2. The extractor on the right side of the bolt pulls the expended cartridge case from the chamber using its grip on the cartridge rim.
3. Initially, the extractor breaks the seal of the expended cartridge case from the chamber area.
   The extractor's spring loaded force maintains pressure on the cartridge rim while it continues to pull the cartridge out of the chamber.
4. The extracting phase continues until the cartridge case is clear of the chamber area but has not exited the weapon.

Figure 2-8. Extraction example

EJECTING

2-17. Ejecting is the removal of the spent cartridge case from the weapon itself (see figure 2-9.)

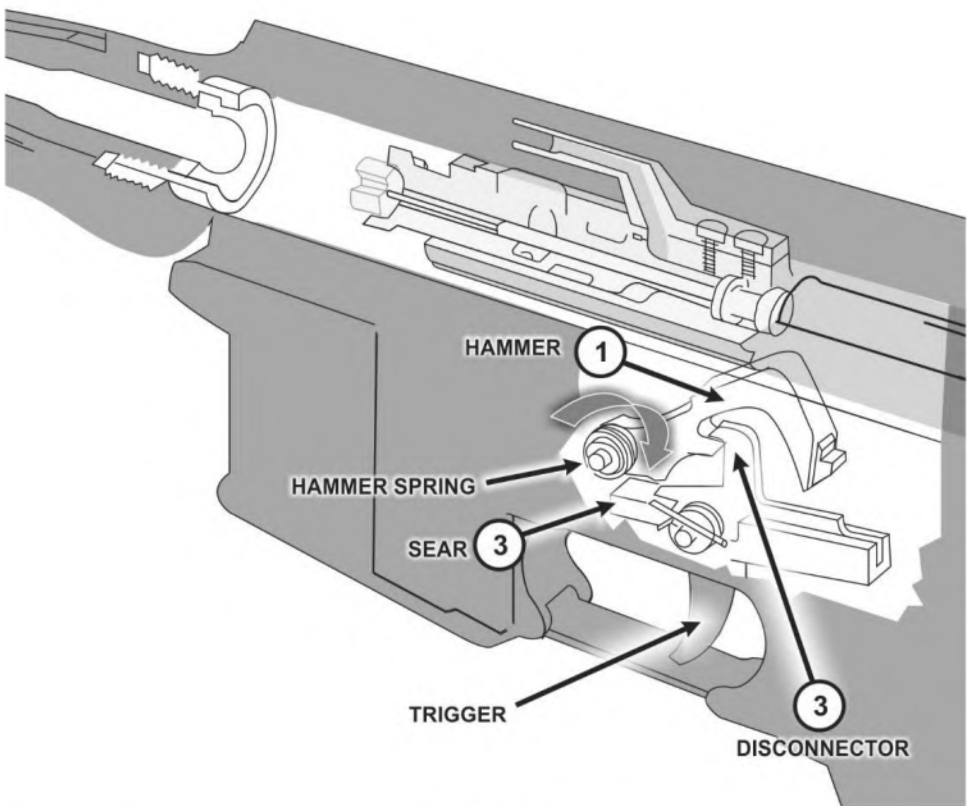


EJECTING
1. The spring loaded push rod ejector located in the bolt assembly exerts its force on the left side of the cartridge case.
2. The extractor maintains constant pressure and grip on the right side of the cartridge case rim.
3. Once the mouth of the cartridge case is clear of the upper receiver's ejection port, the ejector pushes the left side of the cartridge case, and pushes the casing out of the upper receiver to the right.
4. The extractor maintains its grip on the cartridge rim, creating a pivot point during the final ejection of the cartridge case.

Figure 2-9. Ejection example

COCKING

2-18. Cocking is the process of mechanically positioning the trigger assembly's parts for firing (see figure 2-10). The cocking phase completes the full cycle of functioning.



COCKING

1. As the bolt carrier assembly travels fully to the rear, it rotates the hammer and compresses the hammer spring.
2. As the hammer rotates rearward, the disconnector catches the hammer inner bevel.
3. Once the trigger is released , the sear engages on the hammer.

Figure 2-10. Cocking example

COOLING

2-19. Cooling is the process of dissipating heat from the weapon during firing. Although not part of the cycle of functioning, cooling the weapon during firing is critical to ensure the weapon continues to operate efficiently. Firing a round generates heat and pressure within the chamber and bore, which radiates outward through the metal of the barrel.

2-20. The temperature generated by the burning of propellant powders is over one thousand degrees Fahrenheit. Some of the heat produced during firing is retained in the chamber, bore, and barrel during firing and poses a significant hazard to the firer.

2-21. How this heat is absorbed by the weapon and dissipated or removed, is a function of engineering and design. Lightweight weapons like the M4 and M16 do not have sufficient mass to withstand thermal stress efficiently. The weapon system must have a means to radiate the heat outward, away from the barrel to allow continuous firing.

2-22. There are three methods to reduce the thermal stress on a weapon. The M4- and M16-series of weapons use all three of these methods to varying degrees to cool the chamber, bore, and barrel to facilitate continuous operation. These methods of cooling are—

- **Radiational cooling** – allows for the dissipation of heat into the surrounding cooler air. This is the least efficient means of cooling, but is common to most small arms weapons, including the rifle and carbine.
- **Conduction cooling** – occurs when a heated object is in direct physical contact with a cooler object. Conduction cooling on a weapon usually results from high chamber operating temperatures being transferred into surrounding surfaces such as the barrel and receiver of the weapon. The transfer from the chamber to the cooler metals has the net effect of cooling the chamber. Thermal energy is then carried away by other means, such as radiant cooling, from these newly heated surfaces.
- **Convection cooling** – requires the presence of a moving air current. The moving air has greater potential to carry away heat. The hand guards and ARS of the rifle and carbine are designed to facilitate air movement. The heat shield reflects heat energy away from the hand guard and back towards the barrel. The net effect is an updraft that brings the cooler air in from the bottom. This process establishes a convection cycle as heated air is continually replaced by cooler air.

2-23. Soldiers should be aware of the principles of the weapon's cooling methods' direct effects on their line of sight when viewing a target through an aiming device. Dissipating heat along the length of the barrel can create a mirage effect within the line of sight which can cause a significant error to the true point of aim when using magnified optics.

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Chapter 3

Aiming Devices

Every weapon has a method of aiming, that is either fixed or attached to operate the weapon effectively. Soldiers must be familiar with the various aiming devices, how they operate, and how to employ them correctly to maximize their effectiveness. This chapter provides the principles of operation of the most widely available aiming devices, and provides general information concerning their capabilities, function and use.

3-1. An aiming device is used to align the Soldier, the weapon, and the target to make an accurate and precise shot. Each aiming device functions in a different manner. To employ the weapon system to its fullest capability, the Soldier must understand how their aiming devices function.

3-2. The following aiming devices are described within this chapter:

- **Iron**. Iron represent the various types of mechanical sighting systems available on the weapon. They are available in two distinct types:
  - Iron sights (rear aperture and front sight post).
  - Back up iron sights (BUIS).
- **Optics**. These are optics predominantly for day firing, with limited night capability. The optics found within this manual come in two types:
  - Close Combat Optic (CCO).
  - Rifle Combat Optic (RCO, previously referred to as the Advanced Combat Optic Gunsight or ACOG).
- **Thermal**. These are electronic sighting systems that provide a view of the field of view (FOV) based on temperature variations. There are numerous variants of thermal optics, but are grouped into one type:

  Thermal Weapon Sight (TWS).
- **Pointer/Illuminator/Laser**. These aiming devices use either a laser beam, flood light, or other light to aim the weapon at the target. There are three types of pointers, illuminators, and lasers used by the service rifle:
  - Advanced Target Pointer Illuminator Aiming Light (ATPIAL).
  - Dual Beam Aiming Laser–Advanced (DBAL-A2).
  - Illuminator, Integrated, Small Arms (STORM).

UNITS OF ANGULAR MEASUREMENT

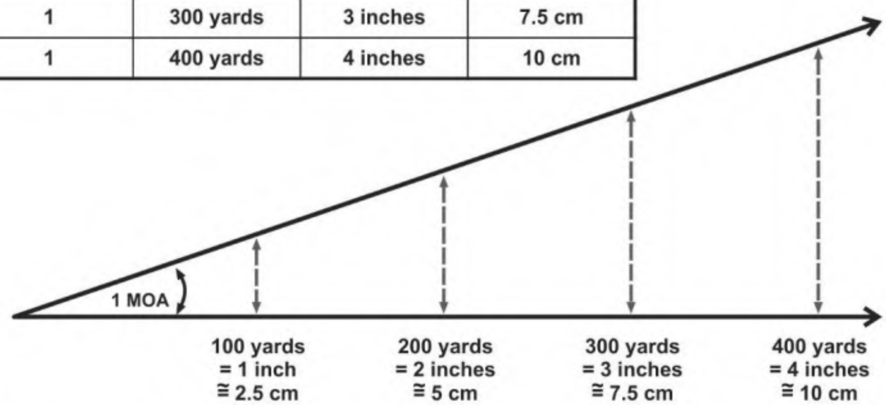
3-3. There are two major units of angular measurement the Army uses: mils and minutes of angle (MOA). These two different units are commonly used terms to describe a measurement of accuracy when firing a weapon, system, or munition. They typically include the accuracy of a specific weapon, the performance of ammunition, and the ability of a shooter as it relates to firing the weapon.

MINUTE OF ANGLE

3-4. A minute of angle (MOA) is an angular unit of measurement equal to $1/60^{th}$ of a degree (see figure 3-1). The most common use of MOA is when describing the distance of change required when zeroing a weapon.

3-5. One MOA equals 1.047 inches per 100 yards. For most applications, a Soldier can round this to 1 inch at 100 yards or 1.1 inches at 100 meters to simplify their arithmetic.

MOA	At Distance	Equals	
1	100 yards	1 inch	2.5 cm
1	200 yards	2 inches	5 cm
1	300 yards	3 inches	7.5 cm
1	400 yards	4 inches	10 cm



Angle dimension exaggerated for clarity. Examples are not to scale.
Centimeter (cm) conversions are approximate.

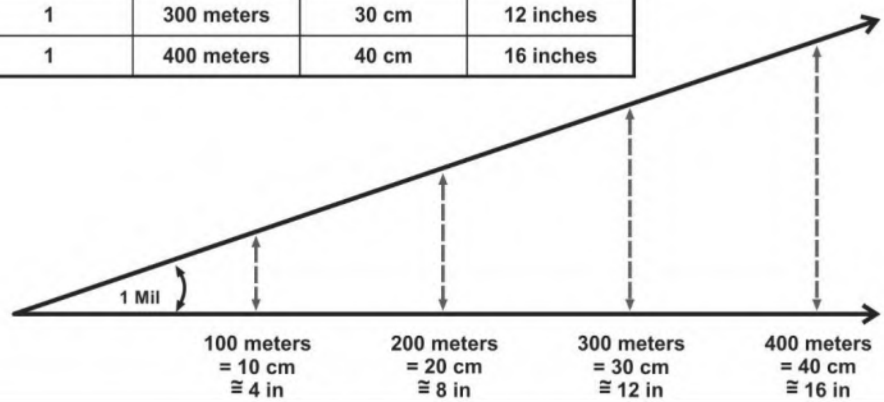
MINUTE OF ANGLE (MOA) Unit of Measeurement	
There are 360 degrees in a circle.	There are 60 MOA in a degree.
There are 21,600 MOA in a circle.	1 MOA at 100 yards ≈ 1 inch.
Smaller measurements of an MOA are described in fractions, not seconds (i.e., 1/2 MOA).	

Figure 3-1. Minute of angle example

MILS

3-6. The mil is a common unit of angular measurement that is used in direct fire and indirect fire applications. (see figure 3-2)

Mil	At Distance	Equals	
1	100 meters	10 cm	4 inches
1	200 meters	20 cm	8 inches
1	300 meters	30 cm	12 inches
1	400 meters	40 cm	16 inches



MILS Unit of Measurement	
There are 360 degrees in a circle.	There are 17.78 mils in a degree.
There are 6400 mils in a circle	1 mil at 100 meters = 10 cm.

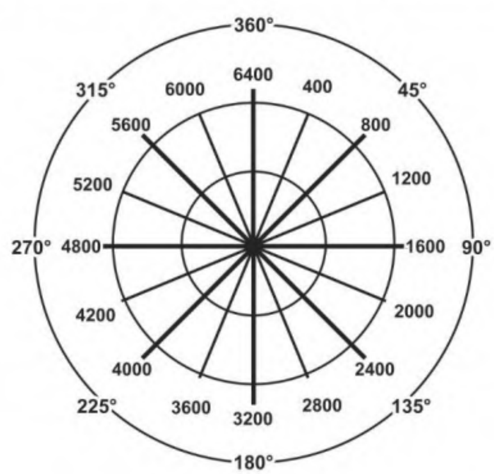


Figure 3-2. Mil example

3-7. This mil to degree relationship is used when describing military reticles, ballistic relationships, aiming devices, and on a larger scale, map reading and for indirect fire.

RETICLE

3-8. A reticle is a series of fine lines in the eyepiece of an optic, such as a CCO, TWS, or RCO (see figure 3-3) used as a measuring scale with included aiming or alignment points. Reticles use either mils or minute of angle for their unit of measurement.

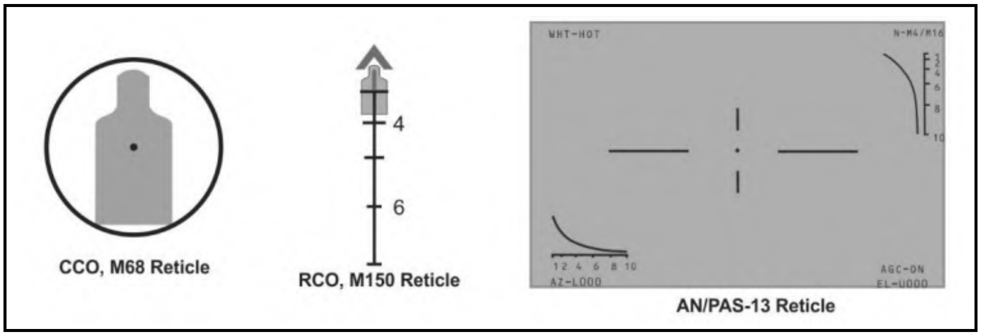


Figure 3-3. Close combat optic / Rifle combat optic reticle / Thermal reticle examples

STADIA RETICLE (STADIAMETRIC RETICLE)

3-9. Commonly used in the thermal weapon sight, a stadia reticle provides a means of rapidly determining the approximate range to target of a viewed threat, based on its standard dimensions. The stadia reticle (sometimes referred to as "stadiametric" or "choke sight") can provide approximate range to target information using width or height of a viewed dismounted target using standard threat dimensions (see figure 3-4).

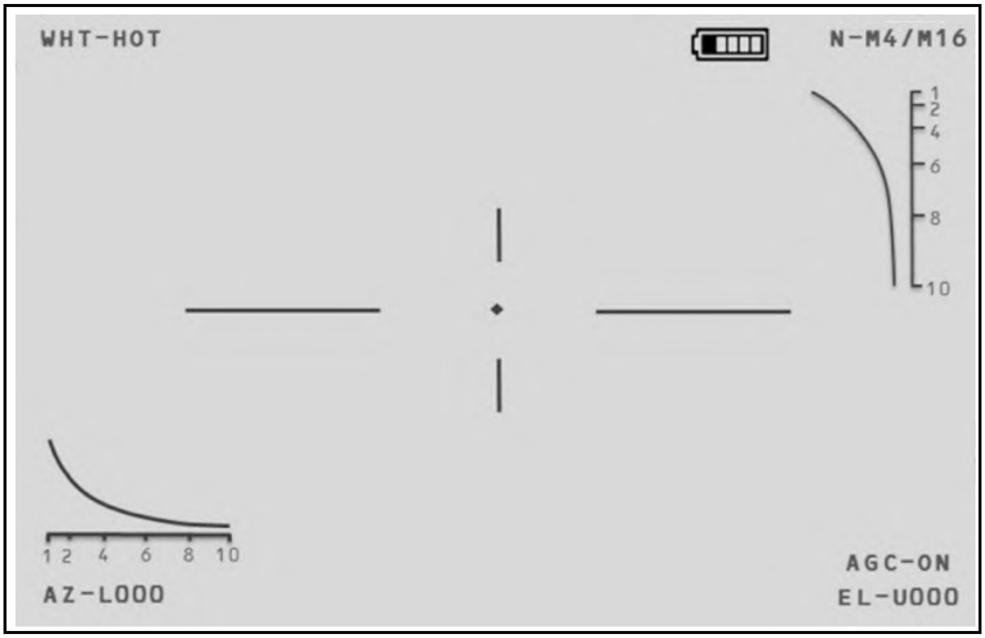


Figure 3-4. Stadia reticle example

3-10. There are two stadia reticles found on the rifle / carbine reticle within the thermal weapons sight; vertical and horizontal.

- **Vertical stadia**. At the lower left of the sight picture, Soldiers can evaluate the range to target of a standing dismounted threat.
- **Horizontal stadia**. In the upper right portion of the sight picture, Soldiers can evaluate the range to target of an exposed dismounted threat based on the width of the target.

ELECTROMAGNETIC SPECTRUM

3-11. A major concern for the planning and use of thermal and other optics to aid in the detection process is understanding ***how they function***, but more appropriately, what they can "see". Each device develops a digital representation of the scene or view it is observing based on what frequencies or wavelengths it can detect within the electromagnetic spectrum. (Note: Thermal devices see differences in heat.)

- **Thermal optics.** This equipment operates in the mid- and far-wavelength of the infrared band, which is the farthest of the infrared wavelengths from visible light. Thermal optics cannot translate ("see") visible light. Thermal optics cannot "see" infrared equipment such as infrared (IR) strobe lights, IR chemical lights, illuminators, or laser pointers. They can only identify emitted radiation in the form of heat (see figure 3-5 on page 3-7).
- **Image intensifiers (I2).** This equipment, such as night vision devices, use the near area of the infrared spectrum closest to the frequencies of visible light, as well as visible light to create a digital picture of the scene. These systems cannot "see" or detect heat or heat sources.

3-12. These sights generally operate on the principles of convection, conduction, and radiation (mentioned in chapter 2 of this publication). The sight "picks up" or translates the IR wavelength (or light) that is emitted from a target scene through one of those three methods.

3-13. Things to be aware of (planning considerations) with these optics are that they have difficulty imaging through the following:

- **Rain** – absorbs the IR emitted by the target, makes it difficult to see.
- **Water** – acts as a mirror and generally reflects IR, providing a false thermal scene.
- **Glass** – acts similar to water, interfering with the sensor's ability to accurately detect emitted radiation behind the glass.

3-14. Situations where IR can see better are the following:

- **Smoke** – will not obscure a target unless the chemical obscurant is extremely hot and dense, or if the target is sitting on top of the smoke source.
- **Dust** – may interfere with the accurate detection of the emitted thermal signature due to dust and debris density between the sensor and the target scene. Dust typically does not obscure the IR signature unless its temperature is similar to the target's.

3-15. Figure 3-5 depicts the areas of the electromagnetic spectrum. It details the various wavelengths within the spectrum where the aiming devices, night vision devices, and equipment operate. It illustrates where these items can and cannot "see" the others, respectively, within their operating range.

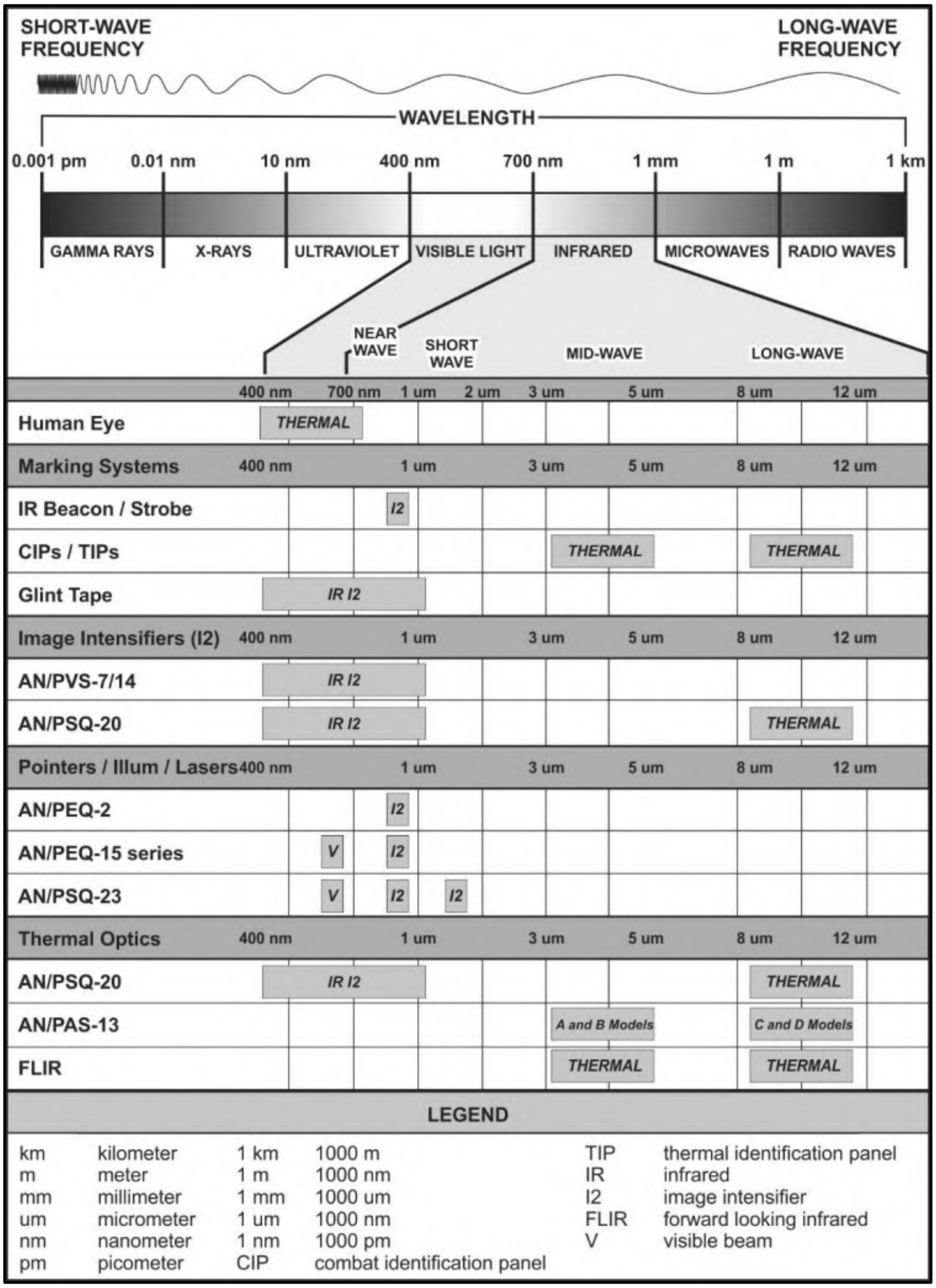


Figure 3-5. Electromagnetic spectrum

OPTICS

3-16. Optics are sighting aids for rifles and carbines that provide enhanced aim point reticles, and may include magnified fields of view. Optics are specific to day operations, although may be used during limited visibility or night operations. They do not have any method of enhancing low light conditions.

3-17. Optics enhance the Soldier's ability to engage targets accurately and at extended ranges (see figure 3-6 on page 3-9). The available optics for mounting on the M4- and M16-series modular weapon system are:

- Iron Sight.
- Back Up Iron Sight (BUIS).
- CCO, M68.
- RCO, M150.

IRON SIGHT

3-18. Some versions of the M4 and M16 come with a carrying handle with an integrated rear aperture. The carrying handle may or may not be removable, depending on the version of the service rifle.

3-19. The integrated rear aperture includes adjustments for both azimuth (wind) and elevation. Specific instructions for zeroing these aiming devices are found in the respective weapon's technical manual.

3-20. The carrying handle has two selectable apertures for the engagement situation:

- Small aperture. Used for zeroing procedures and for mid- and extended-range engagements.
- Large aperture. Used during limited visibility, close quarters, and for moving targets at close or mid-range.

3-21. The iron sight uses the fixed front sight post to create the proper aim. Soldiers use the front sight post centered in the rear aperture. The following information is extracted from the weapon's technical manual.

CARRYING HANDLE		
DIMENSIONS		
LENGTH	7.3 in	18.5 cm
WIDTH	3.5 in	9.0 cm
HEIGHT	1.9 in	4.8 cm
WEIGHT	20.8 oz	590 g

FUNCTION	RIFLE	ADJUSTMENTS
ZERO WINDAGE	M16A2	Center rear sight aperture for mechanical zero windage
	M16A4	
	M4	
	M4A1	
ZERO ELEVATION	M16A2	300 meter mark +1 click up for 25 m zeroing Once zeroing is complete, rotate elevation knob -1 click down to apply 300 m zero
	M16A4	
	M4	
	M4A1	
WINDAGE	M16A2	1/2 MOA
	M16A4	1/2 MOA
	M4	1 MOA
	M4A1	1 MOA
ELEVATION (RANGE) FRONT SIGHT POST	M16A2	1 1/2 MOA
	M16A4	1 1/2 MOA
	M4	1 7/8 MOA
	M4A1	1 7/8 MOA

LEGEND					
BDC	bullet drop compensator	g	grams	MOA	minute of angle
cm	centimeters	in	inches	oz	ounces

Figure 3-6. Carrying handle with iron sight example

Back Up Iron Sight

3-22. The BUIS is a semi-permanent flip-up sight equipped with a rail-grabbing base. The BUIS provides a backup capability effective out to 600 meters and can be installed on M16A4 rifles and M4-series carbines. (See figure 3-7.)

3-23. The BUIS on the first notch of the integrated rail, nearest to the charging handle. The BUIS remains on the modular weapon system (MWS) unless the carrying handle/sight is installed. The following information is extracted from the weapon's technical manual.

BACK UP IRON SIGHT (BUIS)		
DIMENSIONS		
LENGTH	2.1 in	5.3 cm
WIDTH	1.3 in	3.3 cm
HEIGHT	1.5 in	3.8 cm
WEIGHT	4.3 oz	122 g

FUNCTION	SINGLE CLICK	
ZERO WINDAGE	M16A4	White Line
	M4	White Line
	M4A1	White Line
ZERO ELEVATION	M16A4	White Line
	M4	300 meter setting
	M4A1	300 meter setting
WINDAGE	M16A4	1/2 MOA
	M4	3/4 MOA
	M4A1	3/4 MOA
ELEVATION (RANGE) FRONT SIGHT POST	M16A4	1 1/2 MOA
	M4	2 MOA
	M4A1	2 MOA

LEGEND					
cm	centimeters	in	inches	oz	ounces
g	grams	MOA	minute of angle		

Figure 3-7. Back up iron sight

Close Combat Optic, M68

3-24. The close combat optic (CCO), M68 is a non-telescopic (unmagnified) reflex sight that is designed for the "eyes-open" method of sighting (see figure 3-8). It provides Soldiers the ability to fire with one or two eyes open, as needed for the engagement sequence in the shot process.

3-25. The CCO provides a red-dot aiming point using a 2 or 4 MOA diameter reticle, depending on the variant. The red dot aiming point follows the horizontal and vertical movement of the firer's eye, allowing the firer to remain fixed on the target. No centering or focusing on the front sight post is required. There are three versions of the CCO available in the force.

> ***Note.*** Re-tighten the torque-limiting knob after firing the first three to five rounds to fully seat the M68.

3-26. The CCO is zeroed to the weapon. It must remain matched with the same weapon, attached at the same slot in the attached rail system or be re-zeroed. If the CCO must be removed for storage, Soldiers must record the serial number and the rail slot to retain zero.

> ***Note.*** The weapon must be re-zeroed if the CCO is not returned to the same rail slot on the adaptive rail system.

Advantages

3-27. The CCO offers a distinct speed advantage over iron sights in most if not all engagements. The adjustments on brightness allow the Soldier to have the desired brightness from full daylight to blackout conditions.

3-28. The CCO is the preferred optic for close quarter's engagements.

Disadvantages

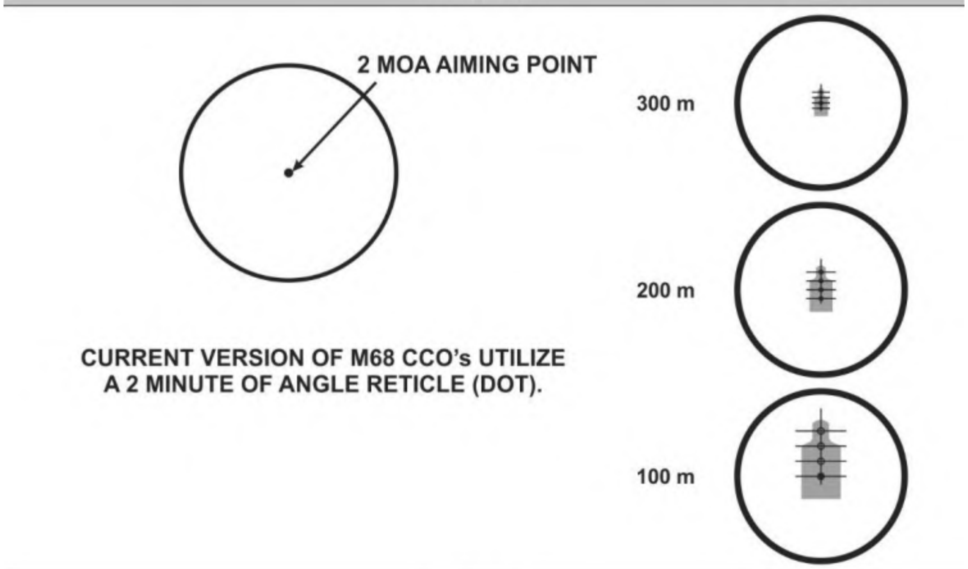
3-29. The CCO lacks a bullet drop compensator or other means to determine accurate range to target beyond 200m.

3-30. The following information is an extract from the equipment's technical manual for Soldier reference.

TM 9-1240-413-13&P		
DIMENSIONS		
LENGTH	4.0 in	10 cm
WIDTH	2.3 in	5.8 cm
HEIGHT	2.7 in	6.8 cm
WEIGHT	15.0 oz	425 g

FUNCTION	SINGLE CLICK
ZERO WINDAGE	0.5 MOA
ZERO ELEVATION	0.5 MOA
WINDAGE	0.5 MOA
ELEVATION (RANGE)	0.5 MOA

RETICLE



LEGEND

cm	centimeters	in	inches	oz	ounces
g	grams	MOA	minute of angle		

Figure 3-8. CCO Reticle, Comp M2 examples

RIFLE COMBAT OPTIC

3-31. The RCO (see figure 3-9) is designed to provide enhanced target identification and hit probability for the M4-/M4A1- or M16-series weapon.

3-32. There are several versions of the RCO available for use across the force. Soldiers must be familiar with their specific version of their assigned RCO, and be knowledgeable on the specific procedures for alignment and operation (see figure 3-9 for RCO azimuth and elevation adjustments).

3-33. The reticle pattern provides quick target acquisition at close combat ranges to 800 meters using the bullet drop compensator (BDC) (see figure 3-10 on page 3-15). It is designed with dual illuminated technology, using fiber optics for daytime employment and tritium for nighttime and low-light use.

3-34. The RCO is a lightweight, rugged, fast, and accurate 4x power optic scope specifically designed to allow the Soldier to keep both eyes open while engaging targets and maintain maximum situational awareness.

Advantages

3-35. The bullet drop compensator (BDC) is accurate for extended range engagements using either M855 or M855A1 ball ammunition. The ballistic difference between the two rounds is negligible under 400 meters and requires no hold determinations.

3-36. This is a widely fielded optic that is rugged, durable, and operates in limited light conditions. The self-illuminating reticle allows for continuous operations through end evening nautical twilight (EENT).

Disadvantages

3-37. This optic's ocular view is limited when engaging targets in close quarters engagements. This requires additional training to master the close quarter's skills while employing the RCO to achieve overmatch against the threat.

3-38. The RCO reticle does not include stadia lines. Windage must be applied by the shooter from a determined estimate. The RCO has a specific eye relief of 70-mm (millimeter) or 1.5 inches. If the eye relief is not correct, the image size will be reduced.

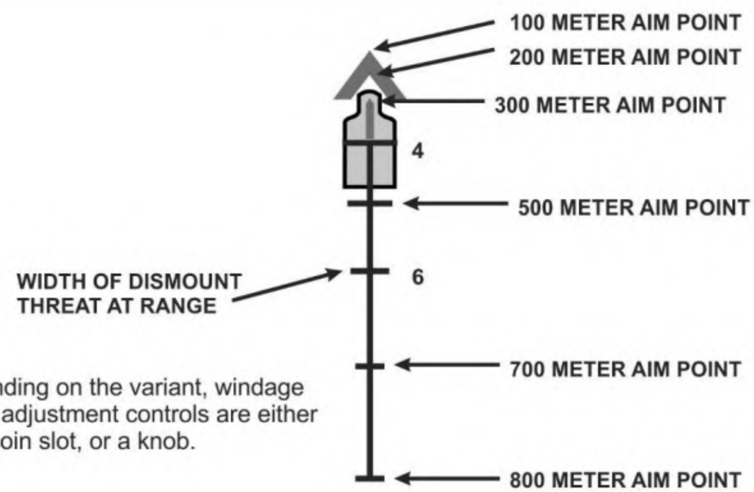
3-39. The fiber optic illuminator element can provide excessive light to the reticle during certain conditions that produce a glare. The RCO does not have a mechanical or built in method to reduce the effects of the glare created. The increased lighting may interfere with the shooter's point of aim and hold determinations. Soldiers may use alternate methods to reduce the glare by reducing the amount of fiber optic exposed to direct sunlight during operating conditions.

3-40. The following information is an extract from the equipment's technical manual for Soldier reference.

TM 9-1240-416-13&P		
DIMENSIONS		
LENGTH	4.0 in	10 cm
WIDTH	2.3 in	5.8 cm
HEIGHT	2.7 in	6.8 cm
WEIGHT	15.0 oz	425 g

FUNCTION	SINGLE CLICK	
	BLADE / COIN SLOT	**KNOB**
ZERO WINDAGE	1/3 MOA	1/2 MOA
ZERO ELEVATION	1/3 MOA	1/2 MOA
WINDAGE	1/3 MOA	1/2 MOA
ELEVATION (RANGE)	1/3 MOA	1/2 MOA

RETICLE



NOTE: Depending on the variant, windage and elevation adjustment controls are either knife blade / coin slot, or a knob.

LEGEND

cm	centimeters	in	inches	oz	ounces
g	grams	MOA	minute of angle		

Figure 3-9. RCO reticle example

THERMAL SIGHTS

3-41. Thermal sights are target acquisition and aiming sensors that digitally replicate the field of view based on an estimation of the temperature. They use advanced forward-looking infrared technology that identify the infrared emitted radiation (heat) of a field of view, and translate those temperatures into a gray- or color-scaled image. The TWS is capable of target acquisition under conditions of limited visibility, such as darkness, smoke, fog, dust, and haze, and operates effectively during the day and night.

3-42. The TWS is composed of five functional groups: (See figure 3-10.)

- **Objective lens** – receives IR light emitting from an object and its surroundings. The objective lens magnifies and projects the IR light.
- **Detector assembly** – senses the IR light and coverts it to a video signal.
- **Sensor assembly** – the sensor electronics processes the video for display on the liquid crystal display (LCD) array in the field of view.
- **LCD array/eyepiece** – the LCD array provides the IR image along with the reticle selected. The light from the LCD array is at the eyepiece.
- **User controls** – the control electronics allows the user to interface with the device to adjust contrast, thermal gain, sensitivity, reticle display, and magnification.

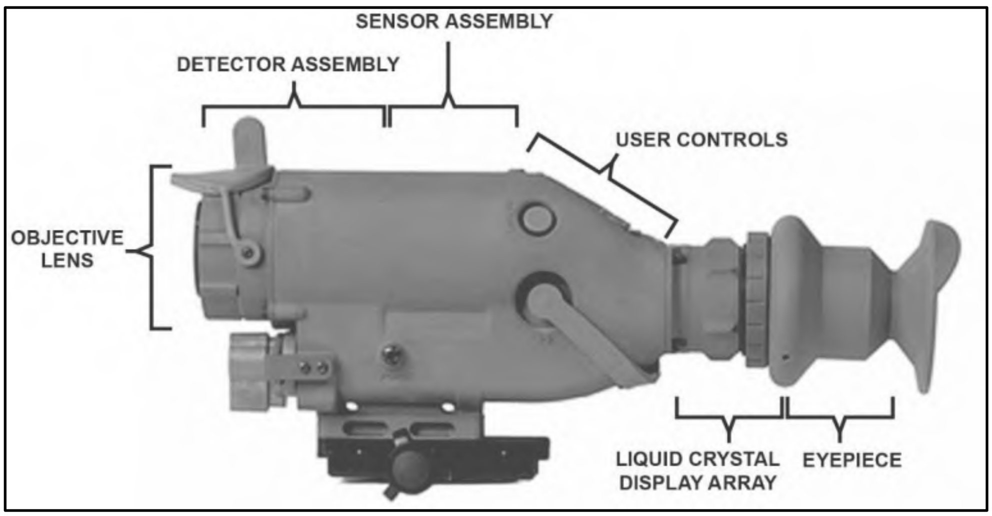


Figure 3-10. Thermal weapon sight example

3-43. A small detector used in thermal sensors or optics to identify IR radiation with wavelengths between 3 and 30 µm (micrometer). The thermal optic calculates and processes the thermal scene into a correlating video image signal based on the temperature identified. These optics can differentiate thermal variations of 1 degree Celsius of the viewable scene. These variations generate a corresponding contrasting gradient that develops a thermal representation on the LCD screen in the eyepiece.

AN/PAS-13 Series of Weapon Thermal Sights

3-44. There are several versions of weapons thermal sights (WTS) available for use across the force. Soldiers must be familiar with their specific model and version of their assigned weapon thermal sight, and be knowledgeable on the specific procedures for alignment and operation. The various models and versions are identified in their official model nomenclature:

- **Version 1 (v1)** – Light Weapons Thermal Sight (LWTS).
- **Version 2 (v2)** – Medium Weapons Thermal Sight (MWTS).
- **Version 3 (v3)** – Heavy Weapons Thermal Sight (HWTS).

3-45. Weapons thermal sights are silent, lightweight, and compact, and have durable battery-powered IR imaging sensors that operate with low battery consumption. (See figure 3-11.)

Advantages

3-46. Military grade weapon thermal weapon sights are designed with the following advantages:

- Small and lightweight.
- Real-time imagery. Devices provide real-time video of the thermal scene immediately after power on.
- Long-lasting battery life. Low power consumption over time.
- Reliable. Long mean time between failures (MTBF).
- Quiet. The lack of a cooling element allows for a very low operating noise level.
- One optic fits on multiple weapons. The use of the ARS rail mounting bracket allows for the same optic to be used on other weapons.
- The F- and G-models attach in front of other aiming devices to improve their capabilities and eliminate the zeroing procedures for the device.

Disadvantages

3-47. These devices have limitations that Soldiers should take into consideration, particularly during combat operations. The primary disadvantages are:

- Cannot interpret ("see") multispectral infrared. These systems view a specific wavelength for emitted radiation (heat variations), and do not allow viewing of all aiming and marking devices at night.
- Reliance on rechargeable batteries and charging stations. Although the batteries are common and have a relatively long battery life, additional equipment is required to charge them. If common nonrechargeable (alkaline) batteries are used, a separate battery adapter is typically required.
- Cannot interpret thermal signatures behind glass or water effectively.
- Thermal systems cannot always detect friendly marking systems worn by dismounts.

VERSION		
Light Weapon Thermal Sight (HWTS)	Medium Weapon Thermal Sight (HWTS)	Heavy Weapon Thermal Sight (HWTS)
AN/PAS-13C (v1)	AN/PAS-13C (v2)	AN/PAS-13C (v3)
AN/PAS-13D (v1)	AN/PAS-13D (v2)	AN/PAS-13D (v3)
AN/PAS-13E (v1)	AN/PAS-13E (v2)	AN/PAS-13E (v3)

NOTE: The MWTS does not include the ballistic reticle for the M4- or M16-series weapons.

Figure 3-11. Weapon thermal sights by version

3-48. Thermal sight has a wide field of view and a narrow field of view (see figures 3-12 and 3-13).

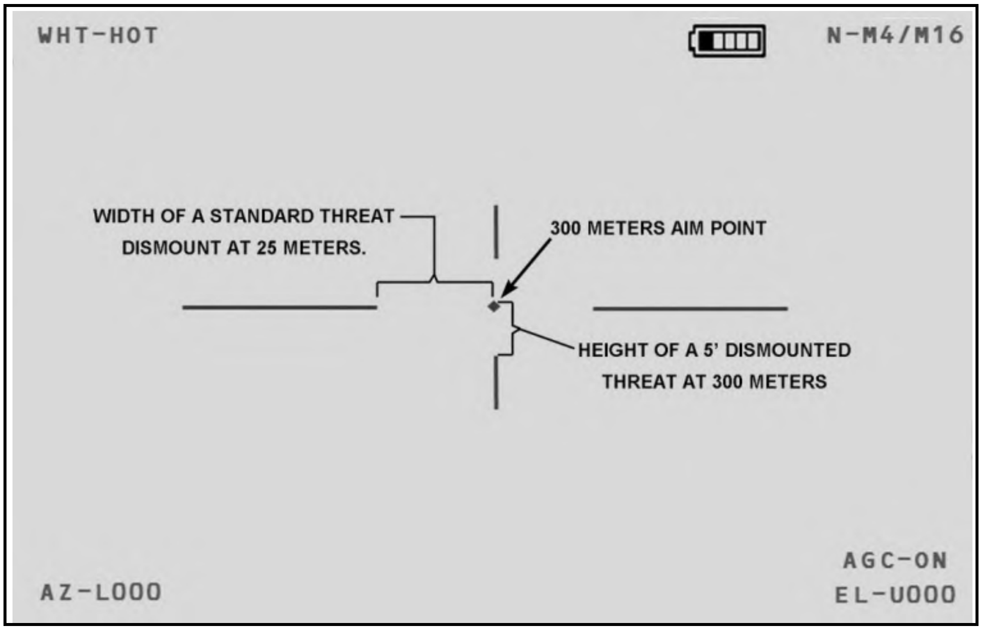


Figure 3-12. Thermal weapons sight, narrow field of view reticle example

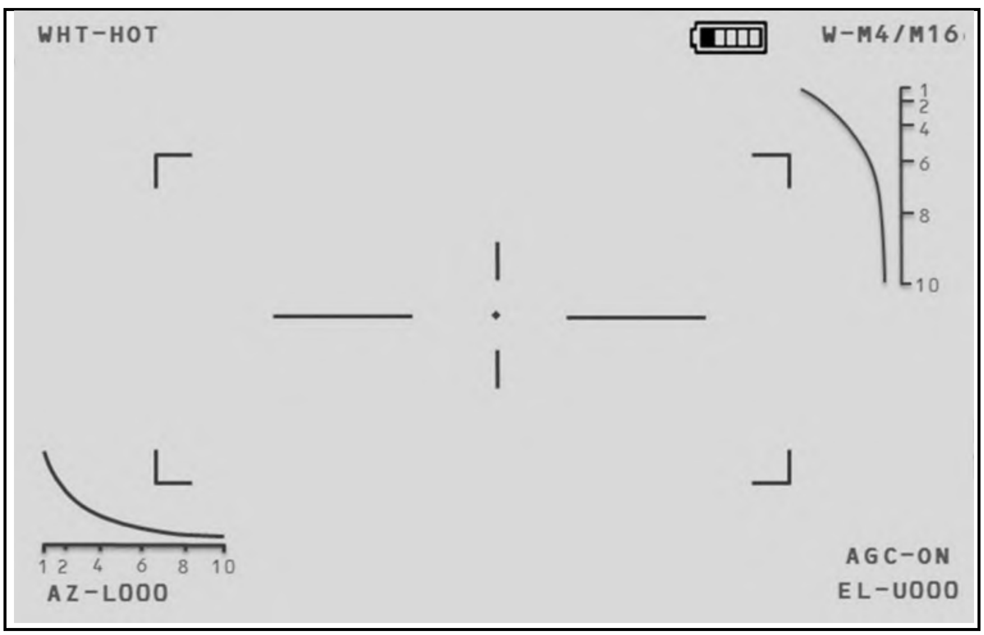


Figure 3-13. Thermal weapons sight, wide field of view reticle example

POINTERS / ILLUMINATORS / LASERS

3-49. Pointers, illuminators, and laser devices for small arms weapons emit a collimated beam of IR light for precise aiming and a separate IR beam for illumination. These devices operate in one single mode at a time, as selected by the user. The laser is activated by a selector switch on the device or by a remote mechanism installed on the weapon. The basic two modes or functions are:

- **Pointer.** When used as a pointer or aiming device, a small, pin-point beam is emitted from the device. The IR beam provides an infrared visible point when it strikes an object or target. The IR beam operates in the 400 to 800 nanometer wavelength and can only be seen by I2 optics, such as the AN-PVS-7 or -14 night vision devices.
- **Illuminator.** Typically used to illuminate a close quarters area as an infrared flood light. The illuminator provides a flood-light effect for the Soldier when used in conjunction with I2 night vision devices.

Note. Laser is an acronym for light amplified stimulated emitted radiation, but is predominantly used as a proper noun.

3-50. The following devices (see table 3-1) are the most common laser pointing devices available for use on the M4- and M16-weapons.

Table 3-1. Laser Aiming Devices for the M4 and M16

Laser Aiming Device	Device Name	Reference
AN/PEQ-2	Target Pointer/Illuminator/ Aiming Light (TPIAL)	TM 9-5855-1915-13&P
AN/PEQ-15	Advanced Target Pointer/ Illuminator/Aiming Light (ATPIAL)	TM 9-5855-1914-13&P
AN/PEQ-15A	Dual Beam Aiming Laser – Advanced2 (DBAL-A2)	TM 9-5855-1912-13&P
AN/PSQ-23	Illuminator, Integrated, Small Arms (STORM)	TM 9-5855-1913-13&P

Note. The ATPIAL, DBAL-A2, and STORM have collocated IR and visible aiming lasers. A single set of adjusters move both aiming beams. Although the aiming lasers are collocated, Soldiers should zero the laser they intend to use as their primary pointer to ensure accuracy and consistency during operation.

AN/PEQ-2 Target Pointer/Illuminator Aiming Light (TPIAL)

3-51. AN/PEQ-2 aiming devices are Class IIIb laser devices that emit a collimated beam of IR light for precise aiming and a separate IR beam for illumination of the target or target area (see figure 3-14 on page 3-21). Both beams can be independently zeroed to the weapon and to each other. The beams can be operated individually or in combination in both high and low power settings.

Note. The IR illuminator is equipped with an adjustable bezel to vary the size of the illumination beam based on the size and distance of the target.

3-52. The aiming devices are used with night observation devices (NODs) and can be used as handheld illuminators/pointers or mounted on the weapon with the included brackets and accessory mounts. In the weapon-mounted mode, the aiming devices can be used to direct fire and to illuminate and designate targets.

3-53. The aiming light is activated by pressing on either the ON/OFF switch lever, or the button on the optional cable switch. Either switch connects power from two AA batteries to an internal electronic circuit which produces the infrared laser. Internal lenses focus the infrared light into a narrow beam. The direction of the beam is controlled by rotating the mechanical Adjusters with click detents. These adjusters are used to zero the aiming light to the weapon.

3-54. Once zeroed to the weapon, the aiming light projects the beam along the line of fire of the weapon. The optical baffle prevents off-axis viewing of the aiming light beam by the enemy.

CAUTION

A safety block is provided for training purposes to limit the operator from selecting high power modes of operation.

3-55. The following information is an extract from the equipment's technical manual for Soldier reference.

TM 9-5855-1915-13&P		
DIMENSIONS		
LENGTH	6.4 in	16.3 cm
WIDTH	2.8 in	7.1 cm
HEIGHT	1.2 in	3 cm
WEIGHT	9.5 oz	269 g

POWER	
BATTERY LIFE	100 hours >32°
	36 hours <32°
POWER SOURCE	2 each AA batteries

MODE OF OPERATION			
MODE	MARKINGS	TGT LASER	ILLUM LASER
O	OFF	OFF	OFF
1	AIM LO	LOW POWER	OFF
2	DUAL LO	LOW POWER	LOW POWER
3	AIM HI	HIGH POWER	OFF
4	DUAL LO/HI	HIGH POWER	LOW POWER
5	DUAL HI	HIGH POWER	HIGH POWER

LASER	DIVERGENCE	WAVELENGTH
IR BEAM	0.3 mRad	820-850 nm
IR ILLUMINATOR	3.0 mRad	820-850 nm

LEGEND					
cm	centimeters	IR	infrared	oz	ounces
g	grams	mRad	milliradians		
in	inches	nm	nanometers		

Figure 3-14. AN/PEQ-2

AN/PEQ-15 Advanced Target Pointer/Illuminator/Aiming Light

3-56. The AN/PEQ-15 ATPIAL is a multifunctional laser that emits both a visible and IR light for precise weapon aiming and target/area illumination. This ruggedized system can be used as a handheld illuminator/pointer or can be mounted to weapons equipped with an M4- or M5-ARS (Military Standard [MIL STD] 1913).

- **Visible light** – can be used to boresight the device to a weapon without the need of night vision goggles. A visible red-dot aiming laser can also be selected to provide precise aiming of a weapon during daylight or night operations.
- **Infrared laser** – emit a highly collimated beam of IR light for precise weapon aiming. A separate IR-illuminating laser can be adjusted from a flood light mode to a single point spot-divergence mode.

3-57. The lasers can be used as handheld illuminator pointers, or can be weapon-mounted with included hardware. The co-aligned visible and IR aiming lasers emit through laser ports in the front of the housing. These highly capable aiming lasers allow for accurate nighttime aiming and system boresighting.

3-58. The AN/PEQ-15 has an integrated rail grabber molded into the body to reduce weight and additional mounting hardware. (Refer to TM 9-5855-1914-13&P for more information.)

CAUTION

The AN/PEQ-15 can be used during force-on-force training in the low power modes only. High power modes can be used on live-fire ranges exceeding 220 meters only.

3-59. The AN/PEQ-15, ATPIAL's (see figure 3-15 on page 3-23) visible aiming laser provides for active target acquisition in low light conditions and close-quarters combat situations, and allows users to zero using the borelight without using NOD. When used in conjunction with NODs, its IR aiming and illumination lasers provide for active, covert target acquisition in low light or complete darkness.

3-60. The ATPIAL visible and IR aiming lasers are co-aligned. A single set of adjusters moves both aiming beams, and the user can boresight/zero using either aiming laser. The following information is an extract from the equipment's technical manual for Soldier reference.

TM 9-5855-1914-13&P		
DIMENSIONS		
LENGTH	4.6 in	11.7 cm
WIDTH	2.8 in	7.1 cm
HEIGHT	1.9 in	4.1 cm
WEIGHT	7.5 oz	213 g

POWER	
BATTERY LIFE	>6 hours in DUAL HIGH (DH) mode
POWER SOURCE	1 each DL-123A, 3 volt

MODE OF OPERATION		
POSITION	MODE	REMARKS
VIS AL	Vis Aiming Laser	Visible Aim Laser ON
O	OFF	Prevents inadvertent laser burst
P	Program	Sets the desired IR pulse rate
AL	AIM LOW	Low power of Aiming Laser
DL	DUAL LOW	Aiming Laser and Illuminator on LOW
AH	AIM HIGH	Aiming Laser set to HIGH
IH	ILLUM HIGH	IR Illuminator set to HIGH
DH	DUAL HIGH	IR Aim and Illuminator set to HIGH

LASER	DIVERGENCE	WAVELENGTH
IR BEAM	0.5 mRad	820-850 nm
IR ILLUMINATOR	1.0 to 105 mRad	820-850 nm
VISIBLE AIMING	0.5 mRad	605-665 nm

LEGEND					
cm	centimeters	IR	infrared	oz	ounces
g	grams	mRad	milliradians		
in	inches	nm	nanometers		

Figure 3-15. AN/PEQ-15, ATPIAL

AN/PEQ-15A, DUAL BEAM AIMING LASER – ADVANCED2

3-61. The AN/PEQ-15A DBAL-A2 is a multifunctional laser device that emits IR pointing and illumination light, as well as a visible laser for precise weapon aiming and target/area illumination. The visible and IR aiming lasers are co-aligned enabling the visible laser to be used to boresight both aiming lasers to a weapon without the need for night vision devices. This ruggedized system can be used as a handheld illuminator/pointer or can be mounted to weapons equipped with an M4 or M5 adapter rail system (MIL-STD-1913).

- **Visible light** – can be used to boresight the device to a weapon without the need of night vision goggles. A visible red-dot aiming laser can also be selected to provide precise aiming of a weapon during daylight or night operations.
- **Infrared laser** – emits a tightly focused beam of IR light for precise aiming of the weapon. A separate IR illumination provides supplemental IR illumination of the target or target area. The IR illuminator is equipped with an adjustable bezel to vary the size of the illumination beam on the size and distance to the target (flood to point divergence).

3-62. The lasers can be used as hand-held illuminator pointers, or can be weapon-mounted with included hardware. These highly capable aiming lasers allow for accurate nighttime aiming and system boresighting.

3-63. The AN/PEQ-15A, DBAL-A2 (see figure 3-16 on page 3-25) visible aiming laser provides for active target acquisition in low light conditions and close quarters combat situations, and allows users to zero using the borelight without using NODs. When used in conjunction with NODs, its IR aiming and illumination lasers provide for active, covert target acquisition in low light or complete darkness.

3-64. The DBAL-A2 visible and IR aiming lasers are co-aligned. A single set of adjusters moves both aiming beams, and the user can boresight/zero using either aiming laser. The following information is an extract from the equipment's technical manual for Soldier reference.

TM 9-5855-1912-13&P		
DIMENSIONS		
LENGTH	3.5 in	8.7 cm
WIDTH	2.9 in	7.4 cm
HEIGHT	1.9 in	4.8 cm
WEIGHT	8 oz	224 g

POWER	
BATTERY LIFE	>5.5 hours in IR DUAL HIGH mode
POWER SOURCE	1 each DL-123A, 3 volt

MODE OF OPERATION		
POSITION	**MODE**	**REMARKS**
AL	LOW POWER	Low power for aim laser
AH	HIGH POWER	High power for aim laser
VIS A	VIS AIM RED	Aiming or marking laser for daylight
VIS A	VIS AIM GREEN	Aiming or marking laser for daylight

LASER	DIVERGENCE	WAVELENGTH
IR BEAM	0.3 mRad	840 nm
IR ILLUMINATOR	0.5 to 75 mRad	840 nm
VISIBLE AIM, RED	0.3 mRad	635 nm
VISIBLE AIM, GREEN	0.5 mRad	532 nm

LEGEND					
cm	centimeters	IR	infrared	oz	ounces
g	grams	mRad	milliradians		
in	inches	nm	nanometers		

Figure 3-16. AN/PEQ-15A, DBAL-A2

AN/PSQ-23, ILLUMINATOR, INTEGRATED, SMALL ARMS

3-65. The AN/PSQ-23 is a battery operated laser range finder (LRF) and digital magnetic compass (DMC) with integrated multifunctional lasers. The illuminator, integrated, small arms device is commonly referred to as the STORM laser. The visible and IR aiming lasers are co-aligned enabling the visible laser to be used to boresight both aiming lasers to a weapon without the need for night vision devices. This ruggedized system can be used as a handheld illuminator/pointer or can be mounted to weapons equipped with an M4 or M5 adapter rail system (MIL-STD-1913).

- **Laser range finder** – provides range to target information from 20 meters to 10,000 meters with an accuracy of +/- 1.5 meters.
- **Digital magnetic compass** – provides azimuth information and limited elevation information to the operator. The azimuth accuracy is +/- 0.5 degrees to +/- 1.5 degrees. The elevation accuracy is +/- 0.2 degrees. The DMC can identify bank or slopes up to 45 degrees with an accuracy of +/- 0.2 degrees.
- **Visible light** – provides for active target acquisition in low light and close quarters combat situations without the need for night vision devices. It can be used to boresight the device to a weapon without the need of night vision devices. A visible red-dot aiming laser can also be selected to provide precise aiming of a weapon during daylight or night operations.
- **Infrared laser** – emits a tightly focused beam of IR light for precise aiming of the weapon. A separate IR illumination provides supplemental IR illumination of the target or target area. The IR illuminator is equipped with an adjustable bezel to vary the size of the illumination beam on the size and distance to the target (flood to point divergence).
- **Infrared illuminator** – the STORM features a separately adjustable IR illuminator with adjustable divergence. It is fixed in the device housing and is set parallel to the rail mount.

Note. The STORM's LRF and DMC may be used in combination to obtain accurate positioning information for targeting purposes and other tactical applications.

3-66. The integrated visible aim laser (VAL) and illumination lasers provide for active, covert target acquisition in low light or complete darkness when used in conjunction with night vision devices. The STORM is also equipped with a tactical engagement simulation (TES) laser allowing it to be used in a laser-based training environment.

3-67. The AN/PEQ-15A, DBAL-A2 visible aiming laser provides for active target acquisition in low light conditions and close-quarters combat situations, and allows users to zero using the borelight without using NODs. When used in conjunction with NODs, its IR aiming and illumination lasers provide for active, covert target acquisition in low light or complete darkness. The following information is an extract from the equipment's technical manual for Soldier reference (see figure 3-17 on page 3-27).

TM 9-5855-1913-13&P		
DIMENSIONS		
LENGTH	7.3 in	18.5 cm
WIDTH	3.5 in	9.0 cm
HEIGHT	1.9 in	4.8 cm
WEIGHT	20.8 oz	590 g

POWER	
BATTERY LIFE	>5.5 hours in IR DUAL HIGH mode
POWER SOURCE	2 each DL-123A, 3 volt

MODE OF OPERATION		
POSITION	MODE	REMARKS
VH	VIS HIGH	Aiming or marking in daylight/indoor
AH	AIM HIGH	IR operates on high power
IH	ILLUM HIGH	IR illum operates on high power
DH	DUAL HIGH	IR/Illum both operate on high power
BUTTON	MODE	REMARKS
L	Laser activate	Activates aiming laser
R	Range/Compass	Press/Hold 3 sec to enter menu power

LASER	DIVERGENCE	WAVELENGTH
IR BEAM	0.5 mRad	820-850 nm
IR ILLUMINATOR	1.0 to 100 mRad	820-850 nm
VISIBLE AIM, RED	0.5 mRad	605-665 nm
LASER RANGE FINDER	1.0 mRad	1570 nm

LEGEND					
cm	centimeters	IR	infrared	oz	ounces
g	grams	mRad	milliradians		
in	inches	nm	nanometers		

Figure 3-17. AN/PSQ-23, STORM

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Chapter 4

Mountable Equipment

Both the M4- and M16-series of weapons have a wide variety of attachments to increase Soldier lethality, situational awareness, and overmatch. The attachments can be applied in various locations on the weapon system. Soldiers must understand what the attachments are, how they are correctly positioned, how to align them with the weapon system, and how to integrate them into use to maximize the system's capabilities.

This chapter explains how the ARS is used to mount the various attachments. It describes the weapons, aiming devices, and accessories available for mounting, and includes general information on the proper mounting location as well as their basic capabilities.

ADAPTIVE RAIL SYSTEM

4-1. The ARS and rail grabbers are designed for M16- and M4-/M4A1-series weapons to mount:

- Weapons.
- Aiming devices.
- Accessories.

4-2. The ARS provides a secure mounting point for various accessories that may be mounted on the weapon's top, bottom, left, and right. Each rail groove has an incremental number identifying the slot location, starting from the rear of the weapon.

4-3. Soldiers should record the attachment or equipment's serial number (if applicable), the location of the attachment (for example, markings between lugs), and any boresight or alignment settings specific to the equipment at that location.

4-4. Once complete, the Soldier should mark the mounting bracket to identify the tightened position with a permanent marker. Marking the mounting bracket allows for rapid identification of loosening hardware during firing. Soldiers must periodically verify the mounting hardware does not loosen during operation. During zeroing or zero confirmation operations, Soldiers should retighten the mounting hardware after the first five rounds.

4-5. Soldiers must ensure the equipment is firmly affixed to the ARS before tie down is complete. If the attachments are loose, their accuracy and effectiveness will be degraded.

MOUNTABLE WEAPONS

4-6. There are two types of weapons that can be physically attached to the M16-/M4-series rifles; grenade launchers and shotguns. These weapons are standard components of the unit's organizational equipment and serve specific purposes during combat operations.

4-7. These weapons are mounted under the barrel of the service rifle at specific locations. They may be removed by a qualified armorer only.

GRENADE LAUNCHERS

4-8. The M320/M320A1 grenade launcher is a lightweight grenade launcher that can operate in a stand-alone or attached configuration. The M320/M320A1 grenade launcher uses an integrated double-action-only trigger system. The M320 series is the replacement weapon for the M203. (See figure 4-1.)

Figure 4-1. M320 attached to M4 series carbine example

4-9. The M203 is a breach loaded attachable grenade launcher that is affixed to the bottom of the barrel of the M16-/M4-series rifle. The M203 cannot be used in a stand-alone configuration. (See figure 4-2)

Figure 4-2. M203 grenade launcher example

4-10. Each mountable 40mm grenade launcher provides the following capabilities to the small unit (see the appropriate TM for authorized use):

- Pyrotechnic signal and spotting rounds:
  - Star cluster, white.
  - Star parachute, white.
  - Star parachute, green.
  - Star parachute, red.
  - Smoke, yellow.
  - Smoke, green.
  - Smoke, red.
  - Illumination, infrared.
- High explosive (HE).
- High explosive, dual purpose (HEDP).
- Nonlethal.
- Training practice (TP).

SHOTGUN SYSTEM

4-11. The M26 Modular Accessory Shotgun System (MASS) is an under-barrel shotgun attachment for the M16/M4/M4A1. The M26 uses a 3- or 5-round detachable box magazine and provides Soldiers with additional tactical capabilities. (Refer to TC 3-22.12 for more information). (See figure 4-3.)

Figure 4-3. M26 shotgun example

4-12. The M26 provides specific tactical capabilities to the Soldier using the following ammunition:

- Slug. Door breaching.
- Shot range, 00 buckshot.
- Nonlethal, rubber slug, buckshot, and riot control.

MOUNTABLE AIMING DEVICES

4-13. Aiming devices mounted to the weapon system should be placed in a specific location on the weapon to maximize their capabilities. Table 4-1 provides the preferred mounting locations of the most common attachments.

Table 4-1. Attachment Related Technical Manuals and Mounting

Attachment	Technical Manual	M4/M4A1, M16A4	M4/M4A1	M16A2/A3
BUIS		UR	UR	
CCO, M68	TM 9-1240-413-13&P	UR*	UR*	MT
RCO, M150	TM 9-1240-416-13&P	UR	UR	MT
AN/PVS-14	TM 11-5855-306-10	UR***		
AN/PEQ-15A	TM 9-5855-1912-13&P	RG**	BA	BA
AN/PEQ-15	TM 9-5855-1914-13&P	RG**	BA	BA
AN/PAS-13B(V1), LWTS	TM 11-5855-312-10	UR	UR	MT
AN/PAS-13B(V3), HWTS	TM 11-5855-312-10	UR	UR	MT
AN/PAS-13C(V1), LWTS	TM 11-5855-316-10	UR	UR	MT
AN/PAS-13C(V3), HWTS	TM 11-5855-316-10	UR	UR	MT
AN/PAS-13D(V)1 LWTS	TM 11-5855-324-10	UR	UR	MT
AN/PAS-13D(V2), MWTS	TM 11-5855-317-10	UR	UR	MT
AN/PAS-13D(V3), HWTS	TM 11-5855-317-10	UR	UR	MT
AN/PSQ-23	TM 9-5855-1913-13&P	RG**	BA	BA

Legend:
BA – Bracket Assembly
BUIS – Back up Iron Sight
CCO – Close Combat Optic
HTWS – Heavy Thermal Weapons Sight
LTWS – Light Thermal Sight
MWTS – Medium Thermal Sight
MT – M16 Mount
RCO – Rifle Combat Optic
RG – Rail Grabber
UR – Upper Receiver
* With a half-moon spacer installed.
** Picatinny or Insight rail grabbers may be used.
*** If used in conjunction with the CCO, the CCO will mount on the top rail of the ARS.

MOUNTABLE ACCESSORIES

4-14. Mountable accessories are items that may be attached to a weapon but are not required for operation. They provide assistance stabilizing the weapon or provide white-light illumination for specific tactical operations.

4-15. These devices are authorized as needed by the small unit. Some mountable accessories are aftermarket (commercial-off-the-shelf, or COTS) items that use the ARS for semipermanent attachment.

BIPOD

4-16. Bipods are highly adjustable that enhance stability within the battle space environment. They are secured by the front sling swivel or the advanced rail system on the foregrip of the weapon. They can be used in combination with a sand sock or other buttstock support to provide an extremely stable firing platform. (See figure 4-4.)

4-17. The bipod is an additional means to stabilize the weapon in various shooting positions. Despite primarily being used in prone position, bipods can be used for additional support in alternate shooting positions while using barricade supports. The bipod provides additional support which facilitates acquisition of muscle relaxation and natural point of aim. The use of bipods in barricade shooting can increase the Soldier's efficiency and probability of a first round hit while engaging targets.

Figure 4-4. Bipod example

VERTICAL FOREGRIP

4-18. Vertical foregrips (VFGs) assist in transitioning from target to target in close quarter combat. (See figure 4-5.)

4-19. The further out the Soldier mounts the VFG, the smoother and quicker his transitions between multiple targets will be, however he should not mount it so far forward that using the VFG is uncomfortable.

Figure 4-5. Vertical foregrip example

FOREGRIP WITH INTEGRATED BIPODS

4-20. VFGs with integrated bipods are acceptable for common use. They combine the VFG capability with a small, limited adjustment bipod. They typically lack the full adjustment capabilities of full bipods, but provide a compact stable extrusion for the firer.

MOUNTED LIGHTS

4-21. The weapon-mounted lights are commonly issued throughout the Army. The purpose of the weapon mounted lights is to provide illumination and assist in target acquisition and identification during limited visibility operations.

4-22. Most weapon mounted lights provide selection between white light and infrared capabilities. Employment of the weapon mounted light is based upon mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC) and unit SOP. The weapon mounted lights should be mounted in such a manner that the Soldier can activate and deactivate them efficiently and their placement does not hinder the use of any other attachment or accessory. They must be attached in such a manner as to prevent negligent or unintentional discharge of white light illumination during movement or climbing.

Chapter 5

EMPLOYMENT

The rifleman's primary role is to engage the enemy with well-aimed shots. (Refer to ATP 3-21.8 for more information.) In this capacity, the rate of fire for the M4 rifle is not based on how fast the Soldier can pull the trigger. Rather, it is based on how fast the Soldier can consistently acquire and engage the enemy with accuracy and precision.

Consistently hitting a target with precision is a complex interaction of factors immediately before, during, and after the round fires. These interactions include maintaining postural steadiness, establishing and maintaining the proper aim on the target, stabilization of the weapon while pressing the trigger, and adjusting for environmental and battlefield conditions.

5-1. Every Soldier must adapt to the firing situation, integrate the rules of firearms safety, manipulate the fire control, and instinctively know when, how, and where to shoot. It is directly influenced by the Soldier's ability to hit the target under conditions of extreme stress:

- Accurately interpret and act upon perceptual cues related to the target, front and rear sights, rifle movement, and body movement.
- Execute minute movements of the hands, elbows, legs, feet, and cheek.
- Coordinate gross-motor control of their body positioning with fine-motor control of the trigger finger.

5-2. Regardless of the weapon system, the goal of shooting remains constant: well-aimed shots. To achieve this end state there are two truths. Soldier's must—

- Properly point the weapon (sight alignment ***and*** sight picture).
- Fire the weapon without disturbing the aim.

5-3. To accomplish this, Soldiers must master sight alignment, sight picture, and trigger control.

- **Sight alignment** – sight alignment is the relationship between the aiming device and the firer's eye. To achieve proper and effective aim, the focus of the firer's eye needs to be on the front sight post or reticle. The Soldier must maintain sight alignment throughout the aiming process.
- **Sight picture** – the sight picture is the placement of the aligned sights on the target.
- **Trigger control –** the skillful manipulation of the trigger that causes the rifle to fire without disturbing the aim.

SHOT PROCESS

5-4. The **shot process** is the basic outline of an individual engagement sequence all firers consider during an engagement, regardless of the weapon employed. The shot process formulates all decisions, calculations, and actions that lead to taking the shot. The shot process may be interrupted at any point before the sear disengaging and firing the weapon should the situation change.

5-5. The shot process has three distinct phases:

- **Pre-shot**.
- **Shot**.
- **Post-shot**.

5-6. To achieve consistent, accurate, well-aimed shots, Soldiers must understand and correctly apply the shot process. The sequence of the shot process does not change, however, the application of each element vary based on the conditions of the engagement.

5-7. Every shot that the Soldier takes has a complete shot process. Grouping, for example, is simply moving through the shot process several times in rapid succession.

5-8. The shot process allows the Soldier to focus on one cognitive task at a time. The Soldier must maintain the ability to mentally organize the shot process's tasks and actions into a disciplined mental checklist, and focus their attention on activities which produce the desired outcome; a well-aimed shot.

5-9. The level of attention allocated to each element during the shot process is proportional to the conditions of each individual shot. Table 5-1 provides an example of a shot process.

Table 5-1. Shot Process example

Pre-shot	Position
	Natural Point of Aim
	Sight Alignment / Picture
	Hold
Shot	Refine Aim
	Breathing Control
	Trigger Control
Post-shot	Follow-through
	Recoil management
	Call the Shot
	Evaluate

FUNCTIONAL ELEMENTS OF THE SHOT PROCESS

5-10. Functional elements of the shot process are the linkage between the Soldier, the weapon system, the environment, and the target that directly impact the shot process and ultimately the consistency, accuracy, and precision of the shot. When used appropriately, they build a greater understanding of any engagement.

5-11. The functional elements are interdependent. A accurate shot, regardless of weapon system, requires the Soldier to establish, maintain, and sustain—

- **Stability** – the Soldier stabilizes the weapon to provide a consistent base to fire from and maintain through the shot process until the recoil pulse has ceased. This process includes how the Soldier holds the weapon, uses structures or objects to provide stability, and the Soldier's posture on the ground during an engagement.
- **Aim** – the continuous process of orienting the weapon correctly, aligning the sights, aligning on the target, and the appropriate lead and elevation (hold) during a target engagement.
- **Control** – all the conscious actions of the Soldier before, during, and after the shot process that the Soldier specifically is in control of. The first of which is trigger control. This includes whether, when, and how to engage. It incorporates the Soldier as a function of safety, as well as the ultimate responsibility of firing the weapon.
- **Movement** – the process of the Soldier moving during the engagement process. It includes the Soldier's ability to move laterally, forward, diagonally, and in a retrograde manner while maintaining stabilization, appropriate aim, and control of the weapon.

5-12. These elements define the tactical engagement that require the Soldier to make adjustments to determine appropriate actions, and compensate for external influences on their shot process. When all elements are applied to the fullest extent, Soldiers will be able to rapidly engage targets with the highest level of precision.

5-13. Time, target size, target distance, and the Soldier's skills and capabilities determine the amount of effort required of each of the functional elements to minimize induced errors of the shot.

5-14. Each weapon, tactical situation, and sight system will have preferred techniques for each step in the shot process and within the functional elements to produce precision and accuracy in a timely manner. How fast or slow the shooter progresses through the process is based on target size, target distance, and shooter capability.

5-15. The most complex form of shooting is under combat conditions when the Soldier is moving, the enemy is moving, under limited visibility conditions. Soldiers and leaders must continue to refine skills and move training from the simplest shot to the most complex. Applying the functional elements during the shot process builds a firer's speed while maintaining consistency, accuracy, and precision during complex engagements.

5-16. Each of the functional elements and the Soldier actions to consider during the shot process are described later in this manual.

TARGET ACQUISITION

5-17. Target acquisition is the ability of a Soldier to rapidly recognize threats to the friendly unit or formation. It is a critical Soldier function before any shot process begins. It includes the Soldier's ability to use all available optics, sensors, and information to detect potential threats as quickly as possible.

5-18. Target acquisition requires the Soldier to apply an acute attention to detail in a continuous process based on the tactical situation. The target acquisition process includes all the actions a Soldier must execute rapidly:

- **Detect** potential threats (target detection).
- **Identify** the threat as friend, foe, or noncombatant (target identification).
- **Prioritize** the threat(s) based on the level of danger they present (target prioritization).

TARGET DETECTION

5-19. Effective target detection requires a series of skills that Soldiers must master. Detection is an active process during combat operations with or without a clear or known threat presence. All engagements are enabled by the Soldier's detection skills, and are built upon three skill sets:

- **Scan and search** – a rapid sequence of various techniques to identify potential threats. Soldier scanning skills determine potential areas where threats are most likely to appear.
- **Acquire** – a refinement of the initial scan and search, based on irregularities in the environment.
- **Locate** – the ability to determine the general location of a threat to engage with accuracy or inform the small unit leader of contact with a potential threat.

Scan and Search

5-20. Scanning and searching is the art of observing an assigned sector. The goal of the scan and search is a deliberate detection of potential threats based on irregularities in the surrounding environment. This includes irregular shapes, colors, heat sources, movement, or actions the Soldier perceives as being "out of place," as compared to the surrounding area.

5-21. Soldiers use five basic search and scan techniques to detect potential threats in combat situations:

- **Rapid scan** – used to detect obvious signs of threat activity quickly. It is usually the first method used, whether on the offense or fighting in the defense.
- **Slow scan** – if no threats are detected during the rapid scan, Soldiers conduct the more deliberate scan using various optics, aiming devices, or sensors. The slow scan is best conducted in the defense or during slow movement or tactical halts.

- **Horizontal scan** – are used when operating in restricted or urban terrain. It is a horizontal sweeping scan that focuses on key areas where potential threats may be over watching their movement or position.
- **Vertical scan** – an up and down scan in restricted or urban environments to identify potential threats that may be observing the unit from an elevated position.
- **Detailed search** – used when no threats are detected using other scanning methods. The detailed search uses aiming devices, thermal weapon systems, magnified optics, or other sensors to slowly and methodically review locations of interest where the Soldier would be positioned if they were the threat (where would I be if I were them?)

Acquire

5-22. Target acquisition is the discovery of any object in the operational environment such as personnel, vehicles, equipment, or objects of potential military significance. Target acquisition occurs during target scan and search as a direct result of observation and the detection process.

5-23. During the scan and search, Soldiers are looking for "target signatures," which are signs or evidence of a threat. Tactically, Soldiers will be looking for threat personnel, obstacles or mines (including possible improvised explosive devices [IEDs]), vehicles, or anti-tank missile systems. These target signatures can be identified with sight, sound, or smell.

Detection Best Practices

5-24. Threat detection is a critical skill that requires thoughtful application of the sensors, optics, and systems at the Soldier's disposal. Finding potential threats as quickly and effectively as possible provides the maximum amount of time to defeat the threat. Soldiers should be familiar with the following best practices to increase target detection:

- Scan with the unaided eye first, then with a magnified optic.
- Practice using I2 and thermal optics in tandem during limited visibility.
- Understand the difference between I2 and thermal optics; what they can "see" and what they can't. (See chapter 4 of this publication.)
- Thermal optics are the preferred sight for target acquisition and engagement, day or night.
- Don't search in the same area as others in the small unit. Overlap, but do not focus on the same sector.
- Practice extreme light discipline during limited visibility including IR light discipline.
- Think as the threat. Search in areas that would be most advantageous from their perspective.
- Detecting threats is exponentially more difficult when operating in a chemical, biological, radiological, nuclear (CBRN) environment. Practice detection skills with personal protective equipment (PPE)/individual

protective equipment (IPE) and understand the increased constraints and limitations, day and night.

Locate

5-25. Target location is the determination of where a target is in your operational environment in relation to the shooter, small unit, or element. Locating a target or series of targets occurs as a result of the search and acquisition actions of each Soldier in the small unit.

5-26. Once a target is located, the threat location can be rapidly and efficiently communicated to the rest of the unit. Methods used to announce a located target depend on the individual's specific position, graphic control measures for the operation, unit SOP, and time available.

TARGET IDENTIFICATION

5-27. Identifying (or discriminating) a target as friend, foe, or noncombatant (neutral) is the second step in the target acquisition process. The Soldier must be able to positively identify the threat into one of three classifications:

- **Friend.** Any force, U.S. or allied, that is jointly engaged in combat operations with an enemy in a theater of operation.
- **Foe (enemy combatant).** Any individual who has engaged acts against the U.S. or its coalition partners in violation of the laws and customs of war during an armed conflict.
- **Noncombatants.** Personnel, organizations, or agencies that are not taking a direct part in hostilities. This includes individuals such as medical personnel, chaplains, United Nations observers, or media representatives or those out of combat such as the wounded or sick. Organizations like the Red Cross or Red Crescent can be classified as noncombatants.

5-28. The identification process is complicated by the increasing likelihood of having to discriminate between friend/foe and combatant/noncombatant in urban settings or restricted terrain. To mitigate fratricide and unnecessary collateral damage, Soldiers use all of the situational understanding tools available and develop tactics, techniques, and procedures for performing target discrimination.

Fratricide Prevention

5-29. Units have other means of designating friendly vehicles from the enemy. Typically, these marking systems are derived from the unit tactical standard operating procedure (TACSOP) or other standardization publications, and applied to the personnel, small units, or vehicles as required:

- **Markings.** Unit markings are defined within the unit SOP. They distinctly identify a vehicle as friendly in a standardized manner.
- **Panels.** VS-17 panels provide a bright recognition feature that allows Soldiers to identify friendly vehicles through the day sight during unlimited visibility. Panels do not provide a thermal signature.

- **Lighting.** Chemical or light emitting diode lights provide a means of marking vehicles at night. However, chemical lights are not visible through a thermal sight. An IR variant is available for use with night vision devices. Lighting systems do not provide for thermal identification during day or limited visibility operations.
- **Beacons and Strobes.** Beacons and strobes are unit-procured, small-scale, compact, battery-operated flashing devices that operate in the near infrared wavelength. They are clearly visibly through night vision optics, but cannot be viewed through thermal optics.

> ***Note.*** Beacons and strobes generate illumination signals that can only be viewed by I2 optics. The signal ***cannot be viewed*** by thermal optics. Leaders and Soldiers are required to be aware of which optic can effectively view these systems when developing their SOPs and when using them in training or combat.
>
> Beacons and strobes have the potential to be viewed by enemy elements with night vision capabilities. Units should tailor use of the beacon based on METT-TC.

- **Symbols.** Unit symbols may be used to mark friendly vehicles. An inverted V, for example, painted on the flanks, rear, and fronts of a vehicle, aid in identifying a target as friendly. These are typically applied in an area of operations and not during training. Symbol marking systems do not provide for thermal identification during day or limited visibility operations.

TARGET PRIORITIZATION

5-30. When faced with multiple targets, the Soldier must prioritize each target and carefully plan his shots to ensure successful target engagement. Mental preparedness and the ability to make split-second decisions are the keys to a successful engagement of multiple targets. The proper mindset will allow the Soldier to react instinctively and control the pace of the battle, rather than reacting to the adversary threat.

5-31. Targets are prioritized into three threat levels—

- **Most dangerous.** A threat that has the capability to defeat the friendly force and is preparing to do so. These targets must be defeated immediately.
- **Dangerous.** A threat that has the capability to defeat the friendly force, but is not prepared to do so. These targets are defeated after all most dangerous targets are eliminated.
- **Least dangerous.** Any threat that does not have the ability to defeat the friendly force, but has the ability to coordinate with other threats that are more prepared. These targets are defeated after all threats of a higher threat level are defeated.

5-32. When multiple targets of the same threat level are encountered, the targets are prioritized according to the threat they represent. The standard prioritization of targets establishes the order of engagement. Firers engage similar threats by the following guide:

- **Near before far**.
- **Frontal before flank**.
- **Stationary before moving**.

5-33. The prioritization of targets provides a control mechanism for the shooter, and facilitates maintaining overmatch over the presented threats. Firers should be prepared deviate from the prioritization guide based on the situation, collective fire command, or changes to the target's activities.

Chapter 6

Stability

Stability is the ability of the Soldier to create a stable firing platform for the engagement. The Soldier stabilizes the weapon to provide a consistent base from which to fire from and maintain through the shot process until the recoil impulse has ceased. This process includes how the Soldier holds the weapon, uses structures or objects to provide stability, and the Soldier's posture on the ground during an engagement. A stable firing platform is essential during the shot process, whether the Soldier is stationary or moving.

This chapter provides the principles of developing a stable firing platform, describes the interaction between the Soldier, weapon, the surroundings, and the methods to achieve the greatest amount of stability in various positions. It explains how the stability functional element supports the shot process and interacts and integrates the other three elements. Stability provides a window of opportunity to maintain sight alignment and sight picture for the most accurate shot.

SUPPORT

6-1. Stability is provided through four functions: support, muscle relaxation, natural point of aim, and recoil management. These functions provide the Soldier the means to best stabilize their weapon system during the engagement process.

6-2. The placement or arrangement of sandbags, equipment, or structures that directly provide support to the upper receiver of the weapon to provide increased stability. This includes the use of a bipod or vertical foregrip, bone and muscle support provided by the shooter to stabilize the rifle.

6-3. Support can be natural or artificial or a combination of both. Natural support comes from a combination of the shooter's bones and muscles. Artificial support comes from objects outside the shooter's body. The more support a particular position provides, the more stable the weapon.

- **Leg Position.** The position of the legs varies greatly depending on the firing position used. The position may require the legs to support the weight of the Soldier's body, support the firing elbow, or to meet other requirements for the firing position. When standing unsupported, the body is upright with the legs staggered and knees slightly bent. In the prone, the firer's legs may be spread apart flat on the ground or bent at the knee. In the sitting position, the legs may also serve an intricate part of the firing position.

- **Stance/Center of Gravity.** The physical position of a Soldier before, during, and after the shot that relates to the firer's balance and posture. The position/center of gravity does not apply when firing from the prone position. The position/center of gravity specifically relates to the Soldier's ability to maintain the stable firing platform during firing, absorbing the recoil impulses, and the ability to aggressively lean toward the target area during the shot process.
- **Firing Elbow.** The placement of the firing elbow during the shot process. Proper elbow placement provides consistent firing hand grip while standing, sitting, or kneeling, and provides support stability in the prone position.
- **Nonfiring Elbow.** The Soldier's placement of the nonfiring elbow during the shot process supports the rifle in the all positions.
- **Firing Hand.** Proper placement of the firing hand will aid in trigger control. Place the pistol grip in the 'V' formed between the thumb and index finger. The pressure applied is similar to a firm handshake grip. Different Soldiers have different size hands and lengths of fingers, so there is no set position of the finger on the trigger. To grip the weapon, the Soldier places the back strap of the weapon's pistol grip high in the web of his firing side hand between his thumb and index (trigger) finger. The Soldier's trigger finger is indexed on the lower receiver, well outside the trigger guard and off the magazine release to prevent inadvertent release of the magazine. The firing hand thumb (or trigger finger for left-handed firers) is indexed on top of the safety selector switch. The Soldier grasps the pistol grip with his remaining three fingers ensuring there is no gap between his middle finger and the trigger guard.
- **Nonfiring Hand.** Proper placement of the non-firing hand is based on the firing position and placement of the non-firing elbow to provide the stability of the weapon. Placement is adjusted during supported and unsupported firing to maximize stability. The non-firing hand is placed as far forward as comfortable without compromising the other elements of the position or inducing extreme shooter-gun angle.
  - The nonfiring hand supports the weight of the rifle by grasping the fore arm. It should be a firm but relaxed grip. In all positions it should be as close to the handguard as naturally possible to aid in recoil management.
  - If possible, the firer should strive to have the thumb of the nonfiring hand provide downward force on the handguard. The pressure will provide the necessary force to assist in the management of the muzzle rise from recoil.
  - In all positions it should be as close to the end of the handguard as naturally possible to aid in recoil management.
  - Due to limited space on current MWS rails the above may not be possible but consideration should be given while mounting lasers to achieve an extended grip.
- **Butt Stock.** Correct placement of the butt stock in the firing shoulder will aid in achieving a solid stock weld. Side to side placement will vary

depending on equipment worn while firing. The butt stock is placed high enough in the shoulder to allow for an upright head position.

- The vertical placement of the butt stock will vary from firing position to firing position. A general guideline to follow is: the higher the position from the ground, the higher the butt stock will be in the shoulder.
- The term "butt stock" refers to both the butt stock (M16-series) and collapsible butt stock (M4-series) for clarity.

- **Stock Weld.** Stock weld is the placement of the firer's head on the stock of the weapon. Correct stock weld is critical to sight alignment. The firer rests the full weight of the head on the stock. The head position is as upright as possible to give the best vision through the aiming device. It allows for scanning additional targets not seen through the aiming device.
  - When establishing the stock weld, bring the rifle up to your head, not your head down to the rifle. The firer's head will remain in the same location on the stock while firing, but the location may change when positions are changed. The bony portion of the cheek placed on the stock is the basic starting point. Soldiers adapt to their facial structure to find the optimal placement that allows for both sight alignment and repetitive placement.
  - Figure 6-1 shows the differences in head placement, which effects sight alignment. The firer on the right is NOT resting the full weight of their head on the stock. The picture on the left shows the skin of the firer's head being pushed down by the full weight of their head. This technique can be quickly observed and corrected by a peer coach.

Note. Soldiers' bodies vary with the amount of flesh and the bone structure of the face. Firers who apply downward force simply to achieve the appearance in the correct (left) image in figure 6-1, on page 6-4, will not have relaxation and will not have a repeatable placement. The goal is to have alignment with consistent placement.

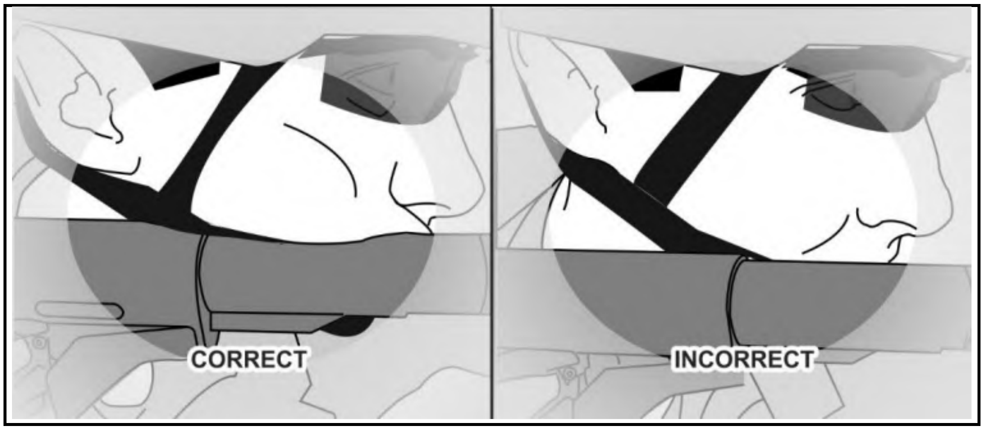

Figure 6-1. Stock weld

MUSCLE RELAXATION

6-4. Muscle relaxation is the ability of the Soldier to maintain orientation of the weapon appropriately during the shot process while keeping the major muscle groups from straining to maintain the weapon system's position. Relaxed muscles contribute to stability provided by support.

- Strained or fatigued muscles detract from stability.
- As a rule, the more support from the shooter's bones the less he requires from his muscles.
- The more skeletal support, the more stable the position, as bones do not fatigue or strain.
- As a rule, the less muscle support required, the longer the shooter can stay in position.

NATURAL POINT OF AIM

6-5. The natural point of aim is the point where the barrel naturally orients when the shooter's muscles are relaxed and support is achieved. The natural point of aim is built upon the following principles:

- The closer the natural point of aim is to the target, the less muscle support required.
- The more stable the position, the more resistant to recoil it is.
- More of the shooter's body on the ground equals a more stable position.
- More of the shooter's body on the ground equals less mobility for the shooter.

6-6. When a Soldier aims at a target, the lack of stability creates a wobble area, where the sights oscillate slightly around and through the point of aim. If the wobble area is larger than the target, the Soldier requires a steadier position or a refinement to their position to decrease the size of his wobble area before trigger squeeze.

Note. The steadier the position, the smaller the wobble area. The smaller the wobble area, the more precise the shot.

6-7. To check a shooter's natural point of aim, the Soldier should assume a good steady position and get to the natural pause. Close their eyes, go through one cycle, and then open their eyes on the natural pause. Where the sights are laying at this time, is the natural point of aim for that position. If it is not on their point of aim for their target, they should make small adjustments to their position to get the reticle or front sight post back on their point of aim. The Soldier will repeat this process until the natural point of aim is on the point of aim on their target.

RECOIL MANAGEMENT

6-8. Recoil management is the result of a Soldier assuming and maintaining a stable firing position which mitigates the disturbance of one's sight picture during the cycle of function of the weapon.

6-9. The Soldier's firing position manages recoil using support of the weapon system, the weight of their body, and the placement of the weapon during the shot process. Proper recoil management allows the sights to rapidly return to the target and allows for faster follow up shots.

SHOOTER–GUN ANGLE

6-10. The shooter gun-angle is the relationship between the shooters upper body and the direction of the weapon. This angle is typically different from firing position to firing position, and directly relates to the Soldier's ability to control recoil. Significant changes in the shooter-gun angle can result in eye relief and stock weld changes.

Note. Units with a mix of left and right handed shooters can take advantage of each Soldiers' natural carry positions, and place left-handed shooters on the right flanks, and right-handed shooters on the left flanks, as their natural carry alignment places the muzzle away from the core element, and outward toward potential threats, and reduces the challenges of firing when moving laterally.

FIELD OF VIEW

6-11. The field of view is the extent that the human eye can see at any given moment. The field of view is based on the Soldier's view ***without*** using magnification, optics, or thermal devices. The field of view is what the Soldier sees, and includes the areas where the Soldier can detect potential threats.

CARRY POSITIONS

6-12. There are six primary carry positions. These positions may be directed by the leader, or assumed by the Soldier based on the tactical situation. The primary positions are—

- Hang.
- Safe hang.
- Collapsed low ready.
- Low ready.
- High ready.
- Ready (or ready-up).

HANG

6-13. Soldiers use the hang when they need their hands for other tasks and no threat is present or likely (see figure 6-2). The weapon is slung and the safety is engaged. The hang carry should not be used when the weapon control status is RED. The reduced security of the weapon may cause the mechanical safety select lever to unintentionally move to SEMI or BURST/AUTO.

Carry Position:	Hang
When Used:	No threat is likely or present. Typically used when not in a tactical environment.
Command:	ASSUME HANG
Advantages:	Provides the maximum amount of Soldier mobility and freedom of movement and use of their hands.
Disadvantages:	Least accessibility to the weapon and the fire controls. Requires the most time to transition to a stable firing position. Maintains minimum amount of physical security.

Figure 6-2. Hang carry example

SAFE HANG

6-14. The safe hang is used when no immediate threat is present and the hands are not necessary (see figure 6-3). In the safe hang carry, the weapon is slung, the safety is engaged, and the Soldier has gripped the rifle's pistol grip. The Soldier sustains Rule 3, keeping the finger off the trigger until ready to engage when transitioning to the ready or ready up position.

6-15. In this position, the Soldier can move in any direction while simultaneously maintaining his muzzle oriented at the ground by using his firing hand. This carry provides control of the weapon, flexibility in movement, and positive control of the weapon's fire controls.

Carry Position:	Safe Hang
When Used:	No immediate threat is likely or present. Used to maintain positive control of the weapon, the fire controls, and weapon orientaion during movement.
Command:	ASSUME SAFE HANG
Advantages:	Provides some Soldier mobility while maintaining positive control of the weapon and weapon orientation.
Disadvantages:	Reduced use of hands.

Figure 6-3. Safe hang example

COLLAPSED LOW READY

6-16. The collapsed low ready is used when a greater degree of muzzle control and readiness to respond to threats or weapon retention is necessary (such as crowded environments). In the collapsed low ready, the firing hand is secure on the weapon's pistol grip. The non-firing hand is placed on the hand guards or vertical foregrip (see figure 6-4).

6-17. This carry allows a Soldier to navigate crowded or restrictive environments while simultaneously minimizing or eliminating his muzzle covering (flagging) by maintaining positive control of the muzzle orientation.

Carry Position:	Collapsed Low Ready
When Used:	A greater degree of muzzle control and readiness is required. Used in restricted or crowded environments, urban terrain, or when positive control of weapon orientation is required.
Command:	ASSUME COLLAPSED
Advantages:	Provides some Soldier mobility while maintaining positive control of the weapon and weapon orientation. Increased readiness.
Disadvantages:	Use of hands limited.

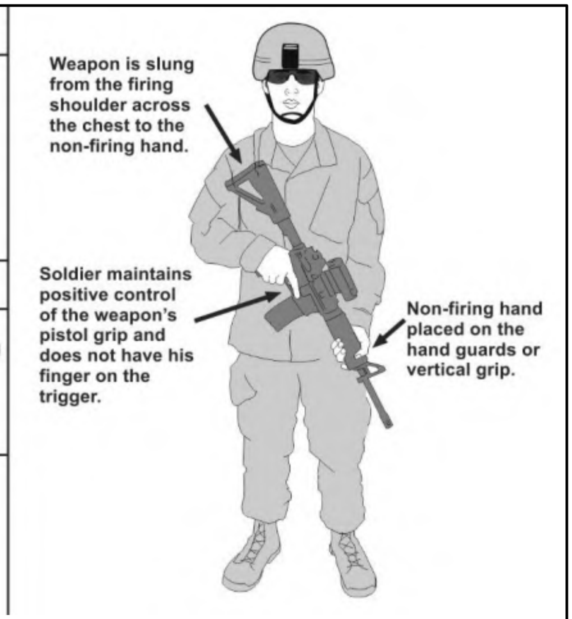

Figure 6-4. Collapsed low ready example

LOW READY

6-18. The low ready provides the highest level of readiness and with the maximum amount of observable area for target acquisition purposes

6-19. In the low ready position, the weapon is slung, the butt stock is in the Soldier's shoulder, and the muzzle is angled down at a 30- to 45-degree angle and oriented towards the Soldier's sector of fire.

6-20. Firing hand is positioned on the pistol grip with the index finger straight and out of the trigger guard. The thumb is placed on the selector lever with the lever placed on safe. From this carry, the Soldier is ready to engage threats within a very short amount of time with minimal movement. (See figure 6-5).

6-21. Observation is maintained to the sector of fire. The Soldier looks over the top of his optics or sights to maintain situation awareness of his sector. The Soldier's head remains upright.

Carry Position:	Low Ready
When Used:	Contact with threats is likely and direct fire engagements are probable.
Command:	GO LOW READY
Advantages:	Readiness is increased to provide for rapid engagement when the weapons control status conditions are met.
Disadvantages:	Reduced awareness laterally and to the rear.

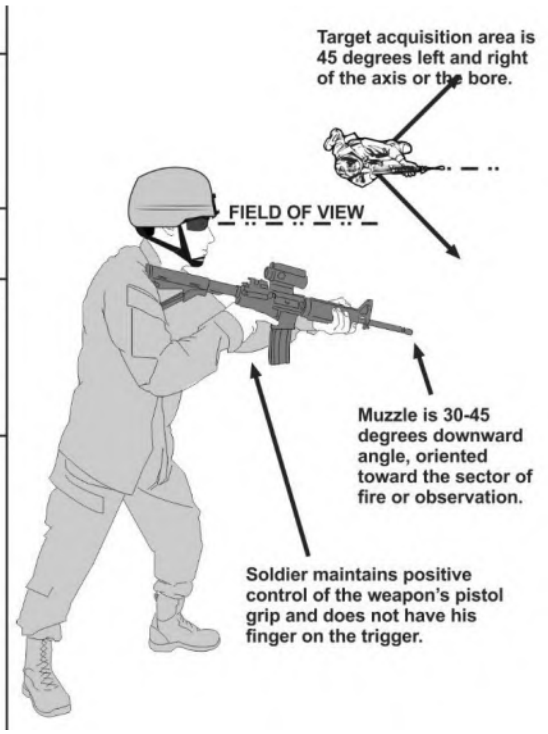

Figure 6-5. Low ready position

HIGH READY

6-22. The high ready is used when the Soldier's sector of fire includes areas overhead or when an elevated muzzle orientation is appropriate for safety (see figure 6-6). The high ready carry is used when contact is likely.

6-23. In the high ready, the weapon is slung, butt stock is in the armpit, the muzzle angled up to at least a 45-degree angle and oriented toward the Soldier's sector of fire—ensuring no other Soldiers are flagged.

6-24. The firing hand remains in the same position as the low ready. The non-firing side hand can be free as the weapon is supported by the firing side hand and armpit.

6-25. This position is not as effective as the low ready for several reasons: it impedes the field of view, flags friendlies above the sector of fire, and typically takes longer to acquire the target.

Carry Position:	High Ready
When Used:	Contact with threats is likely, threats or hazards are overhead, or when elevated muzzle orientation is required.
Command:	GO HIGH READY
Advantages:	Increased readiness for elevated threats, increased flag protection for friendly forces on the same level.
Disadvantages:	Reduced awareness laterally and to the rear. Impedes the field of view, can flag friendlies above the sector of fire, and increases time to acquire targets.

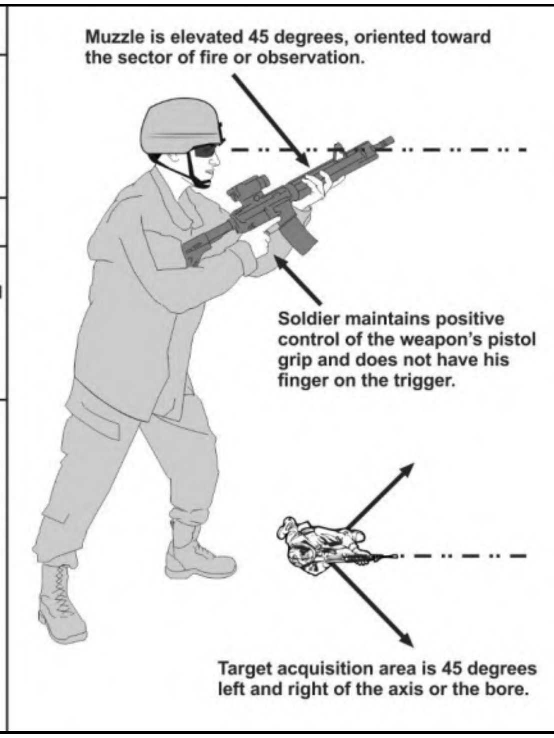

Figure 6-6. High ready position

READY OR READY-UP

6-26. The ready is used when enemy contact is imminent (see figure 6-7). This carry is used when the Soldier is preparing or prepared to engage a threat.

6-27. In the ready, the weapon is slung, the toe of the butt stock is in the Soldier's shoulder, and muzzle is oriented toward a threat or most likely direction of enemy contact. The Soldier is looking through his optics or sights. His non-firing side hand remains on the hand guards or the vertical foregrip.

6-28. The firing hand remains on the pistol grip with the firing finger off the trigger until the decision to engage a target is made.

Carry Position:	Ready or Ready Up
When Used:	Contact with threats is imminent, the orientation of the muzzle is in the most probable target location, and the Soldier is prepared to engage.
Command:	MAKE READY
Advantages:	The highest level of readiness to engage a threat or threats. Rapid transition from target acquisition to engagement.
Disadvantages:	Reduced awareness laterally and to the rear. Requires the Soldier to maintain situational awareness laterally while actively acquiring targets.

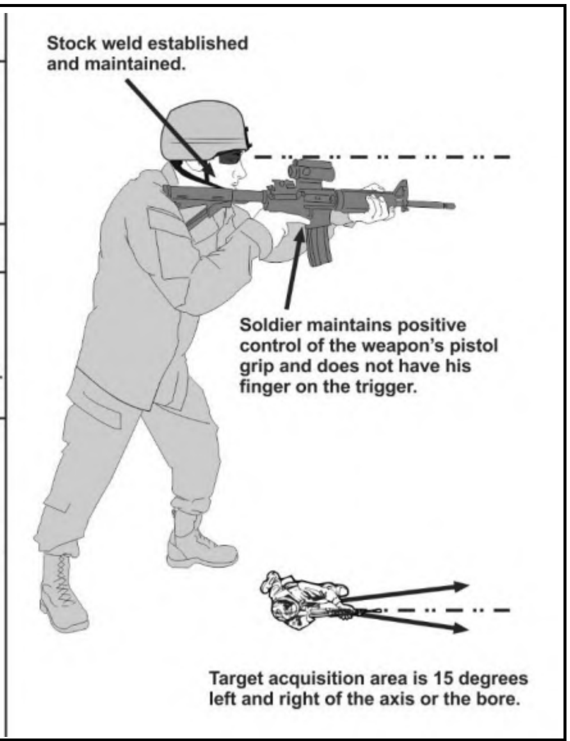

Figure 6-7. Ready position or up position

STABILIZED FIRING

6-29. The Soldier must stabilize their weapon, whether firing from a stationary position or while on the move. To create a stabilized platform, Soldiers must understand the physical relationship between the weapon system, the shooter's body, the ground, and any other objects touching the weapon or shooter's body. The more contact the shooter has to the ground will determine how stable and effective the position is. The situation and tactics will determine the actual position used.

6-30. When a shooter assumes a stable firing position, movement from muscle tension, breathing, and other natural activities within the body will be transferred to the weapon and must be compensated for by the shooter.

6-31. Failing to create an effective platform to fire from is termed a ***stabilization failure***. A stabilization failure occurs when a Soldier fails to:

- Control the movement of the barrel during the arc of movement
- Adequately support the weapon system
- Achieve their natural point of aim.

6-32. These failures compound the firing occasion's errors, which directly correlate to the accuracy of the shot taken. To maximize the Soldier's stability during the shot process, they correctly assume various firing positions when stationary, or offset the induced errors with other firing skills during tactical movement.

6-33. As a rule, positions that are lower to the ground provide a higher level of stability. When the center of gravity elevates the level of stability decreases as shown in figure°6-8.

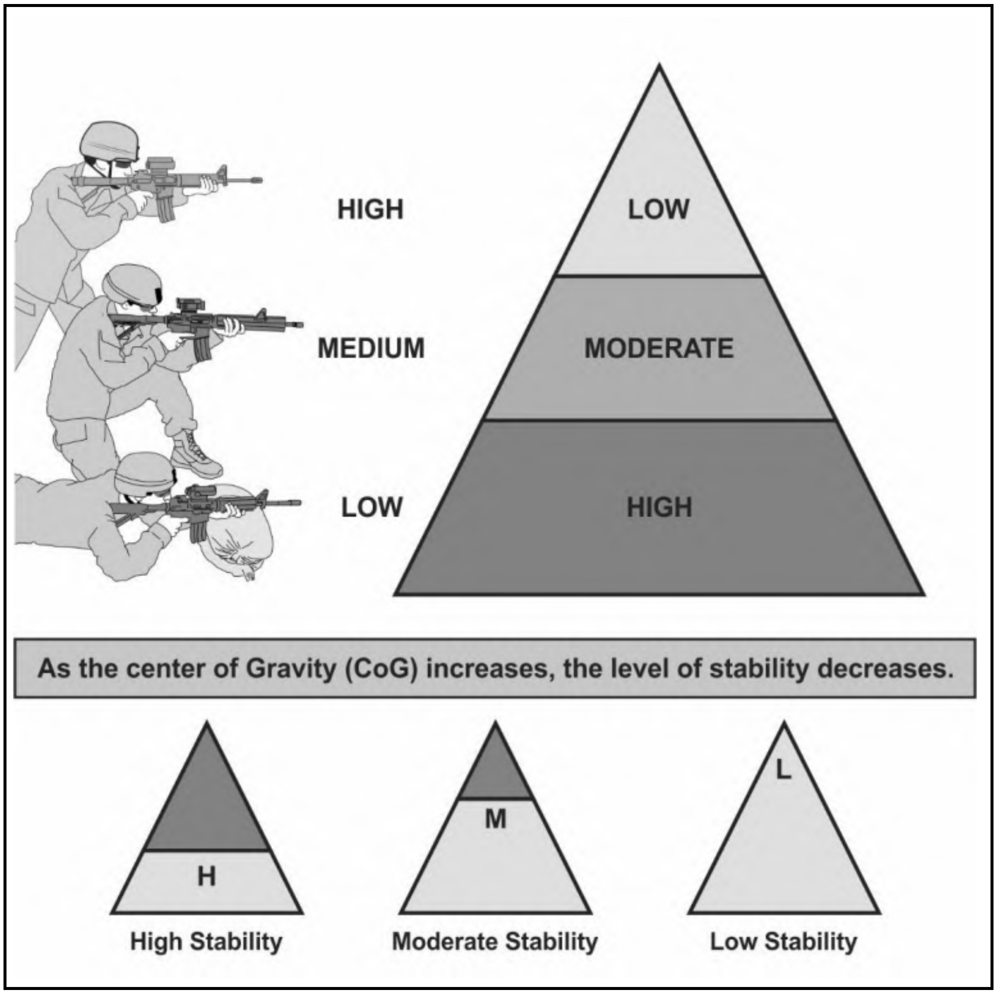

Figure 6-8. Firing position stability example

FIRING POSITIONS

6-34. The nature of combat will not always allow time for a Soldier to get into a particular position. Soldiers need to practice firing in a variety of positions, including appropriate variations. There are 12 firing positions with variations that are common to all Soldiers. The positions are listed highest to lowest. The primary position is listed in bold, with the position variations in italics:

- **Standing** –
  - *Standing, unsupported*.
  - *Standing, supported.*
- **Squatting** – This position allows for rapid engagement of targets when an obstruction blocks the firer from using standard positions. It provides the firer a fairly well supported position by simply squatting down to engage, then returning to a standing position once the engagement is complete. The squatting position is generally unsupported.
- **Kneeling** – The kneeling position is very common and useful in most combat situations. The kneeling position can be supported or unsupported.
  - *Kneeling, unsupported.*
  - *Kneeling, supported.*
- **Sitting** – There are three types of sitting positions: crossed-ankle, crossed-leg, and open-leg. All positions are easy to assume, present a medium silhouette, provide some body contact with the ground, and form a stable firing position. These positions allow easy access to the sights for zeroing.
  - *Sitting, crossed ankle.*
  - *Sitting, crossed leg.*
  - *Sitting, open leg.*
- **Prone –** The prone position is the most stable firing position due to the amount of the Soldier's body is in contact with the ground. The majority of the firer's frame is behind the rifle to assist with recoil management.
  - *Prone, unsupported.*
  - *Prone, supported.*
  - *Prone, roll-over.*
  - *Prone, reverse roll-over.*

6-35. Soldiers must practice the positions dry frequently to establish their natural point of aim for each position, and develop an understanding of the restrictive nature of their equipment during execution. With each dry repetition, the Soldier's ability to change positions rapidly and correctly are developed, translating into efficient movement and consistent stable firing positions.

6-36. Each of these firing positions is described using in a standard format using the terms defined earlier.

STANDING, UNSUPPORTED

6-37. This position should be used for closer targets or when time is not available to assume a steadier position such as short range employment. The upper body should be leaned slightly forward to aid in recoil management. The key focus areas for the standing supported position are applied as described in figure 6-9 below:

1 Support:	Unsupported
2 Leg Position:	Standing, firm, feet shoulder-width apart.
3 Stance / Center of Gravity:	Aggressive lean forward toward the target.
4 Firing Elbow:	Tucked toward the shooter's side.
5 Non-Firing Elbow:	Slightly outward.
6 Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7 Non-Firing Hand:	Extended as forward as possible, for aid in recoil and transitioning.
8 Butt Plate:	Highest point of shoulder to absorb recoil impulse.
9 Stock Weld:	Firm stock weld.
10 Shooter-Gun Angle:	Shooter body is approximately 45 degrees to the gun-target line.

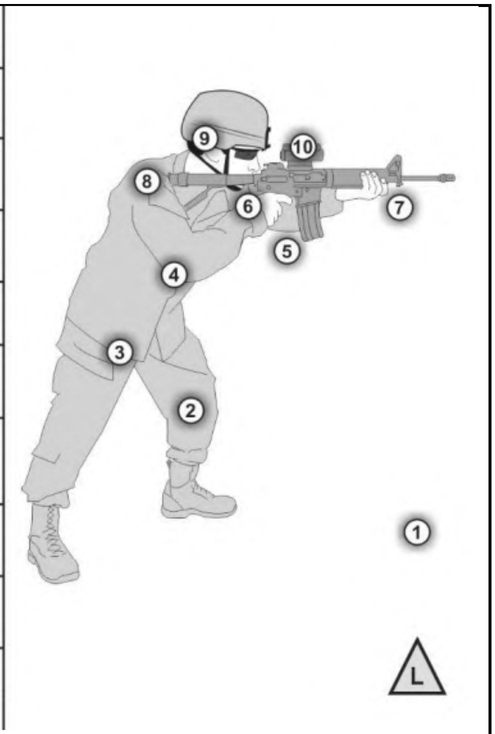

Figure 6-9. Standing, unsupported example

STANDING, SUPPORTED

6-38. Soldier should ensure it is the handguard of the weapon NOT the barrel that is in contact with the artificial support. Barrels being in direct contact with artificial support will result in erratic shots. The standing supported position uses artificial support to steady the position (see figure 6-10.) Forward pressure should be applied by the rear leg and upper body to aid in recoil management. The key focus area for the standing supported position are applied in the following ways:

> **Nonfiring hand.** The nonfiring hand will hold the hand guards firmly and push against the artificial support. Hand positioning will vary depending on the type of support used.

1 Support:	Weapon is supported using a structure, bipod, or equipment.
2 Leg Position:	Standing, firm, feet shoulder-width apart.
3 Stance / Center of Gravity:	Aggressive lean forward toward the target.
4 Firing Elbow:	Tucked toward the shooter's side.
5 Non-Firing Elbow:	Extended to provide non-firing hand support.
6 Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7 Non-Firing Hand:	Firm grasp on the hand guards, push against the artificial support.
8 Butt Plate:	Highest point of shoulder to absorb recoil impulse.
9 Stock Weld:	Firm stock weld.
10 Shooter-Gun Angle:	Shooter body is approximately 45 degrees to the gun-target line.

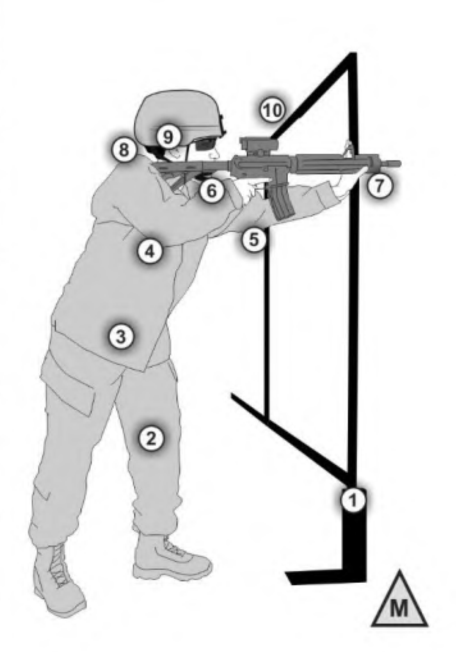

Figure 6-10. Standing, supported example

SQUATTING

6-39. This position allows for rapid engagement of targets when an obstruction blocks the firer from using standard positions. It allows the firer a fairly stable position by simply squatting down to engage, then returning to a standing position after completing the engagement (see figure 6-11.)

6-40. Perform the following to assume a good squatting firing position:

- Face the target.
- Place the feet shoulder-width apart.
- Squat down as far as possible.
- Place the back of triceps on the knees ensuring there is no bone on bone contact.
- Place the firing hand on the pistol grip and the nonfiring hand on the upper hand guards.
- Place the weapon's butt stock high in the firer's shoulder pocket.

Note. The firer may opt to use pressure from firing hand to rotate weapon to place the magazine against the opposite forearm to aid in stabilization.

1	Support:	Unsupported - Soldier uses his body for limited weapon support.
2	Leg Position:	Crouched into a squatting position as low as possible to provide stability.
3	Stance / Center of Gravity:	Squatted, leaning toward the target area to assist with recoil management and absorption.
4	Firing Elbow:	Resting on the outside of the firing knee using the meaty portion of the tricep for support on the knee.
5	Non-Firing Elbow:	Resting on the inside of the non-firing thigh (NOT on the knee).
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Firmly grasping the hand guards or vertical foregrip for support.
8	Butt Plate:	Mid-point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter is approximately 30 degrees off the gun-target line.

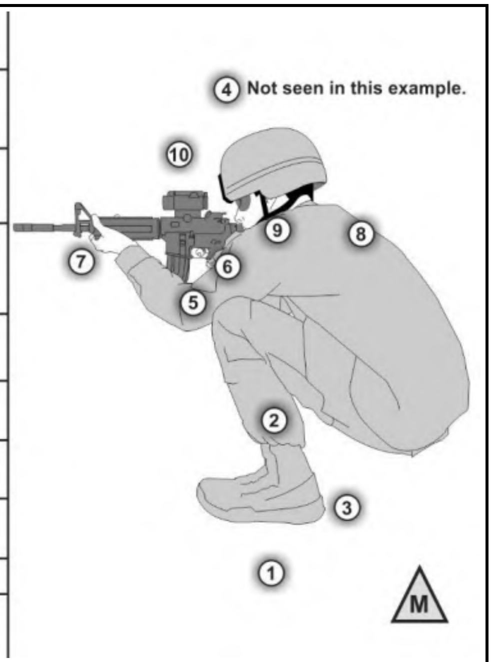

Figure 6-11. Squatting position

KNEELING, UNSUPPORTED

6-41. The kneeling unsupported position does not use artificial support. Figure 6-12 shows the optimum unsupported kneeling position. The firer should be leaning slightly forward into the position to allow for recoil management and quicker follow-up shots. The primary goal of this firing position is to establish the smallest wobble area possible. Key focus areas for kneeling, unsupported are:

- **Nonfiring elbow.** Place the non-firing elbow directly underneath the rifle as much as possible. The elbow should be placed either in front of or behind the kneecap. Placing the elbow directly on the kneecap will cause it to roll and increases the wobble area.
- **Leg position.** The non-firing leg should be bent approximately 90 degrees at the knee and be directly under the rifle. The firing-side leg should be perpendicular to the nonfiring leg. The firer may rest their body weight on the heel. Some firers lack the flexibility to do this and may have a gap between their buttocks and the heel.
- **Aggressive (stretch) kneeling.** All weight on non-firing foot, thigh to calf, upper body leaning forward, nonfiring triceps on non-firing knee, firing leg stretched behind for support. Highly effective for rapid fire and movement.

1	Support:	Unsupported - Soldier uses non-firing knee when possible.
2	Leg Position:	Firing knee on the ground, foot under seat. Non-firing leg bent approximately 90 degrees and under weapon.
3	Stance / Center of Gravity:	Slight lean in to the target area. All weight on non-firing foot, thigh to calf.
4	Firing Elbow:	Tucked toward the shooter's side.
5	Non-Firing Elbow:	Tricep on the non-firing knee for self-support. Elbow underneath rifle. Elbow NOT ON KNEE.
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Firm grasp on the hand guards to control wobble.
8	Butt Plate:	Mid to high point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter body is approximately 30 degrees to the gun-target line.

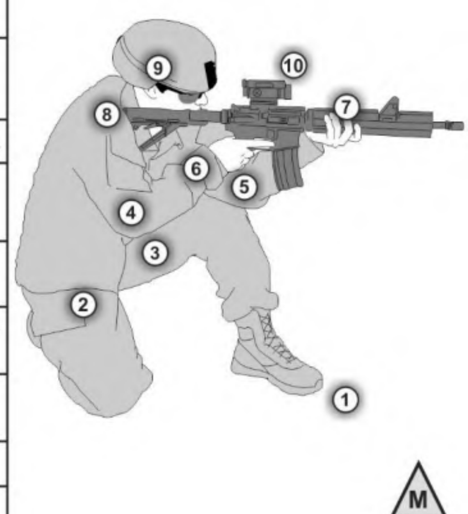

Figure 6-12. Kneeling, unsupported example

KNEELING, SUPPORTED

6-42. The kneeling supported position uses artificial support to steady the position (see figure 6-13). Contact by the nonfiring hand and elbow with the artificial support is the primary difference between the kneeling supported and unsupported positions since it assists in the stability of the weapon. Body contact is good, but the barrel of the rifle must not touch the artificial support. Forward pressure is applied to aid in recoil management. The key focus areas for the kneeling supported position are applied in the following ways:

- **Nonfiring hand.** The nonfiring hand will hold the hand guards firmly and will also be pushed against the artificial support. Hand positioning will vary depending on the type of support used.
- **Nonfiring elbow.** The nonfiring elbow and forearm may be used to assist with the weapon's stability by pushing against the artificial support. The contact of the nonfiring elbow and forearm with the structure will vary depending on the support used and the angle to the target.

1	Support:	Supported using available structure or equipment
2	Leg Position:	Non-firing knee on the ground, foot under seat. Firing leg bent approximately 90 degrees outward.
3	Stance / Center of Gravity:	Slight lean toward target area. All weight on firing foot and pressure on the artificial support.
4	Firing Elbow:	Tucked toward the shooter's side, pressed against the inside of the firing thigh.
5	Non-Firing Elbow:	Extended. May be pushed against the artificial support for stability.
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Firm grasp on the hand guards, push against the artificial support.
8	Butt Plate:	Mid to high point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter body is approximately 30 degrees to the gun-target line.

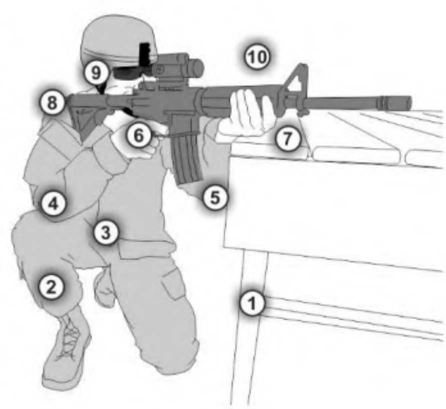

Figure 6-13. Kneeling, supported example

SITTING, CROSSED-ANKLE

6-43. The sitting, crossed-ankle position provides a broad base of support and places most of the body weight behind the weapon (see figure 6-14). This allows quick shot recovery and recoil impulse absorption. Perform the following to assume a good crossed-ankle position:

- Face the target at a 10- to 30-degree angle.
- Place the nonfiring hand under the hand guard.
- Bend at knees and break fall with the firing hand.
- Push backward with feet to extend legs and place the buttocks to ground.
- Cross the non-firing ankle over the firing ankle.
- Bend forward at the waist.
- Place the non-firing elbow on the nonfiring leg below knee.
- Grasp the rifle butt with the firing hand and place into the firing shoulder pocket.
- Grasp the pistol grip with the firing hand.
- Lower the firing elbow to the inside of the firing knee.
- Place the cheek firmly against the stock to obtain a firm stock weld.
- Move the nonfiring hand to a location under the hand guard that provides the maximum bone support and stability for the weapon.

1	Support:	Unsupported - Soldier uses his body for weapon support.
2	Leg Position:	Non-firing leg crossed over firing leg at 90 degrees, ankles inter-locked.
3	Stance / Center of Gravity:	Soldier's frame sitting against the ground for maximum stability, shot recovery, and recoil absorption.
4	Firing Elbow:	Resting on the inside of the firing thigh for support.
5	Non-Firing Elbow:	Resting on the outside of the non-firing thigh (NOT on the knee).
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Firmly grasping the hand guards or vertical foregrip for support.
8	Butt Plate:	Mid-point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter is approximately 30 degrees off the gun-target line.

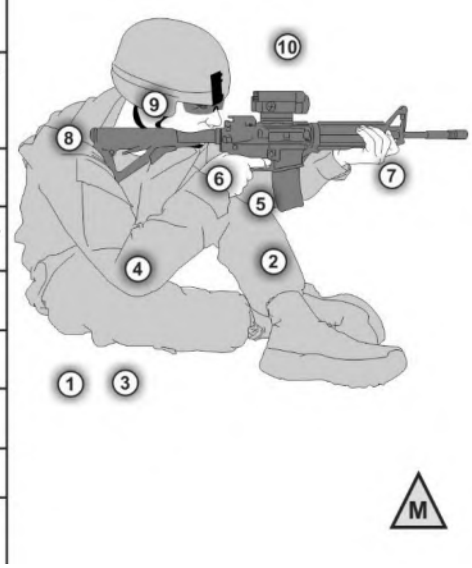

Figure 6-14. Sitting position—crossed ankle

SITTING, CROSSED-LEG

6-44. The crossed-leg sitting position provides a base of support and places most of the body weight behind the weapon for quick shot recovery (see figure 6-15). Soldiers may experience a strong pulse beat in this position due to restricted blood flow in the legs and abdomen. An increased pulse causes a larger wobble area.

6-45. Perform the following to assume a good crossed-leg position:

- Place the nonfiring hand under the hand guard.
- Cross the nonfiring leg over the firing leg.
- Bend at the knees and break the fall with the firing hand.
- Place the buttocks to the ground close to the crossed legs.
- Bend forward at the waist.
- Place the nonfiring elbow on the nonfiring leg at the bend of the knee.
- Establish solid butt stock position in the firing shoulder pocket.
- Grasp the pistol grip with the firing hand.
- Lower the firing elbow to the inside of the firing knee.
- Place the cheek firmly against the stock to obtain a firm stock weld.
- Place the non-firing hand under the hand guard to provide support.

1	Support:	Unsupported - Soldier uses his body for weapon support.
2	Leg Position:	Non-firing leg crossed over firing leg in a crossed sitting position.
3	Stance / Center of Gravity:	Soldier's frame sitting against the ground for maximum stability, shot recovery, and recoil absorption.
4	Firing Elbow:	Resting on the inside of the firing thigh for support.
5	Non-Firing Elbow:	Resting on the outside of the non-firing thigh (NOT on the knee).
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Firmly grasping the hand guards or vertical foregrip for support.
8	Butt Plate:	Mid-point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter is approximately 30 degrees off the gun-target line.

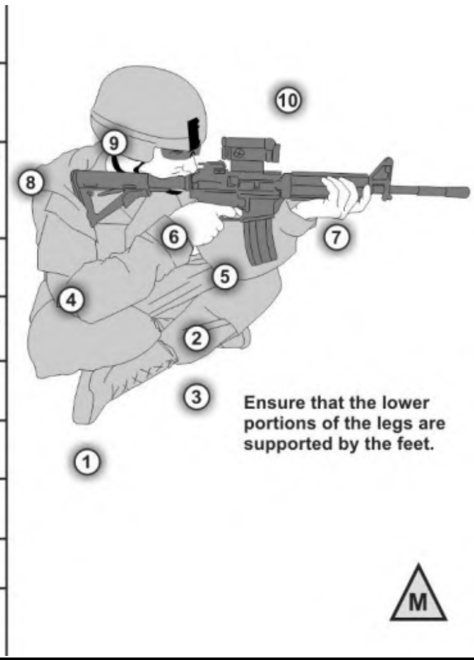

Figure 6-15. Sitting position—crossed-leg

SITTING, OPEN-LEG

6-46. The open-leg sitting position is the preferred sitting position when shooting with combat equipment (see figure 6-16). It places less of the body weight behind the weapon than the other sitting positions. Perform the following to assume a good open-leg position:

- Face the target at a 10 to 30 degree angle to the firing of the line of fire.
- Place the feet approximately shoulder width apart.
- Place the nonfiring hand under the hand guard.
- Bend at the knees while breaking the fall with the firing hand. Push backward with the feet to extend the legs and place the buttocks on ground.
- Place the both the firing and non-firing elbow inside the knees.
- Grasp the rifle butt with the firing hand and place into the firing shoulder pocket.
- Grasp the pistol grip with the firing hand.
- Lower the firing elbow to the inside of the firing knee.
- Place the cheek firmly against the stock to obtain a firm stock weld.
- Move nonfiring hand to a location under the hand guard that provides maximum bone support and stability for the weapon.

1	Support:	Unsupported - Soldier uses his body for limited weapon support.
2	Leg Position:	Open leg stance using seat and heels to provide balance.
3	Stance / Center of Gravity:	Soldier's frame sitting against the ground for maximum stability, shot recovery, and recoil absorption.
4	Firing Elbow:	Resting on the inside of the firing thigh for support.
5	Non-Firing Elbow:	Resting on the inside of the non-firing thigh (NOT on the knee).
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Firmly grasping the hand guards or vertical foregrip for support.
8	Butt Plate:	Mid-point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter is approximately 30 degrees off the gun-target line.

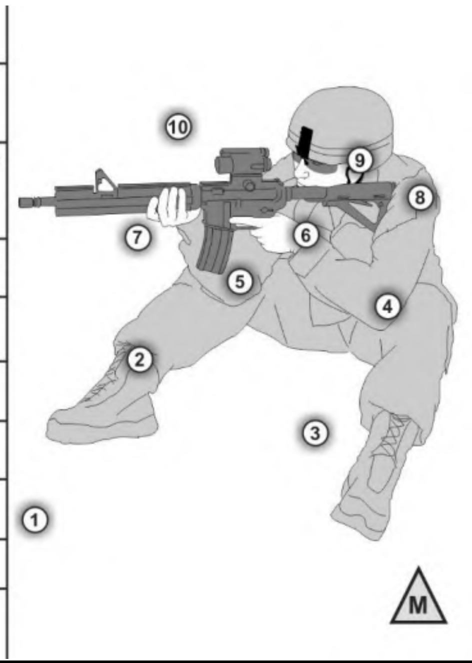

Figure 6-16. Sitting position—open leg

PRONE, UNSUPPORTED

6-47. The prone unsupported position is not as stable as the prone supported position (see figure 6-17). Soldiers must build a stable, consistent position that focuses on the following key areas:

- **Firing hand.** The firer should have a firm handshake grip on the pistol grip and place their finger on the trigger where it naturally falls.
- **Nonfiring hand.** The nonfiring hand is placed to control the weapon and is comfortable.
- **Leg position.** The firer's legs may be either spread with heels as flat as possible on ground or the firing side leg may be bent at the knee to relieve pressure on the stomach.

1	Support:	Unsupported - the Soldier uses his elbows to reduce wobble.
2	Leg Position:	Spread with heels flat against the ground or the firing side leg bent at the knee to relieve pressure.
3	Stance / Center of Gravity:	Prone position maximizes the Soldier's frame against the ground for maximum stability.
4	Firing Elbow:	Used to provide stability to the weapon.
5	Non-Firing Elbow:	As close to directly underneath the weapon as comfortable.
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Firm grasp on the hand guards.
8	Butt Plate:	Mid-point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter body is nearly in-line with the gun-target line.

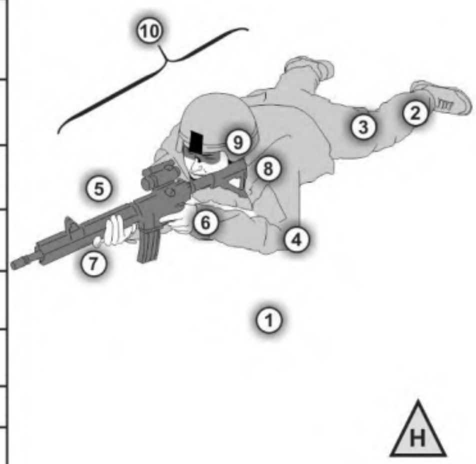

Figure 6-17. Prone, unsupported example

Note. The magazine can be rested on the ground while using the prone unsupported position. Firing with the magazine on the ground will NOT induce a malfunction.

PRONE, SUPPORTED

6-48. The prone supported position allows for the use of support, such as sandbags (see figure 6-18). Soldiers must build a stable, consistent position that focuses on the following key areas:

- **Firing hand.** The firer should have a firm handshake grip on the pistol grip and place their finger on the trigger where it naturally falls.
- **Nonfiring hand.** The nonfiring hand is placed to maximize control the weapon and where it is comfortable on the artificial support.
- **Leg position.** The firer's legs may be either spread with heels as flat as possible on ground or the firing side leg may be bent at the knee to relieve pressure on the stomach.
- **Artificial support.** The artificial support should be at a height that allows for stability without interfering with the other elements of the position.

1	Support:	Supported with sandbag, equipment, or structure.
2	Leg Position:	Spread with heels flat against the ground or the firing side leg bent at the knee to relieve pressure.
3	Stance / Center of Gravity:	Prone position maximizes the Soldier's frame against the ground for maximum stability.
4	Firing Elbow:	Used to provide stability to the weapon.
5	Non-Firing Elbow:	Used to provide stability to the weapon.
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Firm grasp on the hand guards.
8	Butt Plate:	Mid-point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter body is nearly in-line with the gun-target line.

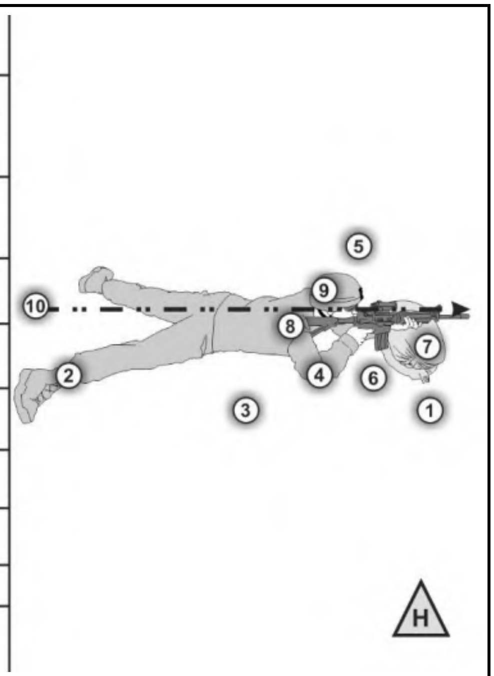

Figure 6-18. Prone, supported example

PRONE, ROLL-OVER

6-49. This position allows the firer to shoot under obstacles or cover that would not normally be attainable from the standard conventional prone position (see figure 6-19). With this position, the bullet trajectory will be off compared to the line of sight and increase with distance from the firer.

For example, in the figure below the sights are rotated to the right. The trajectory of the bullet will be lower than and to the right of point of aim. This error will increase with range.

1	Support:	Unsupported - Soldier may use non-firing hand for limited support.
2	Leg Position:	Spread with heels flat against the ground or the non-firing side leg bent at the knee to provide stability.
3	Stance / Center of Gravity:	Prone position maximizes the Soldier's frame against the ground for maximum stability.
4	Firing Elbow:	Tucked under the firer.
5	Non-Firing Elbow:	Above the weapon in a position that does not interfere with LOS.
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Must provide clearance between ejection port and the ground.
8	Butt Plate:	Mid-point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter body is nearly perpendicular with the gun-target line.

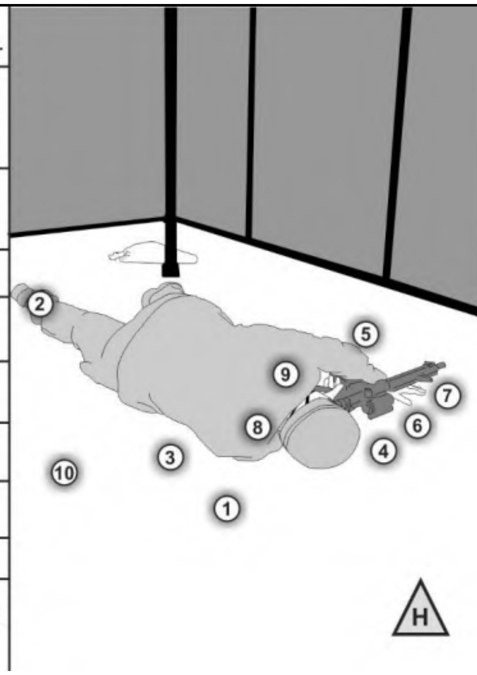

Figure 6-19. Prone, roll-over example

PRONE, REVERSE ROLL-OVER

6-50. This position is primarily used when the firer needs to keep behind cover that is too low to use while in a traditional prone position (see figure 6-20). The bullet's trajectory will be off considerably at long distances while in this position.

6-51. This position is the most effective way to support the weapon when the traditional prone is too low to be effective and where a kneeling position is too high to gain cover or a solid base for support.

1	Support:	Unsupported - Soldier uses his body for weapon support.
2	Leg Position:	Spread with heels flat against the ground or the non-firing side leg bent at the knee to provide stability.
3	Stance / Center of Gravity:	Prone position maximizes the Soldier's frame against the ground for maximum stability.
4	Firing Elbow:	Across body to assist in stabilizing the weapon.
5	Non-Firing Elbow:	Below the weapon in a position to support the weapon.
6	Firing Hand:	Grasping pistol grip, finger off the trigger until ready to fire.
7	Non-Firing Hand:	Placed under the hand guards top provide limited stability.
8	Butt Plate:	Mid-point of shoulder to absorb recoil impulse.
9	Stock Weld:	Firm stock weld.
10	Shooter-Gun Angle:	Shooter body is nearly perpendicular with the gun-target line.

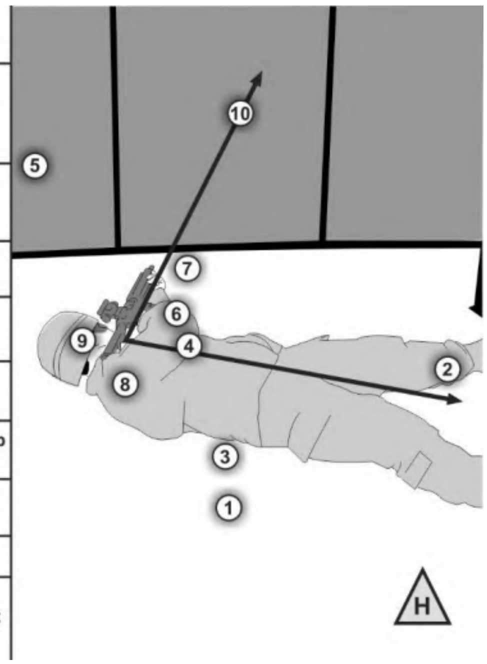

Figure 6-20. Reverse roll-over prone firing position

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Chapter 7

Aim

The functional element aim of the shot process is the continuous process of orienting the weapon correctly, aligning the sights, aligning on the target, and the application of the appropriate lead and elevation during a target engagement. Aiming is a continuous process conducted through pre-shot, shot, and post-shot, to effectively apply lethal fires in a responsible manner with accuracy and precision.

Aiming is the application of perfectly aligned sights on a specific part of a target. Sight alignment is the first and most important part of this process.

COMMON ENGAGEMENTS

7-1. The aiming process for engaging stationary targets consist of the following Soldier actions, regardless of the optic, sight, or magnification used by the aiming device:

- **Weapon orientation** – the direction of the weapon as it is held in a stabilized manner.
- **Sight alignment** – the physical alignment of the aiming device:
  - Iron sight/back-up iron sight and the front sight post.
  - Optic reticle.
  - Ballistic reticle (day or thermal).
- **Sight picture** – the target as viewed through the line of sight.
- **Point of aim (POA)** – the specific location where the line of sight intersects the target.
- **Desired point of impact (POI)**–the desired location of the strike of the round to achieve the desired outcome (incapacitation or lethal strike).

7-2. The aim of the weapon is typically applied to the largest, most lethal area of any target presented. Sights can be placed on target by using battlesight zero (BZ), ***center of visible mass (CoVM)***. The center of visible mass is the initial point of aim on a target of what can be seen by the Soldier. It does not include what the target size is expected or anticipated to be. For example, a target located behind a car exposes its head. The center of visible mass is in the center of the head, not the estimated location of the center of the overall target behind the car.

WEAPON ORIENTATION

7-3. The Soldier orients the weapon in the direction of the detected threat. Weapon orientation includes both the horizontal plane (azimuth) and the vertical plane (elevation). Weapon orientation is complete once the sight and threat are in the Soldier's field of view.

- **Horizontal weapons orientation** covers the frontal arc of the Soldier, spanning the area from the left shoulder, across the Soldier's front, to the area across the right shoulder (see figure 7-1).

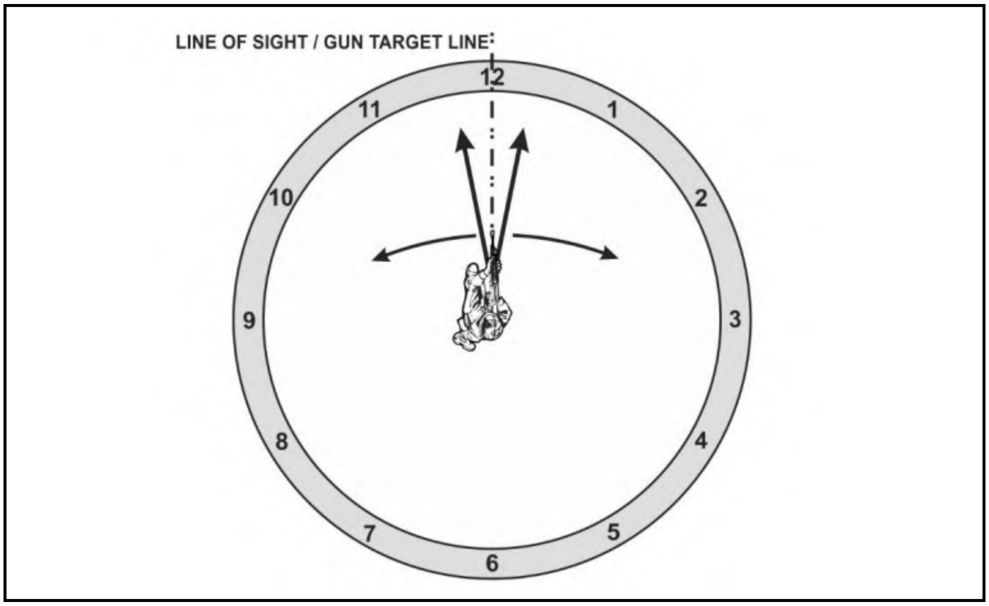


Figure 7-1. Horizontal weapon orientation example

- **Vertical weapons orientation** includes all the aspects of orienting the weapon at a potential or confirmed threat in elevation. This is most commonly applied in restricted, mountainous, or urban terrain where threats present themselves in elevated or depressed firing positions (see figure 7-2).

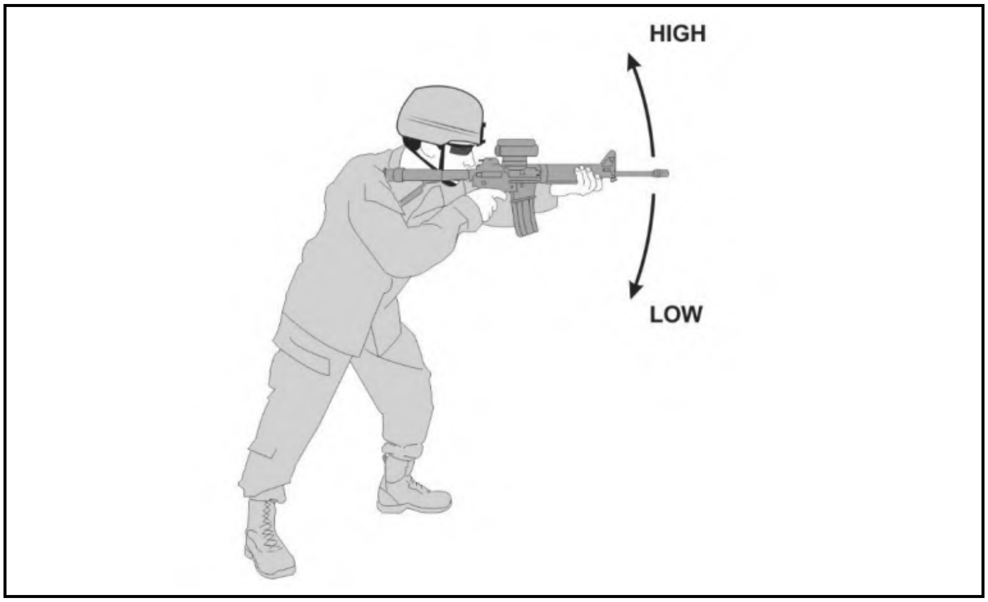


Figure 7-2. Vertical weapons orientation example

SIGHT ALIGNMENT

7-4. Sight alignment is the relationship between the aiming device and the firer's eye. The process used by a Soldier depends on the aiming device employed with the weapon.

- **Iron sight** – the relationship between the front sight post, rear sight aperture, and the firer's eye. The firer aligns the tip of the front sight post in the center of the rear aperture and his/or her eye. The firer will maintain focus on the front sight post, simultaneously centering it in the rear aperture.
- **Optics** – the relationship between the reticle and the firer's eye and includes the appropriate eye relief, or distance of the Soldier's eye from the optic itself. Ensure the red dot is visible in the CCO, or a full centered field of view is achieved with no shadow on magnified optics
- **Thermal** – the relationship between the firer's eye, the eyepiece, and the reticle.
- **Pointers / Illuminators / Lasers** – the relationship between the firer's eye, the night vision device placement and focus, and the laser aiming point on the target.

Note. Small changes matter - 1/1000 of an inch deviation at the weapon can result in up to an 18 inch deviation at 300 meters.

7-5. The human eye can only focus clearly on one object at a time. To achieve proper and effective aim, the focus of the firer's eye needs to be on the front sight post or reticle (see figure 7-3). This provides the most accurate sight alignment for the shot process.

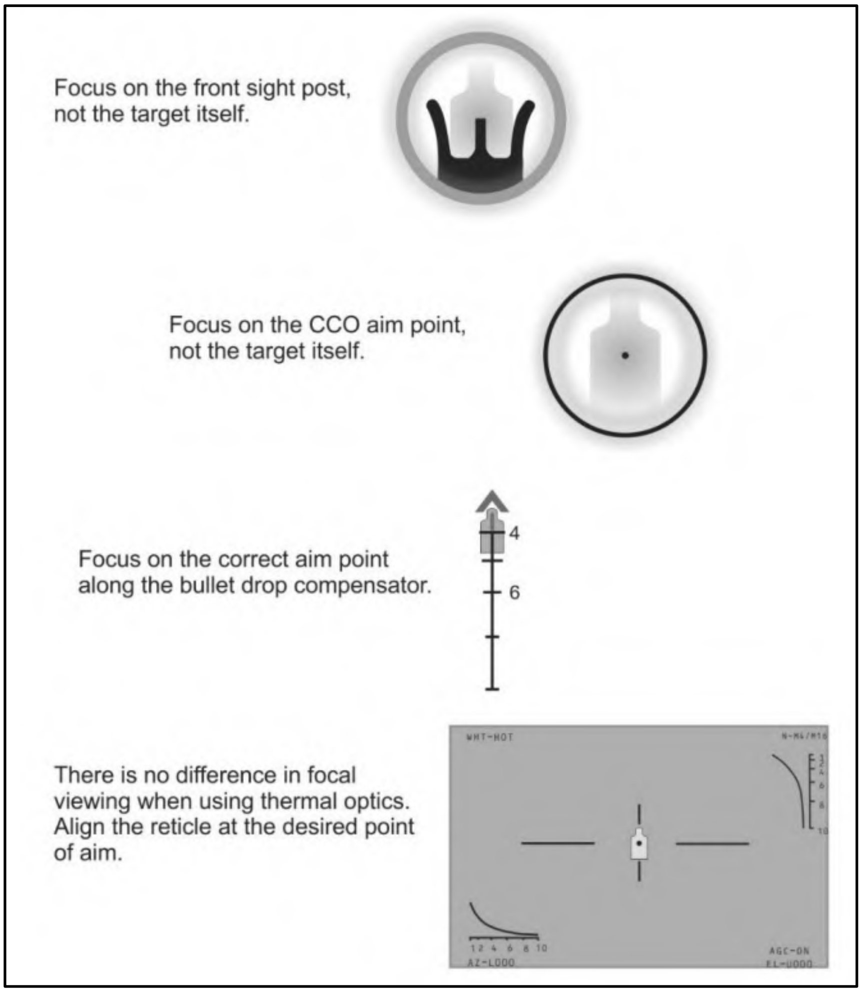


Figure 7-3. Front sight post/reticle aim focus

7-6. Firers achieve consistent sight alignment by resting the full weight of their head on the stock in a manner that allows their dominant eye to look through the center of the aiming or sighting device. If the firer's head placement is subjected to change during the firing process or between shots, the Soldier will experience difficultly achieving accurate shot groups.

SIGHT PICTURE

7-7. The sight picture is the placement of the aligned sights on the target itself. The Soldier must maintain sight alignment throughout the positioning of the sights. This is not the same as sight alignment.

7-8. There are two sight pictures used during the shot process; pre-shot and post-shot. Soldiers must remember the sight pictures of the shot to complete the overall shot process.

- Pre-shot sight picture – encompasses the original point of aim, sight picture, and any holds for target or environmental conditions.
- Post-shot sight picture – is what the Soldier must use as the point of reference for any sight adjustments for any subsequent shot.

POINT OF AIM

7-9. The point on the target that is the continuation of the line created by sight alignment. The point of aim is a point of reference used to calculate any hold the Soldier deems necessary to achieve the desired results of the round's impact.

7-10. For engagements against stationary targets, under 300 meters, with negligible wind, and a weapon that has a 200 meter or 300 meter confirmed zero, the point of aim should be the center of visible mass of the target. The point of aim does not include ANY hold-off or lead changes necessary.

DESIRED POINT OF IMPACT

7-11. The desired point of impact is the location where the Soldier wants the projectile to strike the target. Typically, this is the center of visible mass. At any range different from the weapon's zero distance, the Soldier's desired point of impact and their point of aim will not align. This requires the Soldier to determine the necessary hold-off to achieve the desired point of impact.

COMMON AIMING ERRORS

7-12. Orienting and aiming a weapon correctly is a practiced skill. Through drills and repetitions, Soldiers build the ability to repeat proper weapons orientation, sight alignment, and sight picture as a function of muscle memory.

7-13. The most common aiming errors include:

- **Non-dominant eye use** – The Soldier gets the greatest amount of visual input from their dominant eye. Eye dominance varies Soldier to Soldier. Some Soldier's dominant eye will be the opposite of the dominant hand. For example, a Soldier who writes with his right hand and learns to shoot rifles right handed might learn that his dominant eye is the left eye. This is called cross-dominant. Soldiers with strong cross-dominant eyes should consider firing using their dominant eye side while firing from their non-dominant hand side. Soldiers can be trained to fire from either side of the weapon, but may not be able to shoot effectively using their nondominant eye.

- **Incorrect zero** – regardless of how well a Soldier aims, if the zero is incorrect, the round will not travel to the desired point of impact without adjustment with subsequent rounds (see appendix C of this publication).
- **Light conditions** – limited visibility conditions contribute to errors aligning the sight, selecting the correct point of aim, or determining the appropriate hold. Soldiers may offset the effects of low light engagements with image intensifier (I2) optics, use of thermal optics, or the use of laser pointing devices with I2 optics.
- **Battlefield obscurants** – smoke, debris, and haze are common conditions on the battlefield that will disrupt the Soldier's ability to correctly align their sights, select the proper point of aim, or determine the correct hold for a specific target.
- **Incorrect sight alignment** – Soldiers may experience this error when failing to focus on the front sight post or reticle.
- **Incorrect sight picture** – occurs typically when the threat is in a concealed location, is moving, or sufficient winds between the shooter and target exist that are not accounted for during the hold determination process. This failure directly impacts the Soldier's ability to create and sustain the proper sight picture during the shot process.
- **Improper range determination** – will result in an improper hold at ranges greater than the zeroed range for the weapon.

COMPLEX ENGAGEMENTS

7-14. A complex engagement includes any shot that cannot use the ***CoVM*** as the point of aim to ensure a target hit. Complex engagements require a Soldier to apply various points of aim to successfully defeat the threat.

7-15. These engagements have an increased level of difficulty due to environmental, target, or shooter conditions that create a need for the firer to rapidly determine a ballistic solution and apply that solution to the point of aim. Increased engagement difficulty is typically characterized by one or more of the following conditions:

- **Target conditions**:
  - Range to target.
  - Moving targets.
  - Oblique targets.
  - Evasive targets.
  - Limited exposure targets.
- **Environmental conditions**:
  - Wind.
  - Angled firing.
  - Limited visibility.
- **Shooter conditions**:
  - Moving firing position.

- Canted weapon engagements.
- CBRN operations engagements.

7-16. Each of these firing conditions may require the Soldier to determine an appropriate aim point that is not the CoVM. This Soldier calculated aim point is called the **hold**. During any complex engagement, the Soldier serves as the ballistic computer during the shot process. The hold represents a refinement or alteration of the center of visible mass point of aim at the target to counteract certain conditions during a complex engagement for—

- Range to target.
- Lead for targets based on their direction and speed of movement.
- Counter-rotation lead required when the Soldier is moving in the opposite direction of the moving target.
- Wind speed, direction, and duration between the shooter and the target at ranges greater than 300 meters.
- Greatest lethal zone presented by the target to provide the most probable point of impact to achieve immediate incapacitation.

7-17. The Soldier will apply the appropriate aim (hold) based on the firing instances presented. Hold determinations will be discussed in two formats; immediate and deliberate.

7-18. All Soldiers must be familiar with the immediate hold determination methods. They should be naturally applied when the engagement conditions require. These determinations are provided in "target form" measurements, based on a standard E-type silhouette dimension, approximately 20 inches wide by 40 inches tall.

IMMEDIATE HOLD DETERMINATION

7-19. Immediate holds are based on the values of a "target form," where the increments shown ***are sufficient*** for rapid target hits without ballistic computations. The immediate hold determinations are not as accurate as the deliberate method, and are used for complex target engagements at less than 300 meters.

7-20. Immediate hold locations for azimuth (wind or lead): (See figure 7-4.)

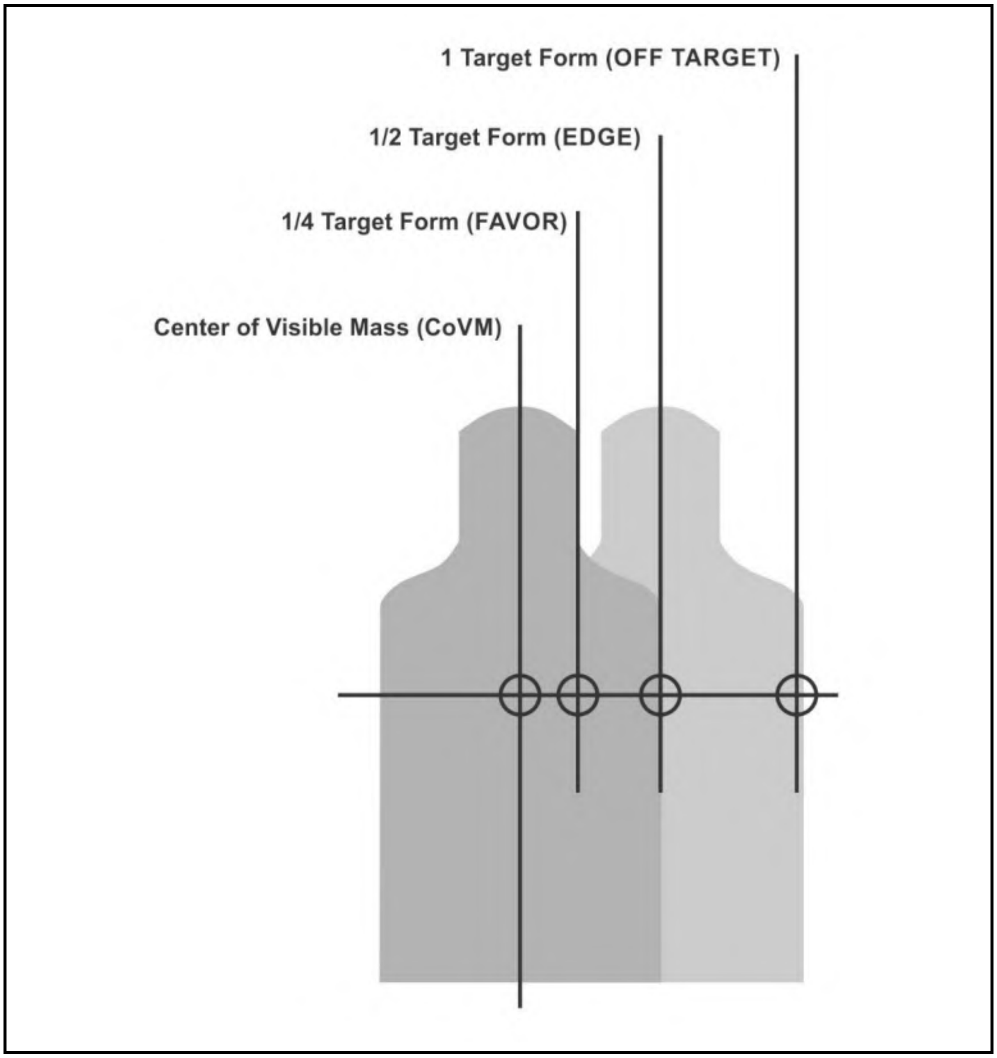


Figure 7-4. Immediate hold locations for windage and lead example

7-21. Immediate hold locations for elevation (range to target): (See figure 7-5.)

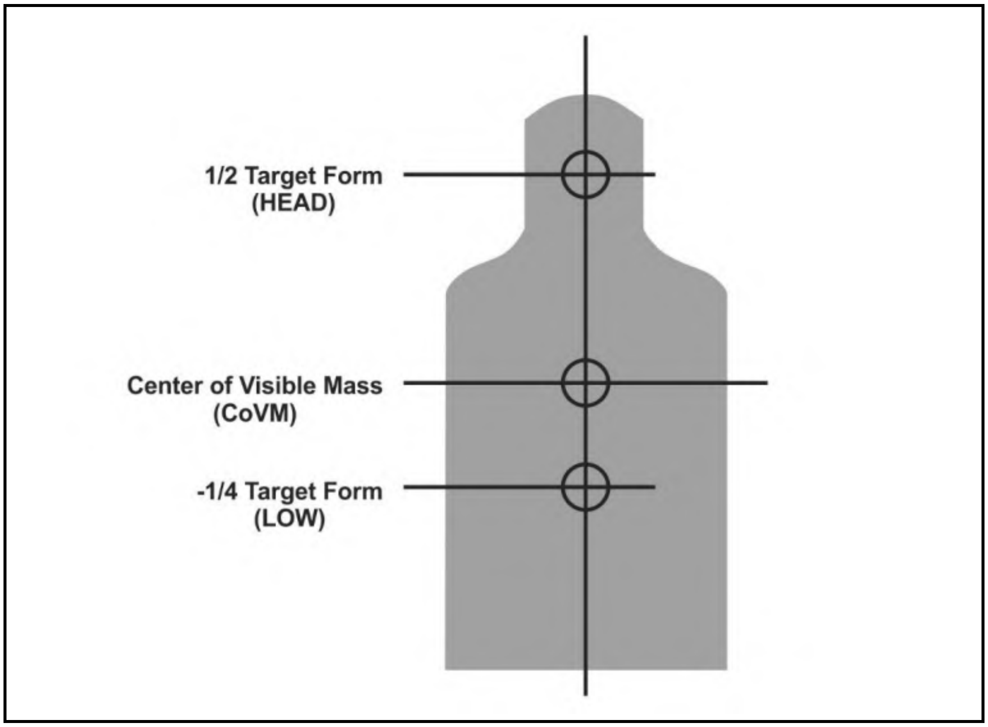


Figure 7-5. Immediate hold locations for elevation (range) example

DELIBERATE HOLD DETERMINATION

7-22. Deliberate hold points of aim are derived from applying the appropriate ballistic math computation. Deliberate hold determinations are required for precise shots beyond 300 meters for wind, extended range, moving, oblique, or evasive targets.

7-23. Deliberate holds for complex engagements are discussed in detail in appendix C, Complex Engagements. The deliberate math calculations are for advanced shooters within the formation and are not discussed within this chapter.

TARGET CONDITIONS

7-24. Soldiers must consider several aspects of the target to apply the proper point of aim on the target. The target's posture, or how it is presenting itself to the shooter, consists of—

- Range to target.
- Nature of the target.
- Nature of the terrain (surrounding the target).

RANGE TO TARGET

7-25. Rapidly determining an accurate range to target is critical to the success of the Soldier at mid and extended ranges. There are several range determination methods shooters should be confident in applying to determine the proper hold-off for pending engagements. There are two types of range determination methods, immediate and deliberate.

Immediate Range Determination

7-26. Immediate methods of range determination afford the shooter the most reliable means of determining the most accurate range to a given target. The immediate methods include—

- Close quarters engagements.
- Laser range finder.
- Front sight post method.
- Recognition method.
- 100-meter unit-of-measure method.

Close Quarters Engagements

7-27. Short-range engagements are probable in close terrain (such as urban or jungle) with engagement ranges typically less than 50 meters. Soldiers must be confident in their equipment, zero, and capabilities to defeat the threats encountered.

7-28. Employment skills include swift presentation and application of the shot process (such as quick acquisition of sight picture) to maintain overmatch. At close ranges, perfect sight alignment is not as critical to the accurate engagement of targets. The weapon is presented rapidly and the shot is fired with the front sight post placed roughly center mass on the desired target area. The front sight post must be in the rear sight aperture.

> ***Note.*** If using iron sights when this type of engagement is anticipated, the large rear sight aperture (0-2) should be used to provide a wider field of view and detection of targets.

Laser Range Finder

7-29. Equipment like the AN/PSQ-23, STORM have an on-board laser range finder that is accurate to within +/- 5 meters. Soldiers with the STORM attached can rapidly determine the most accurate range to target and apply the necessary hold-offs to ensure the highest probability of incapacitation, particularly at extended ranges.

Front Sight Post Method

7-30. The area of the target that is covered by the front sight post of the rifle can be used to estimate range to the target. By comparing the appearance of the rifle front sight post on a target at known distances, your shooters can establish a mental reference point for determining range at unknown distances. Because the apparent size of the target changes as the distance to the target changes, the amount of the target that is covered by the front sight post will vary depending upon its range. In addition, your shooter's eye relief and perception of the front sight post will also affect the amount of the target that is visible (see figure 7-6).

- Less Than 300 Meters. If the target is wider than the front sight post, you can assume that the target is less than 300 meters and can be engaged point of aim/point of impact using your battle sight zero (BZO).
- Greater Than 300 Meters. The service rifle front sight post covers the width of a man's chest or body at approximately 300 meters. If the target is less than the width of the front sight post, you should assume the target is in excess of 300 meters. Therefore, your BZO cannot be used effectively.

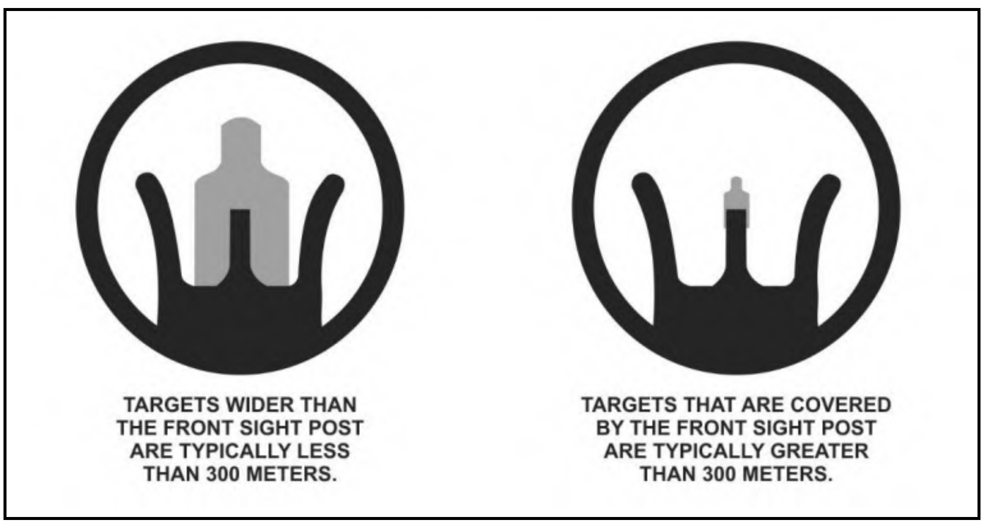


Figure 7-6. Front sight post method example

Recognition Method

7-31. When observing a target, the amount of detail seen at various ranges gives the shooter a solid indication of the range to target. Shooters should study and remember the appearance of a person when they are standing at 100 meters increments. During training, Soldiers should note the details of size and the characteristics of uniform and equipment for targets at those increments.

7-32. Once Soldiers are familiar and memorize the characteristics of standing threats at 100 meter increments out to 500 meters, they should study the targets in a kneeling and then in the prone position. By comparing the appearance of these positions at known ranges from 100 meters to 500 meters, shooters can establish a series of mental images that will help determine range on unfamiliar terrain. They should also study the appearance of other familiar objects such as weapons and vehicles.

- **100 meters** – the target can be clearly observed in detail, and facial features can be distinguished.
- **200 meters** – the target can be clearly observed, although there is a loss of facial detail. The color of the skin and equipment is still identifiable.
- **300 meters** – the target has a clear body outline, face color usually remains accurate, but remaining details are blurred.
- **400 meters** – the body outline is clear, but remaining detail is blurred.
- **500 meters** – the body shape begins to taper at the ends. The head becomes indistinct from the shoulders.

100-meter Unit-of-Measure Method

7-33. To determine the total distance to the target using the 100 meter unit of measure method, shooters must visualize a distance of 100 meters (generally visualizing the length of a football field) on the ground. Soldiers then estimate how many of these units can fit between the shooter and the target.

7-34. The greatest limitation of the unit of measure method is that its accuracy is directly related to how much of the terrain is visible. This is particularly true at greater ranges. If a target appears at a range of 500 meters or more and only a portion of the ground between your shooter and the target can be seen, it becomes difficult to use the unit of measure method of range estimation with accuracy.

7-35. Proficiency in the unit of measure method requires constant practice. Throughout training, comparisons should be continually made between the range estimated by your shooter and the actual range as determined by pacing or other, more accurate measurement.

Immediate hold for Range to Target

7-36. Immediate range determination holds are based on the zero applied to the weapon. The 300 meter zero is the Army standard and works in all tactical situations, including close quarters combat. Figure 7-7, on page 7-13, shows the appropriate immediate holds for range to target based on the weapon's respective zero:

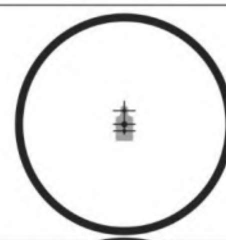
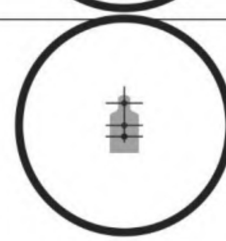
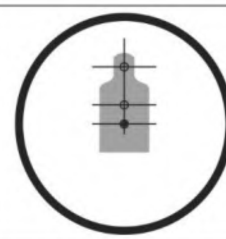
RANGE	HOLD	IRON SIGHT	CCO, M68
500 m	1 FORM OVER	USE BDC	
400 m	1/2 HEAD	USE BDC	
300 m	CoVM		
200 m	-1/4 LOW		
100 m	-1/4 LOW		
BDC - Bullet Drop Compensator			

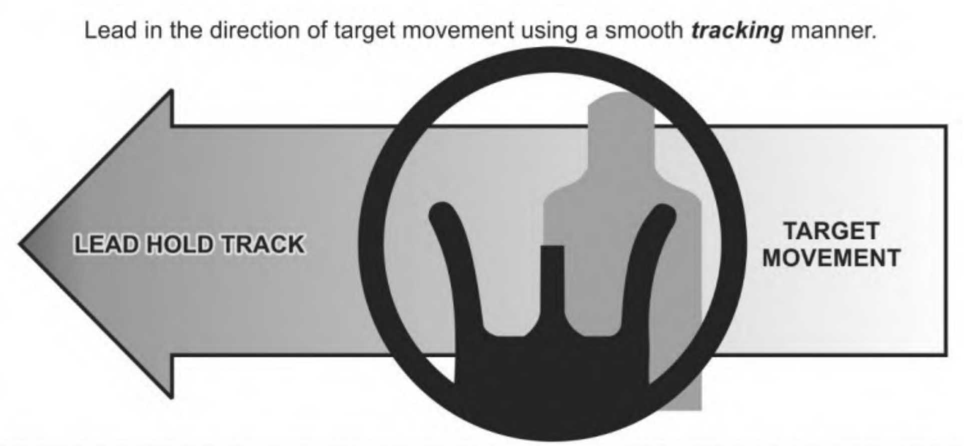
Figure 7-7. Immediate holds for range to target

MOVING TARGETS

7-37. Moving targets are those threats that appear to have a consistent pace and direction. Targets on any battlefield will not remain stationary for long periods of time, particularly once a firefight begins. Soldiers must have the ability to deliver lethal fires at a variety of moving target types and be comfortable and confident in the engagement techniques. There are two methods for defeating moving targets; tracking and trapping.

Immediate hold for moving targets.

7-38. The immediate hold for moving targets includes an estimation of the speed of the moving target and an estimation of the range to that target. The immediate holds for all moving targets are shown below. (See figure 7-8.)



RANGE TO TARGET	WALKING	RANGE WALK	TACTICAL RUSH
500 m	Deliberate Method	Deliberate Method	Deliberate Method for all running or tactical rush targets.
400 m	1 FORM		
300 m	1/2 EDGE	1 FORM	
200 m	1/4 FAVOR	1/2 EDGE	
100 m	CoVM	1/4 FAVOR	

Figure 7-8. Immediate holds for moving targets example

OBLIQUE TARGETS

7-39. Threats that are moving diagonally toward or away from the shooter are called ***oblique targets***. They offer a unique problem set to shooters where the target may be moving at a steady pace and direction; however, their oblique direction of travel makes them appear to move slower.

7-40. Soldiers should adjust their hold based on the angle of the target's movement from the gun-target line. The following guide will help Soldiers determine the appropriate change to the moving target hold to apply to engage the moving oblique threats (see figure 7-9).

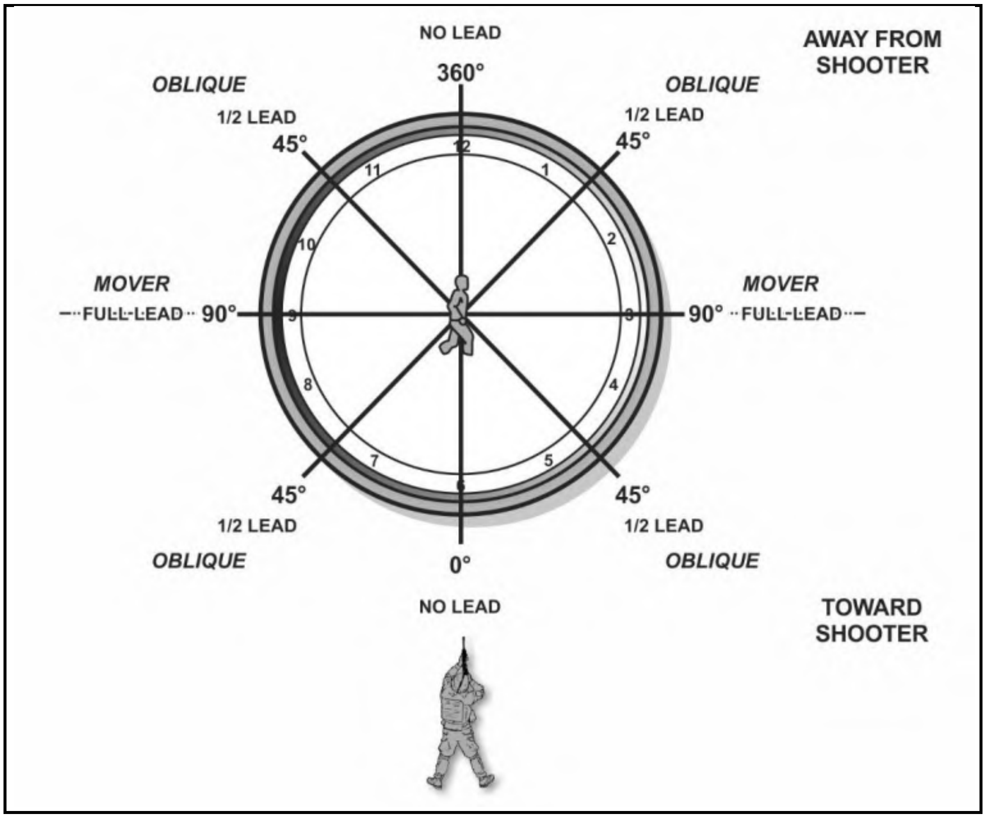


Figure 7-9. Oblique target example

ENVIRONMENTAL CONDITIONS

7-41. The environment can complicate the shooter's actions during the shot process with excessive wind or requiring angled firing limited visibility conditions. Soldiers must understand the methods to offset or compensate for these firing occasions, and be prepared to apply these skills to the shot process. This includes when multiple complex conditions compound the ballistic solution during the firing occasion.

WIND

7-42. Wind is the most common variable and has the greatest effect on ballistic trajectories, where it physically pushes the projectile during flight off the desired trajectory (see appendix B of this publication). The effects of wind can be compensated for by the shooter provided they understand how wind effects the projectile and the terminal point of impact. The elements of wind effects are—

- The time the projectile is exposed to the wind (range).
- The direction from which the wind is blowing.
- The velocity of the wind on the projectile during flight.

Wind Direction and Value

7-43. Winds from the left blow the projectile to the right, and winds from the right blow the projectile to the left. The amount of the effect depends on the time of (projectile's exposure) the wind speed and direction. To compensate for the wind, the firer must first determine the wind's direction and value.

7-44. The clock system can be used to determine the direction and value of the wind (See figure 7-10 on page 7-17). Picture a clock with the firer oriented downrange towards 12 o'clock.

7-45. Once the direction is determined, the value of the wind is next. The value of the wind is how much effect the wind will have on the projectile. Winds from certain directions have less effect on projectiles. The chart below shows that winds from 2 to 4°o'clock and 8 to 10 o'clock are considered full-value winds and will have the most effect on the projectile. Winds from 1, 5, 7, and 11 o'clock are considered half-value winds and will have roughly half the effect of a full-value wind. Winds from 6 and 12°o'clock are considered no-value winds and little or no effect on the projectile.

EXAMPLE

A 10-mph (miles per hour) wind blowing from the 1 o'clock direction would be a half-value wind and has the same effect as a 5 mph, full-value wind on the projectile.

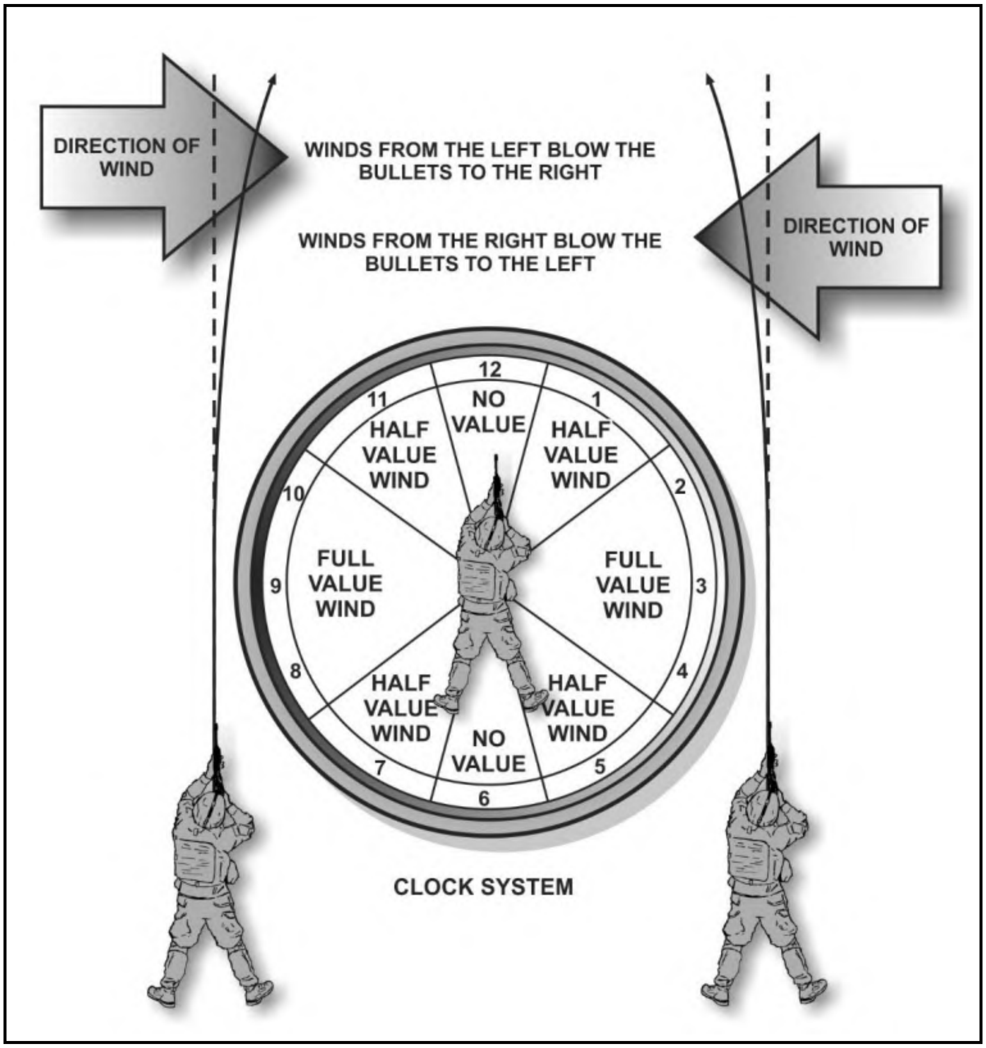


Figure 7-10. Wind value

7-46. The wind will push the projectile in the direction the wind is blowing (see figure 7-11). The amount of effects on the projectile will depend on the time of exposure, direction of the wind, and speed of the wind. To compensate for wind the Soldier uses a hold ***in the direction of the wind (into the wind)***.

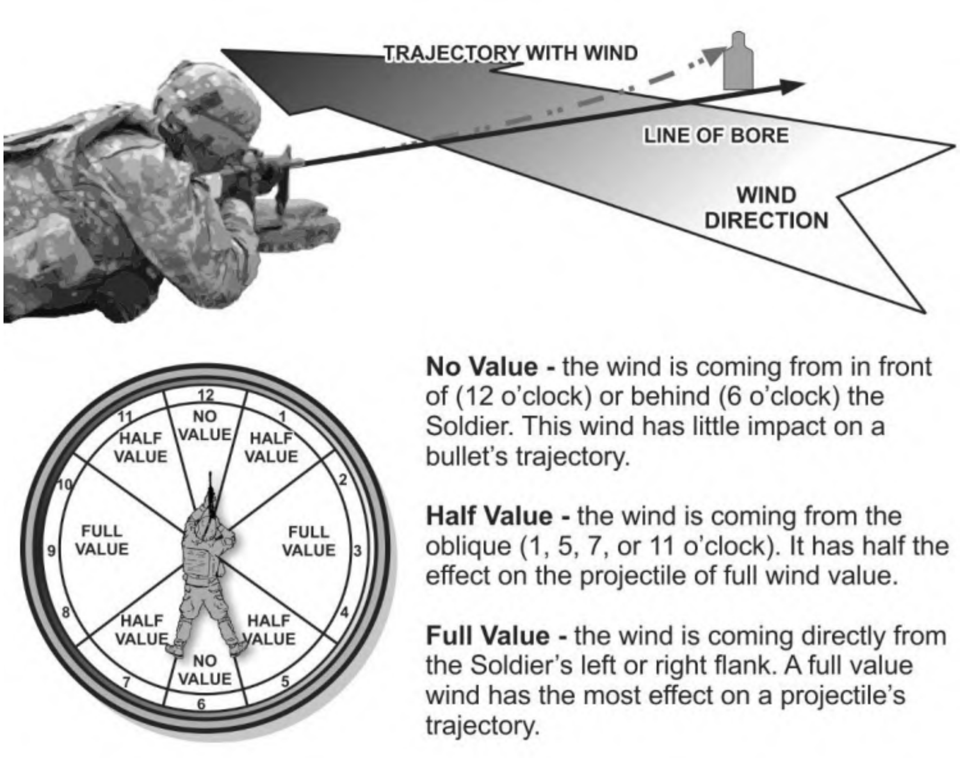


Figure 7-11. Wind effects

Wind Speed

7-47. Wind speeds can vary from the firing line to the target. Wind speed can be determined by taking an average of the winds blowing on the range. The firer's focus should be on the winds between the midrange point and the target. The wind at the one half to two thirds mark will have the most effect on the projectile since that is the point where most projectiles have lost a large portion of their velocity and are beginning to destabilize.

7-48. The Soldier can observe the movement of items in the environment downrange to determine the speed. Each environment will have different vegetation that reacts differently.

7-49. Downrange wind indicators include the following:

- 0 to 3 mph = Hardly felt, but smoke drifts.
- 3 to 5 mph = Felt lightly on the face.
- 5 to 8 mph = Keeps leaves in constant movement.

- 8 to 12 mph = Raises dust and loose paper.
- 12 to 15 mph = Causes small trees to sway.

7-50. The wind blowing at the Soldiers location may not be the same as the wind blowing on the way to the target.

Wind Estimation

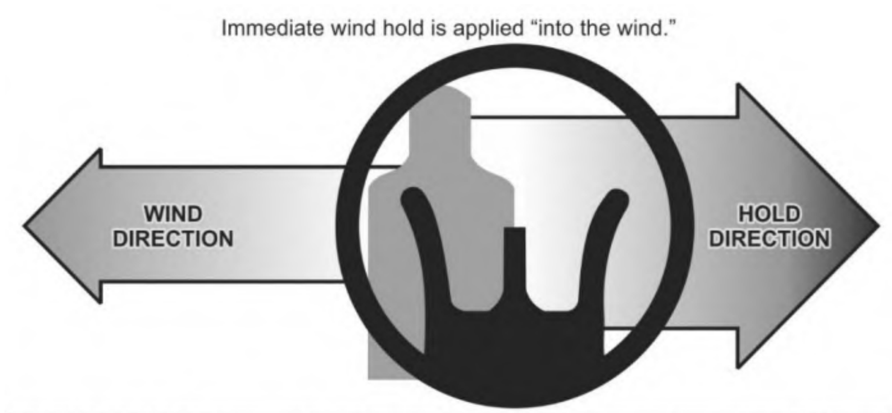
7-51. Soldiers must be comfortable and confident in their ability to judge the effects of the wind to consistently make accurate and precise shots. Soldiers will use wind indicators between the Soldier and the target that provide windage information to develop the proper compensation or hold-off.

7-52. To estimate the effects of the wind on the shot, Soldiers need to determine three windage factors:

- Velocity (speed).
- Direction.
- Value.

Immediate Wind Hold

7-53. Using a hold involves changing the point of aim to compensate for the wind drift. For example, if wind causes the bullet to drift 1/2 form to the left, the aiming point must be moved 1/2 form to the right. (See figure 7-12, page 7-20.)



RANGE TO TARGET	0-5 mph	6-10 mph	11-15 mph
500 m	1/4 FAVOR	1 FORM	Use Deliberate Method (see Appendix C)
400 m	CoVM	1 FORM	
300 m	CoVM	1/2 EDGE	1 FORM
200 m	CoVM	1/2 EDGE	1/2 EDGE
100 m	CoVM	1/4 FAVOR	1/2 EDGE

Figure 7-12. Wind hold example

7-54. Firers must adjust their points of aim into the wind to compensate for its effects. If they miss a distant target and wind is blowing from the right, they should aim to the right for the next shot. A guide for the initial adjustment is to split the front sight post on the edge of the target facing the wind.

7-55. Newly assigned Soldiers should aim at the target's center of visible mass for the first shot, and then adjust for wind when they are confident that wind caused the miss. Experienced firers should apply the appropriate hold for the first shot, but should follow the basic rule—when in doubt, aim at the center of mass.

LIMITED VISIBILITY

7-56. Soldiers must be lethal at night and in limited visibility conditions, as well as during the day. That lethality depends largely on whether Soldier can fire effectively with today's technology: night vision devices (NVDs), IR aiming devices, and TWSs.

7-57. Limited visibility conditions may limit the viewable size of a threat, or cause targets to be lost after acquisition. In these situations, Soldiers may choose to apply a hold for where a target is ***expected*** to be rather than wait for the target to present itself for a more refined reticle lay or sight picture.

7-58. Soldiers may switch between optics, thermals, and pointers to refine their point of aim. To rapidly switch between aiming devices during operations in limited visibility, the Soldier must ensure accurate alignment, boresighting, and zeroing of all associated equipment. Confidence in the equipment is achieved through drills related to changing the aiming device during engagements, executing repetitions with multiple pieces of equipment, and practicing nonstandard engagement techniques using multiple aiming devices in tandem (IR pointer with NVDs, for example).

Chapter 8

Control

The control element of employment considers all the conscious actions of the Soldier before, during, and after the shot process that the Soldier's specifically in control of. It incorporates the Soldier as a function of safety, as well as the ultimate responsibility of firing the weapon.

Proper trigger control, without disturbing the sights, is the most important aspect of control and the most difficult to master.

Combat is the ultimate test of a Soldier's ability to apply the functional elements of the shot process and firing skills. Soldiers must apply the employment skills mastered during training to all combat situations (for example, attack, assault, ambush, or urban operations). Although these tactical situations present problems, the application of the functional elements of the shot process require two additions: changes to the rate of fire and alterations in weapon/target alignment. This chapter discusses the engagement techniques Soldiers must adapt to the continuously changing combat engagements.

8-1. When firing individual weapons, the Soldier is the weapon's fire control system, ballistic computer, stabilization system, and means of mobility. Control refers to the Soldier's ability to regulate these functions and maintain the discipline to execute the shot process at the appropriate time.

8-2. Regardless of how well trained or physically strong a Soldier is, a wobble area (or arc of movement) is present, even when sufficient physical support of the weapon is provided. The arc of movement (AM) may be observed as the sights moving in a W shape, vertical (up and down) pulses, circular, or horizontal arcs depending on the individual Soldier, regardless of their proficiency in applying the functional elements. The wobble area or arc of movement is the extent of lateral horizontal and front-to-back variance in the movement that occurs in the sight picture (see figure 8-1).

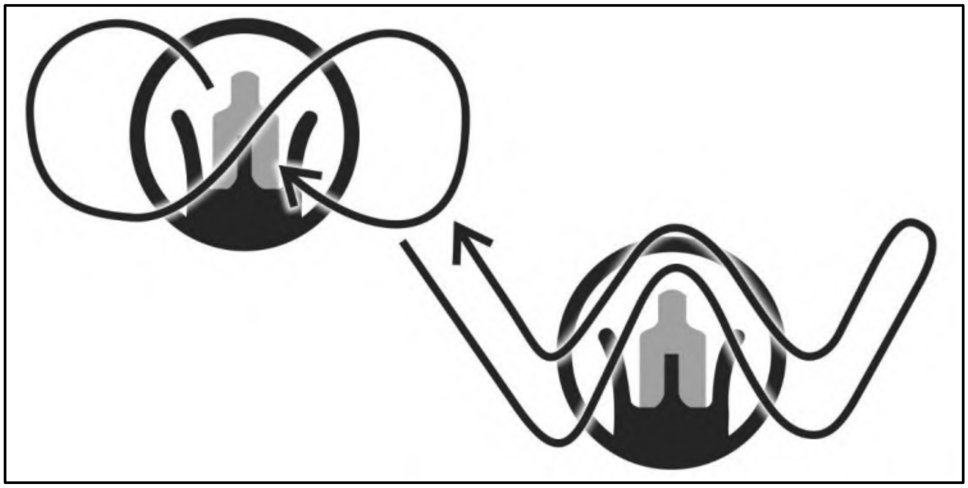


Figure 8-1. Arc of movement example

8-3. The control element consists of several supporting Soldier functions, and include all the actions to minimize the Soldier's induced arc of movement. Executed correctly, it provides for the best engagement window of opportunity to the firer. The Soldier physically maintains positive control of the shot process by managing—

- Trigger control.
- Breathing control.
- Workspace.
- Calling the shot (firing or shot execution).
- Follow-through.

TRIGGER CONTROL

8-4. Trigger control is the act of firing the weapon while maintaining proper aim and adequate stabilization until the bullet leaves the muzzle. Trigger control and the shooter's position work together to allow the sights to stay on the target long enough for the shooter to fire the weapon and bullet to exit the barrel.

8-5. Stability and trigger control complement each other and are integrated during the shot process. A stable position assists in aiming and reduces unwanted movements during trigger squeeze without inducing unnecessary movement or disturbing the sight picture. A smooth, consistent trigger squeeze, regardless of speed, allows the shot to fire at the Soldier's moment of choosing. When both a solid position and a good trigger squeeze are achieved, any induced shooting errors can be attributed to the aiming process for refinement.

8-6. Smooth trigger control is facilitated by placing the finger where it naturally lays on the trigger. Natural placement of the finger on the trigger will allow for the best mechanical advantage when applying rearward pressure to the trigger.

- **Trigger finger placement** – the trigger finger will lay naturally across the trigger after achieving proper grip (see figure 8-2). There is no specified point on the trigger finger that must be used. It will not be the same for all Soldiers due to different size hands. This allows the Soldier to engage the trigger in the most effective manner
- **Trigger squeeze** – The Soldier pulls the trigger in a smooth consistent manner adding pressure until the weapon fires. Regardless of the speed at which the Soldier is firing the trigger control will always be smooth.
- **Trigger reset** – It is important the Soldier retains focus on the sights while resetting the trigger.

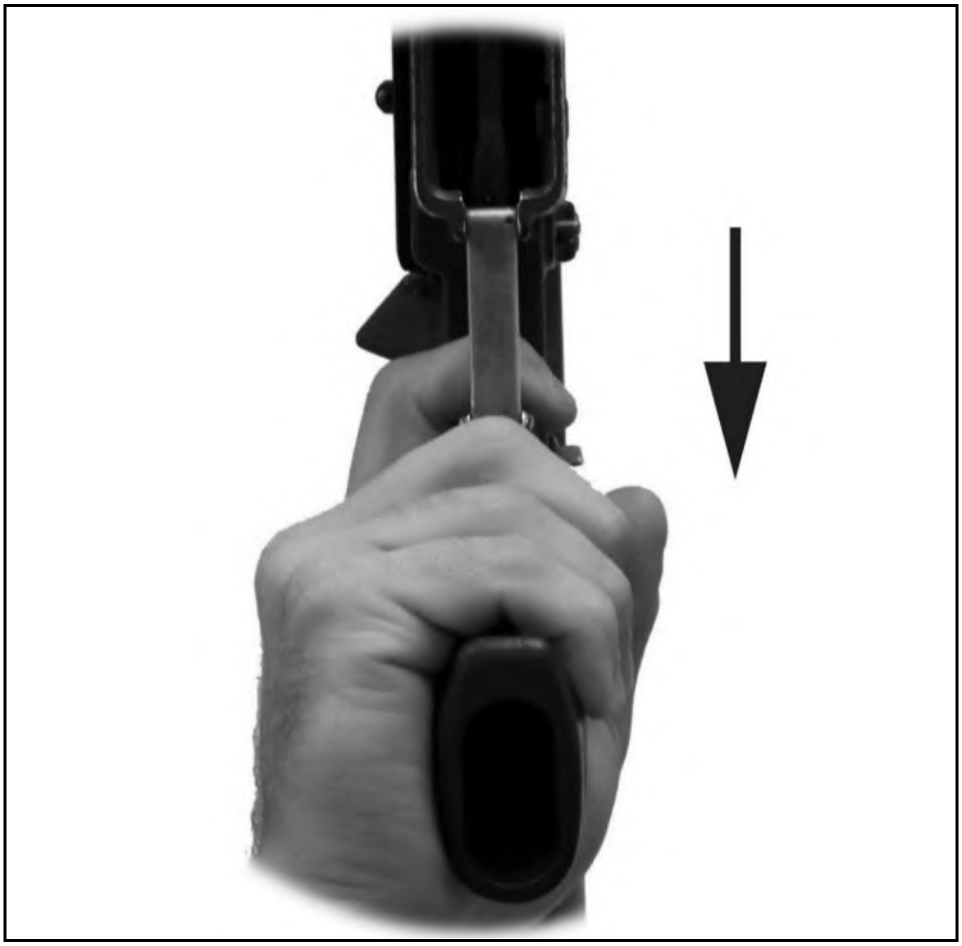


Figure 8-2. Natural trigger finger placement

BREATHING CONTROL

8-7. During the shot process, the shooter controls their breathing to reduce the amount of movement of the weapon. During training, the Soldier will learn a method of breathing control that best suits their shooting style and preference. Breathing control is the relationship of the respiratory process (free or under stress) and the decision to execute the shot with trigger squeeze.

8-8. Breathing induces unavoidable body movement that contribute to wobble or the arc of movement (AM) during the shot process. Soldiers cannot completely eliminate all motion during the shot process, but they can significantly reduce its effects through practice and technique. Firing on the natural pause is a common technique used during grouping and zeroing.

8-9. Vertical dispersion during grouping is most likely not caused by breathing but by failure to maintain proper aiming and trigger control. Refer to appendix E of this publication for proper target analysis techniques.

WORKSPACE MANAGEMENT

8-10. The workspace is a spherical area, 12 to 18 inches in diameter centered on the Soldier's chin and approximately 12 inches in front of their chin. The workspace is where the majority of weapons manipulations take place. (See figure 8-3 on page 8-5.)

8-11. Conducting manipulations in the workspace allows the Soldier to keep his eyes oriented towards a threat or his individual sector of fire while conducting critical weapons tasks that require hand and eye coordination. Use of the workspace creates efficiency of motion by minimizing the distance the weapon has to move between the firing position to the workspace and return to the firing position.

8-12. Location of the workspace will change slightly in different firing positions. There are various techniques to use the workspace. Some examples are leaving the butt stock in the shoulder, tucking the butt stock under the armpit for added control of the weapon, or placing the butt stock in the crook of the elbow.

8-13. Workspace management includes the Soldier's ability to perform the following functions:

- **Selector lever** – to change the weapon's status from safe to semiautomatic, to burst/automatic from any position.

Note. Some models will have ambidextrous selectors.

- **Charging handle** – to smoothly use the charging handle during operation. This includes any corrective actions to overcome malfunctions, loading, unloading, or clearing procedures.
- **Bolt catch** – to operate the bolt catch mechanism on the weapon during operations.
- **Ejection port** – closing the ejection port cover to protect the bolt carrier assembly, ammunition, and chamber from external debris upon completion

of an engagement. This includes observation of the ejection port area during malfunctions and clearing procedures.

- **Magazine catch** – the smooth functioning of the magazine catch during reloading procedures, clearing procedures, or malfunction corrective actions.
- **Chamber check** – the sequence used to verify the status of the weapon's chamber.
- **Forward assist** – the routine use of the forward assist assembly of the weapon during loading procedures or when correcting malfunctions.

WORKSPACE MANIPULATIONS
Charging Handle
Bolt Catch
Ejection Port
Magazine Catch
Chamber Check
Forward Assist
Selector Lever

Weapon oriented downrange.
Buttstock seated at inner elbow.
Weapon elevated to approximately 45 degrees.
Weapon is rotated as necessary to complete required manipulations.

Figure 8-3. Workspace example

CALLING THE SHOT

8-14. Knowing precisely where the sights are when the weapon discharges is critical for shot analysis. Errors such as flinching or jerking of the trigger can be seen in the sights before discharge.

8-15. Calling a shot refers to a firer stating exactly where he thinks a single shot strikes by recalling the sights relationship to the target when the weapon fired. This is normally expressed in clock direction and inches from the desired point of aim.

8-16. The shooter is responsible for the point of impact of every round fired from their weapon. This requires the Soldier to ensure the target area is clear of friendly and neutral actors, in front of and behind the target. Soldiers must also be aware of the environment the target is positioned in, particularly in urban settings—friendly or neutral actors may be present in other areas of a structure that the projectile can pass through.

RATE OF FIRE

8-17. The shooter must determine ***how*** to engage the threat with the weapon, on the current shot as well as subsequent shots. Following the direction of the team leader, the Soldier controls the rate of fire to deliver consistent, lethal, and precise fires against the threat.

SLOW SEMIAUTOMATIC FIRE

8-18. Slow semiautomatic fire is moderately paced at the discretion of the Soldier, typically used in a training environment or a secure defensive position at approximately 12 to 15 rounds per minute. All Soldiers learn the techniques of slow semiautomatic fire during their introduction to the service rifle during initial entry training. This type of firing provides the Soldier the most time to focus on the functional elements in the shot process and reinforces all previous training.

RAPID SEMIAUTOMATIC FIRE

8-19. Rapid semiautomatic fire is approximately 45 rounds per minute and is typically used for multiple targets or combat scenarios where the Soldier does not have overmatch of the threat. Soldiers should be well-trained in all aspects of slow semiautomatic firing before attempting any rapid semiautomatic fire training.

8-20. Those who display a lack of knowledge of employment skills should not advance to rapid semiautomatic fire training until these skills are learned and mastered.

AUTOMATIC OR BURST FIRE

8-21. Automatic or burst fire is when the Soldier is required to provide suppressive fires with accuracy, and the need for precise fires, although desired, is not as important. Automatic or burst fires drastically decrease the probability of hit due to the rapid succession of recoil impulses and the inability of the Soldier to maintain proper sight alignment and sight picture on the target.

8-22. Soldiers should be well-trained in all aspects of slow semiautomatic firing before attempting any automatic training.

FOLLOW-THROUGH

8-23. Follow-through is the continued mental and physical application of the functional elements of the shot process after the shot has been fired. The firer's head stays in contact with the stock, the firing eye remains open, the trigger finger holds the trigger back through recoil and then lets off enough to reset the trigger, and the body position and breathing remain steady.

8-24. Follow-through consists of all actions controlled by the shooter after the bullet leaves the muzzle. It is required to complete the shot process. These actions are executed in a general sequence:

- **Recoil management.** This includes the bolt carrier group recoiling completely and returning to battery.
- **Recoil recovery.** Returning to the same pre-shot position and reacquiring the sight picture. The shooter should have a good sight picture before and after the shot.
- **Trigger/Sear reset.** Once the ejection phase of the cycle of function is complete, the weapon initiates and completes the cocking phase. As part of the cocking phase, all mechanical components associated with the trigger, disconnect, and sear are reset. Any failures in the cocking phase indicate a weapon malfunction and require the shooter to take the appropriate action. The shooter maintains trigger finger placement and releases pressure on the trigger until the sear is reset, demonstrated by a metallic click. At this point the sear is reset and the trigger pre-staged for a subsequent or supplemental engagement if needed.
- **Sight picture adjustment.** Counteracting the physical changes in the sight picture caused by recoil impulses and returning the sight picture onto the target aiming point.
- **Engagement assessment.** Once the sight picture returns to the original point of aim, the firer confirms the strike of the round, assesses the target's state, and immediately selects one of the following courses of action:
    - **Subsequent engagement.** The target requires additional (subsequent) rounds to achieve the desired target effect. The shooter starts the pre-shot process.
    - **Supplemental engagement.** The shooter determines the desired target effect is achieved and another target may require servicing. The shooter starts the pre-shot process.
    - **Sector check.** All threats have been adequately serviced to the desired effect. The shooter then checks his sector of responsibility for additional threats as the tactical situation dictates. The unit's SOP will dictate any vocal announcements required during the post-shot sequence.
    - **Correct Malfunction.** If the firer determines during the follow-through that the weapon failed during one of the phases of the cycle of function, they make the appropriate announcement to their team and immediately execute corrective action.

MALFUNCTIONS

8-25. When any weapon fails to complete any phase of the cycle of function correctly, a malfunction has occurred. When a malfunction occurs, the Soldier's priority remains to defeat the target as quickly as possible. The malfunction, Soldier capability, and secondary weapon capability determine if, when, and how to transition to a secondary weapon system.

8-26. The Soldier controls which actions must be taken to ensure the target is defeated as quickly as possible based on secondary weapon availability and capability, and the level of threat presented by the range to target and its capability:

- **Secondary weapon can defeat the threat.** Soldier transitions to secondary weapon for the engagement. If no secondary weapon is available, announce their status to the small team, and move to a covered position to correct the malfunction.
- **Secondary weapon cannot defeat the threat**. Soldiers quickly move to a covered position, announce their status to the small team, and execute corrective action.
- **No secondary weapon.** Soldiers quickly move to a covered position, announce their status to the small team, and execute corrective action.

8-27. The end state of any of corrective action is a properly functioning weapon. Typically, the phase where the malfunction occurred within the cycle of function identifies the general problem that must be corrected. From a practical, combat perspective, malfunctions are recognized by their symptoms. Although some symptoms do not specifically identify a single point of failure, they provide the best indication on which corrective action to apply.

8-28. To overcome the malfunction, the Soldier must first avoid over analyzing the issue. The Soldier must train to execute corrective actions immediately without hesitation or investigation during combat conditions.

8-29. There are two general types of corrective action:

- **Immediate action** – simple, rapid actions or motions taken by the Soldier to correct basic disruptions in the cycle of function of the weapon. Immediate action is taken when a malfunction occurs such that the trigger is squeeze and the hammer falls with an audible "click."
- **Remedial action** – a skilled, technique that must be applied to a specific problem or issue with the weapon that will not be corrected by taking immediate action. Remedial action is taken when the cycle of function is interrupted where the trigger is squeezed and either has little resistance during the squeeze ("mush") or the trigger cannot be squeezed.

8-30. No single corrective action solution will resolve ***all*** or ***every*** malfunction. Soldiers need to understand what failed to occur, as well as any specific sounds or actions of the weapon in order to apply the appropriate correction measures.

8-31. Immediate action can correct rudimentary failures during the cycle of function:

- **Failure to fire** – is when a round is locked into the chamber, the weapon is ready to fire, the select switch is placed on SEMI or BURST / AUTO, and the trigger is squeezed, the hammer falls (audible click), and the weapon does not fire.
- **Failure to feed** – is when the bolt carrier assembly is expected to move return back into battery but ***is prevented from moving all the way forward***. A clear gap can be seen between the bolt carrier assembly and the forward edge of the ejection port. This failure may cause a stove pipe or a double feed (see below).
- **Failure to chamber** – when the round is being fed into the chamber, but the bolt carrier assembly does not fully seat forward, failing to chamber the round and lock the bolt locking lugs with the barrel extension's corresponding lugs.
- **Failure to extract** – when either automatically or manually, the extractor loses its grip on the cartridge case or the bolt seizes movement rearward during extraction that leaves the cartridge case partially removed or fully seated.
- **Failure to eject** – occurs when, either automatically or manually, a cartridge case is extracted from the chamber fully, but does not leave the upper receiver through the ejection port.

8-32. Remedial action requires the Soldier to quickly identify one of four issues and apply a specific technique to correct the malfunction. Remedial action is required to correct the following types of malfunctions or symptoms:

- **Immediate action fails to correct symptom** – when a malfunction occurred that initiated the Soldier to execute immediate action and multiple attempts failed to correct the malfunction. A minimum of two cycles of immediate action should have been completed; first, without a magazine change, and the second with a magazine change.
- **Stove pipe** – can occur when either a feeding cartridge or an expended cartridge case is pushed sideways during the cycle of function causing that casing to stop the forward movement of the bolt carrier assembly and lodge itself between the face of the bolt and the ejection port.
- **Double feed** – occurs when a round is chambered and not fired and a subsequent round is being fed without the chamber being clear.
- **Bolt override** – is when the bolt fails to push a new cartridge out of the magazine during feeding or chambering, causing the bolt to ride on top of the cartridge.
- **Charging handle impingement** – when a round becomes stuck between the bolt assembly and the charging handle where the charging handle is not in the forward, locked position.

8-33. Although there are other types of malfunctions or disruptions to the cycle of function, those listed above are the most common. Any other malfunction will require additional time to determine the true point of failure and an appropriate remedy.

> ***Note***. When malfunctions occur in combat, the Soldier must announce STOPPAGE or another similar term to their small unit, quickly move to a covered location, and correct the malfunction as rapidly as possible. If the threat is too close to the Soldier or friendly forces, and the Soldier has a secondary weapon, the Soldier should immediately transition to secondary to defeat the target prior to correcting the malfunction.

RULES FOR CORRECTING A MALFUNCTION

8-34. To clear a malfunction, the Soldier must—

- **Apply Rule #1.** Soldiers must remain coherent of their weapon and continue to treat their weapon as if it is loaded when correcting malfunctions.
- **Apply Rule #2.** Soldiers must ensure the weapon's orientation is appropriate for the tactical situation and not flag other friendly forces when correcting malfunctions.
- **Apply Rule #3.** Take the trigger finger off the trigger, keep it straight along the lower receiver placed outside of the trigger guard.
- **Do not attempt to place the weapon on SAFE** (unless otherwise noted). Most stoppages will not allow the weapon to be placed on safe because the sear has been released or the weapon is out of battery. Attempting to place the weapon on SAFE will waste time and potentially damage the weapon.
- **Treat the symptom.** Each problem will have its own specific symptoms. By reacting to what the weapon is "telling" the Soldier, they will be able to quickly correct the malfunction.
- **Maintain focus on the threat.** The Soldier must keep their head and eyes looking downrange at the threat, not at the weapon. If the initial corrective action fails to correct the malfunction, the Soldier must be able to quickly move to the next most probable corrective action.
- **Look last.** Do not look and analyze the weapon to determine the cause of the malfunction. Execute the drill that has the highest probability of correcting the malfunction.
- **Check the weapon.** Once the malfunction is clear and the threat is eliminated, deliberately check the weapon when in a covered location for any potential issues or contributing factors that caused the malfunction and correct them.

Perform Immediate Action

8-35. To perform immediate action, the Soldier instinctively:

- Hears the hammer fall with an audible "click."
- Taps the bottom of the magazine firmly.
- Rapidly pulls the charging handle and releases to extract / eject the previous cartridge and feed, chamber, and lock a new round.
- Reassess by continuing the shot process.

Note. If a malfunction continues to occur with the same symptoms, the Soldier will remove the magazine and insert a new loaded magazine, then repeat the steps above.

Perform Remedial Action

8-36. To perform remedial action, the Soldier must have a clear understanding of where the weapon failed during the cycle of function. Remedial action executed when one of the following conditions exist:

- Immediate action does not work after two attempts.
- The trigger refuses to be squeezed.
- The trigger feels like "mush" when squeezed.

8-37. When one of these three symptoms exist, the Soldier looks into the chamber area through the ejection port to quickly assess the type of malfunction. Once identified, the Soldier executes actions to "reduce" the symptom by removing the magazine and attempting to clear the weapon. Once complete, visually inspect the chamber area, bolt face, and charging handle. Then, complete the actions for the identified symptom:

- **Stove pipe** – Grasp case and attempt to remove, cycle weapon and attempt to fire. If this fails, pull charging handle to the rear while holding case.
- **Double-feed** - the Soldier must remove the magazine, clear the weapon, confirm the chamber area is clear, secure a new loaded magazine into the magazine well, and chamber and lock a round.
- **Bolt override** – Remove magazine. Pull charging handle as far rearward as possible. Strike charging handle forward. If this fails, pull charging handle to the rear a second time, use tool or finger to hold the bolt to the rear, sharply send charging handle forward.

CORRECTING MALFUNCTIONS

8-38. Figure 8-4 below provides a simple mental flow chart to rapidly overcome malfunctions experienced during the shot process.

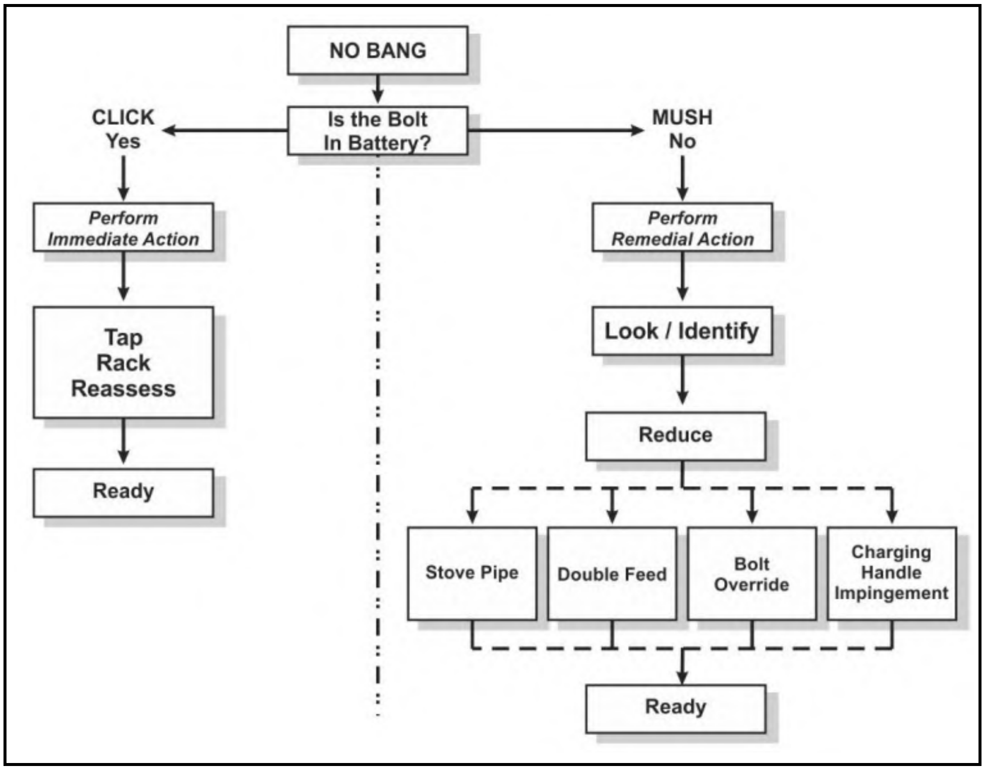


Figure 8-4. Malfunction corrective action flow chart

COOK-OFF

8-39. Rapid and continuous firing of several magazines in sequence without cooling, will severely elevate chamber temperatures. While unlikely this elevated temperature may cause a malfunction known as a "cook-off". A “cook-off” may occur while the round is locked in the chamber, due to excessive heating of the ammunition. Or the rapid exposure to the cooler air outside of the chamber, due in part to the change in pressure.

8-40. If the Soldier determines that he has a potential “cook-off” situation he should leave the weapon directed at the target, or in a known safe direction, and follow proper weapons handling procedures, until the barrel of the weapon has had time to cool. If the chambered round has not been locked in the chamber for 10 seconds, it should be ejected as quickly as possible. If the length of time is questionable or known to be longer than 10 seconds and it is tactically sound, the Soldier should follow the above procedures until the weapon is cooled. If it is necessary to remove the round before the weapon has time to cool, the Soldier should do so with care as the ejected round may detonate due to rapid cooling in open air.

WARNING

Ammunition “cook-off” is not likely in well maintained weapons used within normal training and combat parameters.

Soldiers and unit leadership need to consider the dangers of keeping rounds chambered in weapons that have elevated temperatures due to excessive firing. Or clearing ammunition that has the potential to cook-off when exposed to the cooler air outside of the chamber.

Exposure to the colder air outside of the chamber has the potential to cause the “cook-off” of ammunition. Keeping ammunition chambered in severely elevated temperatures also has the potential to cause the “cook-off” of ammunition.

Note. For more information about troubleshooting malfunctions and replacing components, see organizational and direct support maintenance publications and manuals.

TRANSITION TO SECONDARY WEAPON

8-41. A secondary weapon, such as a pistol, is the most efficient way to engage a target at close quarters when the primary weapon has malfunctioned. The Soldier controls which actions must be taken to ensure the target is defeated as quickly as possible based on the threat presented.

8-42. The firer transitions by taking the secondary weapon from the HANG or HOLSTERED position to the READY UP position, reacquiring the target, and resuming the shot process as appropriate.

8-43. Refer to the appropriate secondary weapon's training publications for the specific procedures to complete the transition process.

Chapter 9

Movement

The movement functional element is the process of the Soldier moving tactically during the engagement process. It includes the Soldier's ability to move laterally, forward, diagonally, and in a retrograde manner while maintaining stabilization, appropriate aim, and control of the weapon.

Proper application of the shot process during movement is vital to combat operations. The most complex engagements involve movement of both Soldier and the adversary. The importance of sight alignment and trigger control are at their highest during movement. The movement of the Solider degrades stability, the ability to aim, and creates challenges to proper trigger control.

MOVEMENT TECHNIQUES

9-1. Tactical movement of the Soldier is classified in two ways: vertical and horizontal. Each require specific considerations to maintain and adequately apply the other functional elements during the shot process.

9-2. **Vertical movements** are those actions taken to change their firing posture or negotiate terrain or obstacles while actively seeking, orienting on, or engaging threats. Vertical movements include actions taken to—

- Change between any of the primary firing positions; standing, crouched, kneeling, sitting, or prone.
- Negotiate stairwells in urban environments.
- Travel across inclined or descending surfaces, obstacles, or terrain.

9-3. **Horizontal movements** are actions taken to negotiate the battlefield while actively seeking, orienting on, or engaging threats. There are eight horizontal movement techniques while maintaining weapon orientation on the threat—

- **Forward** – movement in a direction directly toward the adversary.
- **Retrograde** – movement rearward, in a direction away from the threat while maintaining weapon orientation on the threat.
- **Lateral right/left** – lateral, diagonal, forward, or retrograde movement to the right or left.
- **Turning left/right/about** – actions taken by the Soldier to change the weapon orientation left/right or to the rear, followed by the Soldier's direction of travel turning to the same orientation.

FORWARD MOVEMENT

9-4. Forward movement is continued progress in a direction toward the adversary or route of march. This is the most basic form of movement during an engagement.

TECHNIQUE

9-5. During forward movement,—

- Roll the foot heel to toe to best provide a stable firing platform.
- Shooting while moving should be very close to the natural walking gait and come directly from the position obtained while stationary.
- Keep the weapon at the ready position. Always maintain awareness of the surroundings, both to your left and right, at all times during movement.
- Maintain an aggressive position.
- The feet should almost fall in line during movement. This straight-line movement will reduce the arc of movement and visible "bouncing" of the sight picture.
- Keep the muzzle of the weapon facing down range toward the expected or detected threat.
- Keep the hips as stationary as possible. Use the upper body as a turret, twisting at the waist, maintaining proper platform with the upper body.

RETROGRADE MOVEMENT

9-6. Retrograde movement is where the orientation of the weapon remains to the Soldier's front while the Soldier methodically moves rearward.

TECHNIQUE

9-7. During retrograde movement, the Soldier should—

- Take only one or two steps that will open the distance or reposition the feet.
- Place the feet in a toe to heel manner and drop the center body mass by consciously bending the knees, using a reverse combat glide.
- Maintain situational awareness of team members, debris, and terrain.
- Use the knees as a shock absorber to steady the body movement to maintain the stability of the upper body, stabilizing the rifle sight(s) on the target.
- Ensure all movement is smooth and steady to maintain stability.
- Bend forward at the waist to put as much mass as possible behind the weapon for recoil management.
- Keep the muzzle oriented downrange toward the expected or detected threat.
- Keep the hips as stationary as possible. Use the upper body as a turret, twisting at the waist, maintaining proper platform with the upper body.

LATERAL MOVEMENT

9-8. Lateral movement is where the Soldier maintains weapon orientation downrange at the expected or detected threat while moving to the left or right. In the most extreme cases, the target will be offset 90 degrees or more from the direction of movement.

TECHNIQUE

9-9. During lateral movement, Soldiers should—

- Place their feet heel to toe and drop their center mass by consciously bending the knees.
- Use the knees as a shock absorber to steady the body movement to maintain the stability of the upper body, stabilizing the rifle sight(s) on the target.
- Ensure all movement is smooth and steady to maintain stability.
- Bend forward at the waist to put as much mass as possible behind the weapon for recoil management.
- Roll the foot, heel to toe, as you place the foot on the ground and lift it up again to provide for the smoothest motion possible.
- Keep the weapon at the alert or ready carry. Do not aim in on the target until ready to engage.
- Maintain awareness of the surroundings, both to the left and right, at all times during movement.
- Trigger control when moving is based on the wobble area. The Soldier shoots when the sights are most stable, not based on foot position.
- Keep the muzzle of the weapon facing down range toward the threat.
- When moving, the placement of the feet should be heel to toe.
- Do not overstep or cross the feet, because this can decrease the Soldier's balance and center of gravity.
- Keep the hips as stationary as possible. Use the upper body as a turret, twisting at the waist, maintaining proper platform with the upper body.

Note. It is more difficult to engage adversaries to the firing side while moving laterally. The twist required to achieve a full 90-degree offset requires proper repetitive training. The basic concept of movement must be maintained, from foot placement to platform.

Twisting at the waist will not allow the weapon to be brought to a full 90 degrees off the direction of travel, especially with nonadjustable butt stocks. The Soldier will need to drop the non-firing shoulder and roll the upper body toward the nonfiring side. This will cause the weapon and upper body to cant at approximately a 45-degree angle, relieving some tension in the abdominal region, allowing the Soldier to gain a few more degrees of offset.

TURNING MOVEMENT

9-10. Turning movement are used to engage widely dispersed targets in the oblique and on the flanks. Turning skills are just as valuable in a rapidly changing combat environment as firing on the move (such as lateral movement) skills are and should only be used with the alert carry.

9-11. It does not matter which direction the Soldier is turning or which side is the Soldier's strong side. The Soldier must maintain the weapon at an exaggerated low-alert carry for the duration of the turn.

9-12. Muzzle awareness must be maintained at all times. Ensure that the muzzle does not begin to come up on target the body is completely turned toward the threat.

9-13. When executing a turn to either side, the Soldier will—

- **Look first**. Turn head to the direction of the turn first.
- **Weapon follows the eyes**. The Soldier moves the weapon smoothly to where the eyes go.
- **Follow with the body**. The body will begin movement with the movement of the weapon. Soldiers finish the body movement smoothly to maintain the best possible stability for the weapon.
- **Maintain situational awareness**. The Soldier must be completely aware of the surrounding terrain, particularly for tripping hazards. When necessary, Soldiers should visually check their surroundings during the turning action and return their vision to the target area as quickly as possible.

Appendix A

Ammunition

Appendix A discusses the characteristics and capabilities of the different ammunition available for the M4- and M16-series weapons. It also includes general ammunition information such as packaging, standard and North Atlantic Treaty Organization (NATO) marking conventions, the components of ammunition, and general principles of operation. The information within this appendix is 5.56mm for the M4- and M16-series weapons only.

SMALL ARMS AMMUNITION CARTRIDGES

A-1. Ammunition for use in rifles and carbines is described as a cartridge. A small arms cartridge (see figure A-1) is an assembly consisting of a cartridge case, a primer, a quantity of propellant, and a bullet. The following terminology describe the general components of all small arms ammunition (SAA) cartridges:

- **Cartridge case.** The cartridge case is a brass, rimless, center-fire case that provides a means to hold the other components of the cartridge.
- **Propellant.** The propellant (or powder) provides the energy to propel the projectile through the barrel and downrange towards a target through combustion.
- **Primer.** The primer is a small explosive charge that provides an ignition source for the propellant.
- **Bullet.** The bullet or projectile is the only component that travels to the target.

Note. Dummy cartridges are composed of a cartridge case and bullet, with no primer or propellant. Some dummy cartridges contain inert granular materials to simulate the weight and balance of live cartridges.

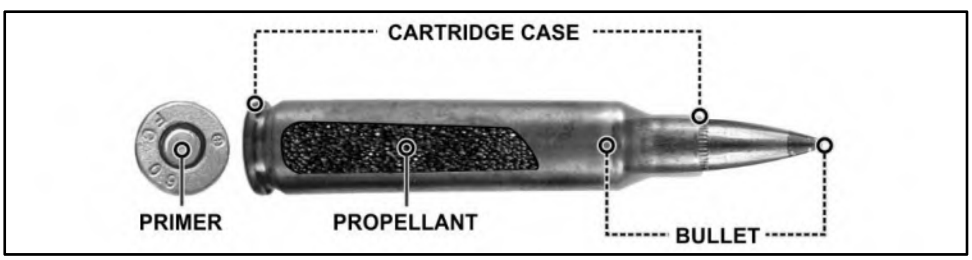


Figure A-1. Small arms ammunition cartridges

A-2. There are multiple types of bullets used for various purposes. These include ball, tracer, armor-piercing, blank, special ball long range (LR), dummy, and short range training.

A-3. The cartridge case is made of steel, aluminum, or a brass combination (70 percent copper and 30 percent zinc) for military use. The M4- and M16-series weapons is a rimless cartridge case that provides an extraction groove (shown in figure A-2). These cartridge cases are designed to support center-fire operation.

A-4. Center-fire cases have a centrally located primer well/pocket in the base of the case, which separates the primer from the propellant in the cartridge case. These cases are designed to withstand pressures generated during firing and are used for most small arms.

A-5. All 5.56mm ammunition uses the rimless cartridge case. A rimless cartridge is where the rim diameter is the same as the case body, and uses an extractor groove to facilitate the cycle of functioning. This design allows for the stacking of multiple cartridges in a magazine.

A-6. When the round is fired, the cartridge case assists in containing the burning propellant by expanding the cartridge case tightly to the chamber walls to provide rear obturation.

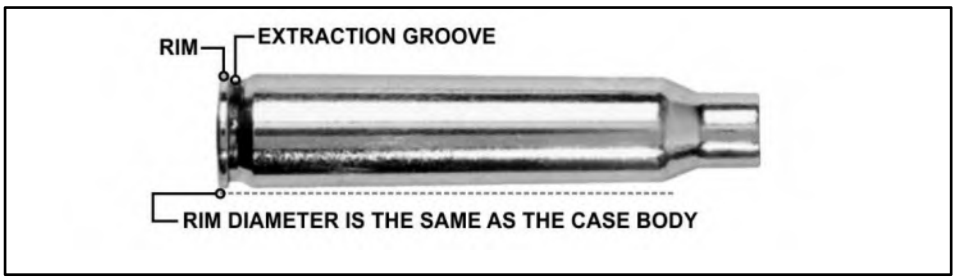


Figure A-2. Cartridge case

PROPELLANT

A-7. Cartridges are loaded with various propellant weights that impart sufficient velocity, within safe pressure, to obtain the required ballistic projectile performance. The propellants are either a single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerine) composition.

A-8. The propellant (see figure A-3) may be a single-cylindrical or multiple-perforation, a ball, or a flake design to facilitate rapid burning. Most propellants are coated to assist the control of the combustion rate. A final graphite coating facilitates propellant flow and eliminates static electricity in loading the cartridge.

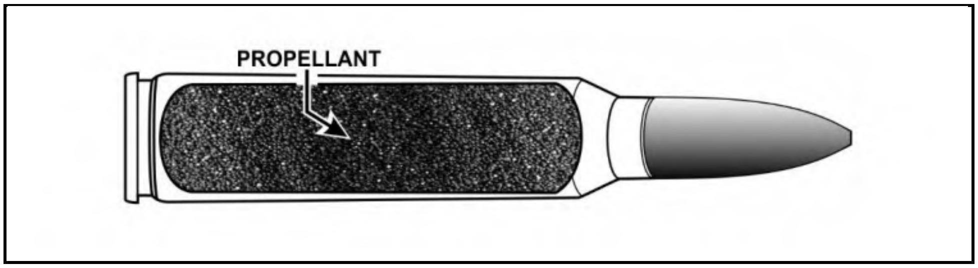


Figure A-3. Propellant

PRIMER

A-9. Center-fire small arms cartridges contain a percussion primer assembly. The assembly consists of a brass or gilding metal cup (see figure A-4). The cup contains a pellet of sensitive explosive material secured by a paper disk and a brass anvil.

A-10. The weapon firing pin striking the center of the primer cup base compresses the primer composition between the cup and the anvil. This causes the composition to explode. Holes or vents located in the anvil or closure cup allow the flame to pass through the primer vent, igniting the propellant.

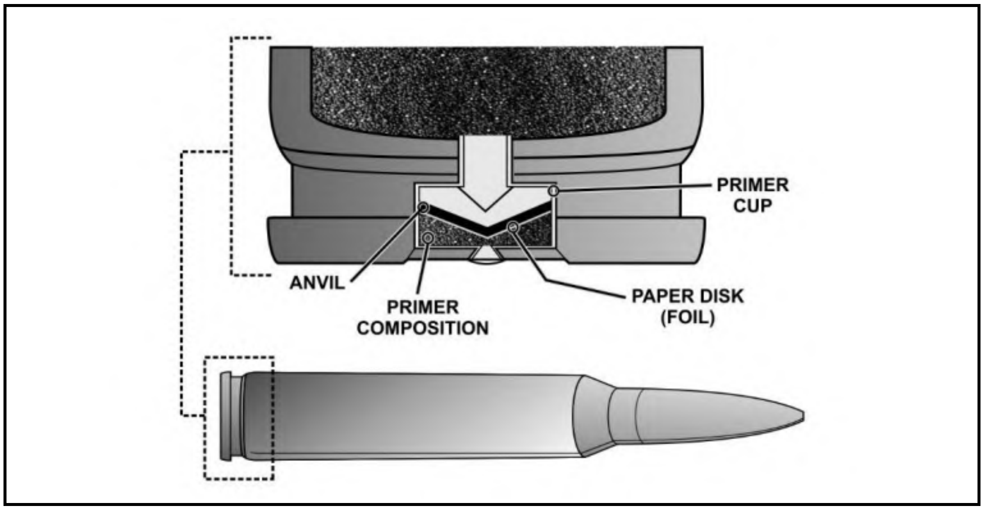


Figure A-4. 5.56mm primer detail

BULLET

A-11. The bullet is a cylindrically shaped lead or alloy projectile that engages with the rifling of the barrel. Newer projectiles consist of a copper slug with exposed steel penetrator, as with the M855A1. The bullets used today are either lead (lead alloy), or assemblies of a jacket and a lead or steel core penetrator. The lead used in lead-alloy bullets is combined with tin, antimony or both for bullet hardness. The alloying reduces barrel leading and helps prevent the bullet from striping (jumping) the rifling during firing.

A-12. Jacketed bullets (see figure A-5) are used to obtain high velocities and are better suited for semiautomatic and automatic weapons. A bullet jacket may be either gilding metal, gilding metal-clad steel, or copper plated steel. In addition to a lead or steel core, they may contain other components or chemicals that provide a terminal ballistic characteristic for the bullet type.

A-13. Some projectiles may be manufactured from plastic, wax, or plastic binder and metal powder, two or more metal powders, or various combinations based on the cartridge's use.

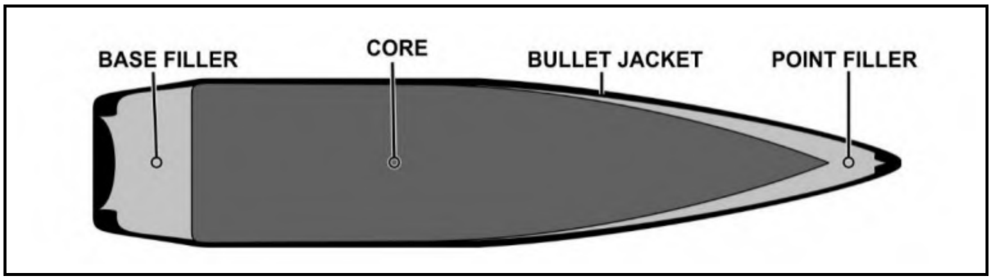


Figure A-5. Bullet example, Armor-piercing cartridge

SMALL ARMS AMMUNITION TYPES

A-14. There are seven types of SAA for the M4- and M16-series weapons that are used for training and combat. Each of these ammunition types provides a different capability and have specific characteristics. The following are the most common types of ammunition for the rifle and carbine:

BALL

A-15. The ball cartridge (see figure A-6) is intended for use in rifles and carbines against personnel and unarmored targets. The bullet, as designed for general purpose combat and training requirements, normally consists of a metal jacket and a lead slug.

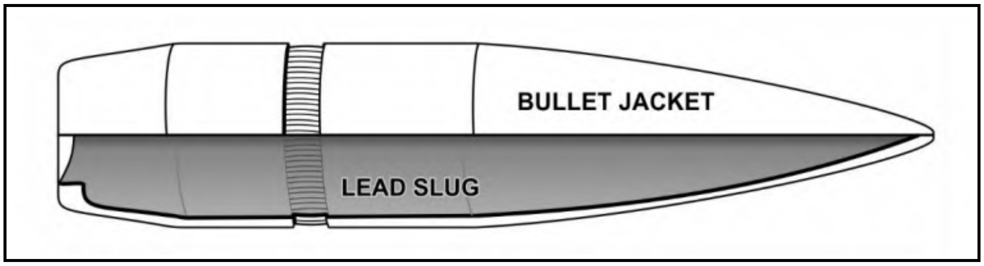


Figure A-6. Ball cartridge

TRACER (TCR OR T)

A-16. A tracer round contains a pyrotechnic composition in the base of the bullet to permit visible observation of the bullet's in-flight path or trajectory and point of impact. (See figure A-7) The pyrotechnic composition is ignited by the propellant when the round is fired, emitting a bright flame visible by the firer. Tracer rounds may also be used to pinpoint enemy targets to ignite flammable materials and for signaling purposes.

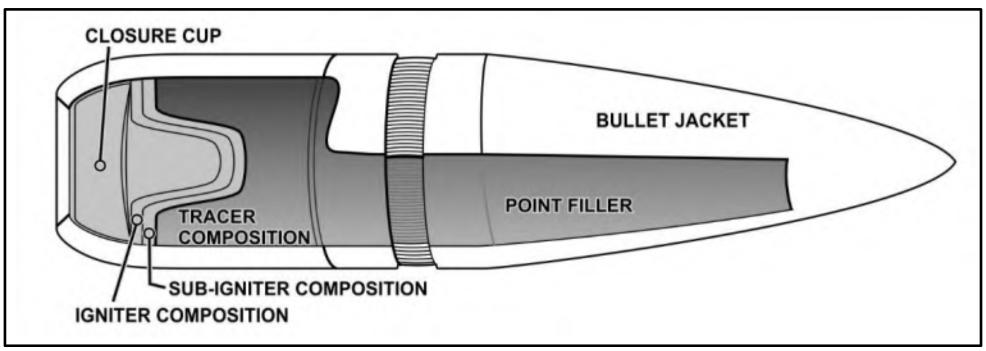


Figure A-7. Ball with tracer cartridge

ARMOR PIERCING (AP)

A-17. The armor-piercing cartridge (see figure A-8) is intended for use against personnel and light armored and unarmored targets, concrete shelters, and similar bullet-resistant targets. The bullet consists of a metal jacket and a hardened steel-alloy core. In addition, it may have a lead base filler and/or a lead point filler.

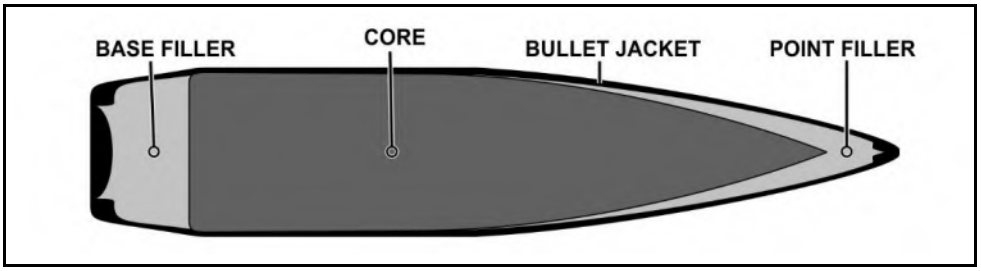


Figure A-8. Armor-piercing cartridge

SHORT RANGE TRAINING AMMUNITION

A-18. The short range training ammunition (SRTA) (see figure A-9) cartridges are designed for target practice where the maximum range is reduced for training purposes. This cartridge ballistically matches the ball cartridge out to 300 meters, and rapidly drops in velocity and accuracy. This allows for installations with restricted training range facilities to continue to operate with accurate munitions. This cartridge is also a preferred round when conducting training in a close quarters environment, like a shoot house or other enclosed training facility.

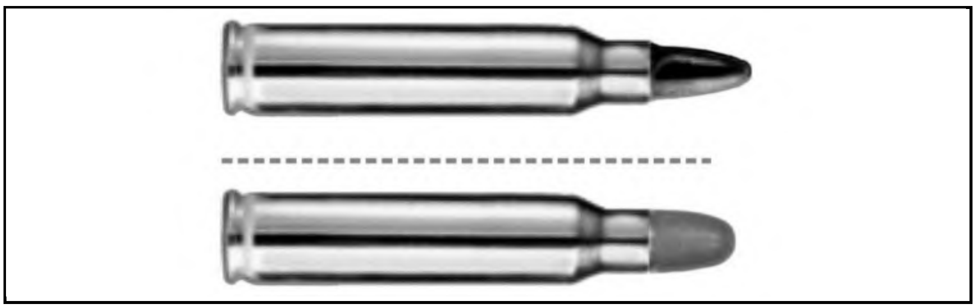


Figure A-9. Short range training ammunition cartridge

BLANK (BLK)

A-19. The blank cartridge (see figure A-10) is distinguished by the absence of a bullet or projectile. It is used for simulated fire, in training maneuvers, and for ceremonial purposes. These rounds consist of a roll crimp (knurl) or cannelure on the body of the case, which holds a paper wad in place instead of a projectile. Newer cartridges have rosette crimp (7 petals) and an identification knurl on the cartridge case.

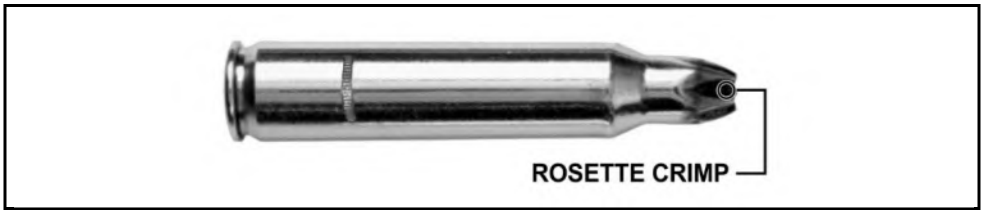


Figure A-10. Blank cartridge

CLOSE COMBAT MISSION CAPABILITY KIT

A-20. The close combat mission capability kit (CCMCK) cartridge (see figure A-11) is used for training purposes only.

A-21. The M4 carbine/M16 rifle conversion adapter kit provides utmost safety, in-service reliability and maintainability. The kit is easy to install with a simple exchange of the bolt. It adapts the host weapon to fire unlinked 5.56mm M1042 man-marking ammunition with the feel and function of live ammunition. The kit includes fail-safe measures to prevent the discharge of a standard "live" round.

Figure A-11. Close combat mission capability kit cartridge

DUMMY

A-22. The dummy cartridge (see figure A-12) is used for practice in loading weapons and simulated firing to detect errors in employment skills when firing weapons. This round is completely inert and consists only of an empty cartridge case and ball bullet. Cartridge identification is by means of holes through the side of the case or longitudinal corrugations in the case and by the empty primer pocket.

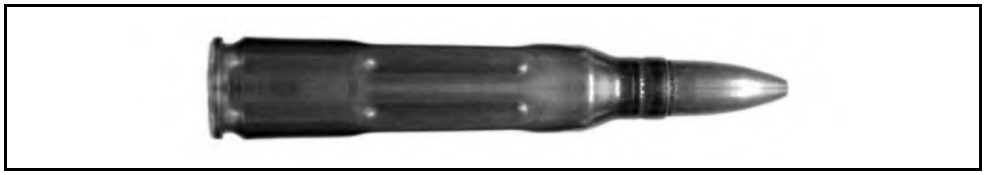


Figure A-12. Dummy cartridge

COLORS, MARKINGS, AND SYMBOLS

A-23. Small arms ammunition is identifiable by color coding specification per type and intended use. Table A-1 describes the general color codes for all types of 5.56mm small arms ammunition. Table A-2 identifies the color code specifications that are applied to the tip of 5.56mm ammunition.

A-24. Markings stenciled or stamped on munitions or their containers include all information needed for complete identification.

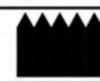
A-25. Packaging and containers for small arms ammunition are clearly marked with standard NATO symbols identifying the contents of the package by type of ammunition, primary use, and packaging information. The most common NATO symbols are described according to Standardization Agreement (STANAG) (see table A-2 on page A-11).

A-26. Small arms ammunition (less than 20mm) is not color-coded under MIL-STD-709D. Marking standards for small arms ammunition are outlined in—

- TM 9-1305-201-20&P.
- TM 9-1300-200.

A-27. These publications describe the color coding system for small arms projectiles. The bullet tips are painted a distinctive color as a ready means of identification for the user. (Refer to TM 9-1300-200 for more information.)

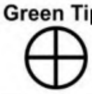
Table A-1. Small Arms Color Coding and Packaging Markings

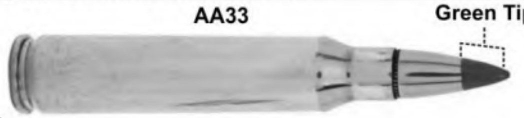
Ammunition Type	Color Coding	Package Marking
Ball	No Color or Green (M855)	●
Tracer (TCR or T)	Orange Tip	■
Armor Piercing (AP)	Black Tip	◀
Short Range Training Ammunition (STRA)	Blue	
Blank (BLK)	Cringed or Capped End	
Close Combat Mission Capabilities Kit (CCMCK) Dummy	Black Cartridge and Tip, or Perforated Cartridge	None
Special Markings	**Color Code**	**Package Marking**
NATO Standard		⊕
Interchangeable - suitable for use in similar caliber NATO weapons		
Bandoleers - ammunition is packaged in bandoleers		
Clipped - ammunition is packaged in clips for use with a speed loader		

5.56-MM AMMUNITION

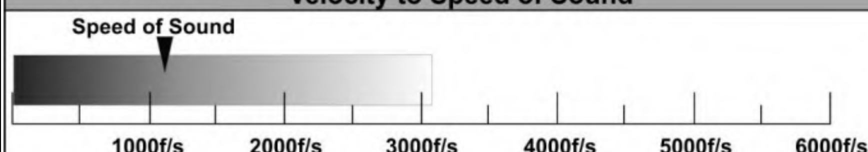
A-28. The following tables A-2 through A-10 on pages A-10 through A-18, will provide a brief description of the ten different types of commonly used 5.56mm ammunition for training and combat. Some types of 5.56mm ammunition will have more than one applicable Department of Defense Identification Code (DODIC); those DODICs are provided for the clarity and ease of the unit's ammunition resource manager.

Table A-2. 5-56mm, M855, Ball

Cartridge, 5.56mm, M855, Ball			
DODIC	A059	AA33	Green Tip
Model:	M855		
Type:	Ball		
Weight:	190 grain		
Length:	57.4 mm	2.26 in	
Color Code:		Green Tip	
Markings:			
Case			
Type:	Center Fire	Description:	5.56 x 45 mm
Propellant			
Type:	WC844	Double Base	Nitrocellulouse,
Weight:	26.1 gr	0.06 oz	Nitroglycerine
Primer			
Type:	Center Fire, Percussion		
Bullet			
Type:	Ball, Copper Alloy Jacket		
Design:	Conical steel insert and lead antimony alloy cylindrical core copper alloy jacket.		
Weight:	62 gr	0.14 oz	
Length:	23 mm	0.906 in	
Tracer:	None		
Characteristics			
Chamber Pressure:	3792 bars	55000 psi	
Velocity:	922 m/sec	3025 ft/sec	2.69 mach
Kinetic Energy (Ek)	1708 J	1260 FtLbsF	



Velocity to Speed of Sound



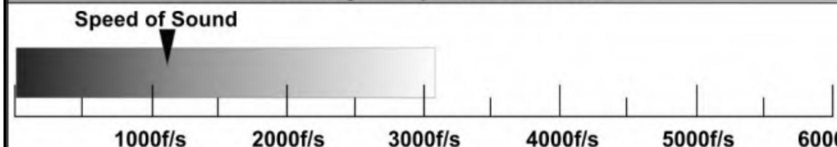
Special Features

The M16A2 Rifle was designed to fire M855 Ball to achieve commonality of ammunition at the small unit level. Chamber pressures generated by the M855 and the required barrel twist (1:7 or 32 calibers) make it unsuitable in the obsolete M16 and M16A1 weapons. The M855's steel insert is effective against most types of fabric body armor while its three-piece construction achieve good effects against unprotected personnel targets.

Table A-3. 5.56mm, M855A1, Enhanced Performance Round (EPR), Ball

Cartridge, 5.56mm, M855A1, Ball, EPR			
DODIC	AB57	AB58	
Model:	M855A1		
Type:	Ball, EPR		
Weight:	190 grain		
Length:	57.4 mm	2.26 in	
Color Code:		Bronze Tip	
Markings:			
Case			
Type:	Center Fire	Description:	5.56 x 45 mm
Propellant			
Type:	WC844	Double Base	Nitrocellulouse,
Weight:	28.1 gr	0.06 oz	Nitroglycerine
Primer			
Type:	Center Fire, Percussion		
Bullet			
Type:	Ball, EPR, Lead free slug (or core)		
Design:	Steel Penetrator encapsulated in a reverse gilded metal jacket.		
Weight:	62 gr	0.14 oz	
Length:	23 mm	0.906 in	
Tracer:	None		
Characteristics			
Chamber Pressure:	3792 bars	55000 psi	
Velocity:	960 m/sec	3150 ft/sec	2.8 mach
Kinetic Energy (Ek)	1851 J	1366 FtLbsF	

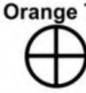
Velocity to Speed of Sound



Special Features

The M855A1's steel penetrator is effective against light armored targets while its three-piece construction maintains operational capabilities against unprotected personnel targets. The M855A1 enhances performance on hard targets/barriers. Improved propellant reduces muzzle flash. Optimized for use with the M4 series carbine for close quarters engagements.

Table A-4. 5.56mm, M856A1, Tracer

Cartridge, 5.56mm, M856A1, Tracer			
DODIC	A063		Orange Tip
Model:	M856A1		
Type:	Tracer		
Weight:	190 grain		
Length:	57.4 mm	2.26 in	
Color Code:		Orange Tip	
Markings:			
Case			
Type:	Center Fire	Description:	5.56 x 45 mm
Propellant			
Type:	Wc844	Double Base	Nitrocellulouse,
Weight:	24.7 gr	0.06 oz	Nitroglycerine
Primer			
Type:	Center Fire, Percussion		
Bullet			
Type:	Tracer		
Design:	Lead alloy core in copper alloy jacket with incendiary compound fill in hollow base.		
Weight:	63.7 gr	0.15 oz	
Length:	29.3 mm	1.154 in	
Tracer:	None		
Characteristics			
Chamber Pressure:	3792 bars	55000 psi	
Velocity:	875 m/sec	2870 ft/sec	2.55 mach
Kinetic Energy (Ek)	1580 J	1165 FtLbsF	
Velocity to Speed of Sound			
Special Features			
Because the M856 loses mass as it travels, it necessitates a 1:7 barrel twist to keep it stable in flight.			

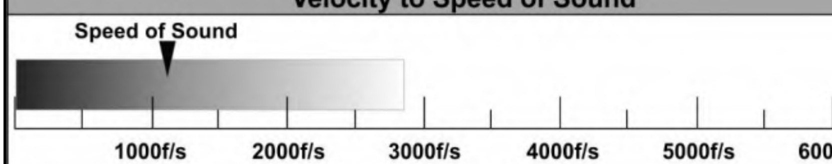


Table A-5. 5.56mm, Mk301, MOD 0, DIM Tracer

Cartridge, 5.56mm, Mk301 Mod 0, Dim Tracer			
DODIC	AB03	0	Violet Tip
Model:	Mk301 Mod 0		
Type:	Dim Tracer		
Weight:	190 grain		
Length:	57.4 mm	2.26 in	
Color Code:		Violet Tip	
Markings:			
Case			
Type:	Center Fire	Description:	5.56 x 45 mm
Propellant			
Type:	WC844	Double Base	Nitrocellulouse,
Weight:	26.1 gr	0.06 oz	Nitroglycerine
Primer			
Type:	Center Fire, Percussion		
Bullet			
Type:	Dim Tracer, Copper Alloy Jacket		
Design:	Lead alloy core in copper alloy jacket with incendiary compound fill in a hollow case.		
Weight:	62 gr	0.14 oz	
Length:	23 mm	0.906 in	
Tracer:	Dim Tracer element		
Characteristics			
Chamber Pressure:	4047 bars	55000 psi	
Velocity:	922 m/sec	3025 ft/sec	2.69 mach
Kinetic Energy (Ek)	1708 J	1260 FtLbsF	
Velocity to Speed of Sound			
Special Features			
Low burning temperature of tracer mix produces IR light spectrum tracer effects, visible with use of night vision devices. Dim Tracer element consists of a barium nitrate composition, with tracer effective range to 900m. WC845S propellant provides flash suppression.			

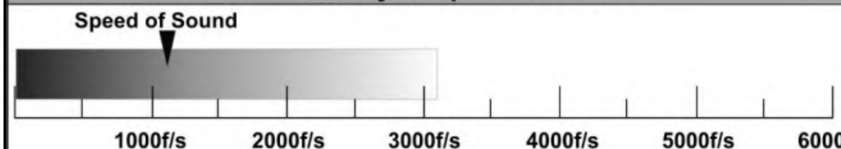


Table A-6. 5.56mm, M995, Armor Piercing

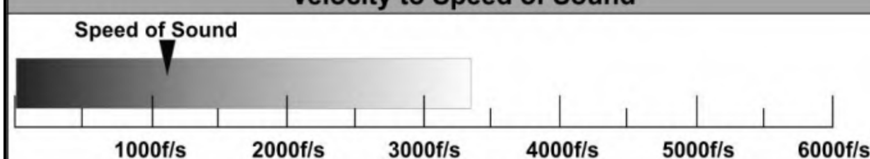
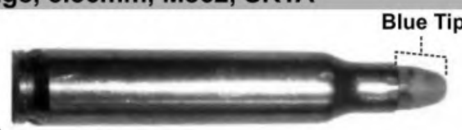
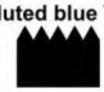
Cartridge, 5.56mm, M995, Armor Piercing			
DODIC	AA69		Black Tip
Model:	M995		
Type:	Armor Piercing		
Weight:	180 grain		
Length:	57.4 mm	2.26 in	
Color Code:		Black Tip	
Markings:			
Case			
Type:	Center Fire	Description:	5.56 x 45 mm
Propellant			
Type:	WCR845	Double Base	Nitrocellulouse,
Weight:	27.5 gr	0.06 oz	Nitroglycerine
Primer			
Type:	Center Fire, Berdan		
Bullet			
Type:	Armor Piercing, Tungsten-Cobalt core		
Design:	Tungsten-Cobalt core located by aluminum cup in copper alloy jacket		
Weight:	52 gr	0.12 oz	
Length:	29.3 mm	1.154 in	
Tracer:	None		
Characteristics			
Chamber Pressure:	3465 bars	55000 psi	
Velocity:	1013 m/sec	3324 ft/sec	2.95 mach
Kinetic Energy (Ek)	1729 J	1276 FtLbsF	
Velocity to Speed of Sound			
			
Special Features			
The M995 was designed for use in all U.S. 5.56mm weapons, it will penetrate 12mm of steel at 100m to defeat light armored vehicles and other barrier materials on the battlefield.			

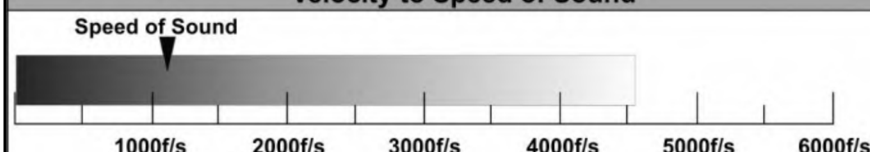
Table A-7. 5.56mm, M862, Short Range Training Ammunition

Cartridge, 5.56mm, M862, SRTA			
DODIC	AA68		
Model:	M862		
Type:	SRTA		
Weight:	108 grain		
Length:	57.4 mm	2.26 in	
Color Code:		Fluted blue Tip	
Markings:			
Case			
Type:	Center Fire	Description:	5.56 x 45 mm
Propellant			
Type:	0	Double Base	Nitrocellulouse,
Weight:	gr	0 oz	Nitroglycerine
Primer			
Type:		Center Fire	
Bullet			
Type:		SRTA	
Design:	Plastic projectile		
Weight:	6.9 gr	0.02 oz	
Length:	29.3 mm	1.154 in	
Tracer:	None		
Characteristics			
Chamber Pressure:	2758 bars	40000 psi	
Velocity:	1379 m/sec	4525 ft/sec	4.02 mach
Kinetic Energy (Ek)	425 J	314 FtLbsF	





Velocity to Speed of Sound

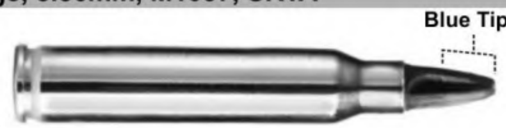


Special Features

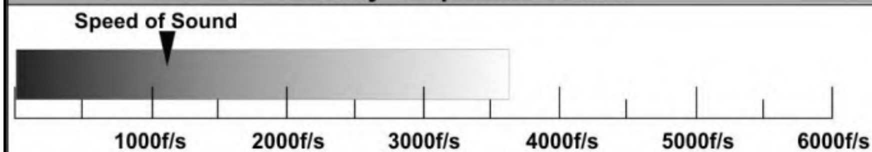
The M862 is ballistically matched to standard M855 ball ammunition out to 25m, with a maximum range of 250m. M862 ammunition MUST be used with the M2 training bolt. This provides units the capability to conduct training on installations that have limited range facilities which require the use of reduced/decreased Surface Danger Zones.

Table A-8. 5.56mm, M1037, Short Range Training Ammunition

Cartridge, 5.56mm, M1037, SRTA			
DODIC	AB67		
Model:	M1037		
Type:	SRTA		
Weight:	165 grain		
Length:	57.4 mm	2.26 in	
Color Code:		Fluted blue Tip	
Markings:			
Case			
Type:	Center Fire	Description:	5.56 x 45 mm
Propellant			
Type:	0	Double Base	Nitrocellulouse,
Weight:	gr	0 oz	Nitroglycerine
Primer			
Type:	Center Fire		
Bullet			
Type:	SRTA, Frangible		
Design:	Copper, nylon and carbon fiber projectile		
Weight:	33 gr	0.08 oz	
Length:	29.3 mm	1.154 in	
Tracer:	None		
Characteristics			
Chamber Pressure:	2758 bars	40000 psi	
Velocity:	1097 m/sec	3600ft/sec	3.2 mach
Kinetic Energy (Ek)	1287J	950 FtLbsF	



Velocity to Speed of Sound



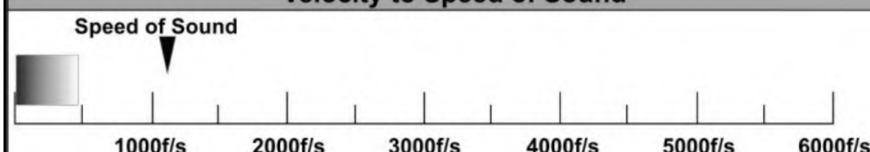
Special Features

The M1037 is ballistically matched to standard M855 ball ammunition out to 100m, with a maximum range of less than 600m. M1037 ammunition DOES NOT require the use of the M2 training bolt. This provides units the capability to conduct training on installations that have limited range facilities which require the use of reduced/ decreased Surface Danger Zones.

Table A-9. 5.56mm, M1042 Close Combat Mission Capability Kit

Cartridge, 5.56mm, M1042, Close Combat Mission Capability Kit			
DODIC	AB09 (blue tip)	AB10 (red tip)	AB11 (yellow tip)
Model:	M1042		
Type:	CCMCK		
Weight:	94.86 grain		
Length:	57.4 mm	2.26 in	
Color Code:		Blue, red, or yellow plastic tip	
Markings:			
Case			
Type:	Rim Fire	Description:	5.56 x 45 mm
Propellant			
Type:	0	Double Base	Nitrocellulouse,
Weight:	gr	0 oz	Nitroglycerine
Primer			
Type:		Rim Fire	
Bullet			
Type:		CCMCK	
Design:	0		
Weight:	6.9 gr	0.02 oz	
Length:	29.3 mm	1.154 in	
Tracer:	None		
Characteristics			
Chamber Pressure:	0 bars	0 psi	
Velocity:	149 m/sec	488 ft/sec	0.43 mach
Kinetic Energy (Ek)	5 J	4 FtLbsF	

Velocity to Speed of Sound



Special Features

The CCMCK is a user installed weapons modification system used for short range force on force training. The M1042 is a low velocity marking ammunition that prevents the weapon from firing service ammunition. Fail-safe is achieved by utilizing a 3mm offset firing pin which will only work with the M1042 rim fire primer. In the event that a "Live" 5.56mm cartridge is chambered and the trigger is pulled, the conversion will offset.

Table A-10. 5.56mm, M200, Blank

Cartridge, 5.56mm, M200, Blank			
DODIC	A080		
Model:	M200		
Type:	Blank		
Weight:	107 grain		
Length:	48.3 mm	1.902in	
Color Code:		Rosette Crimp	
Markings:			

Case			
Type:	Center Fire	Description:	5.56 x 45 mm

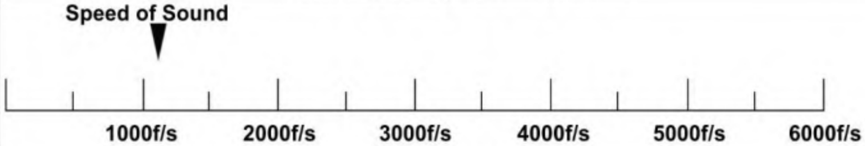
Propellant			
Type:	HPC 13	Double Base	Nitrocellulouse,
Weight:	7 gr	0.02 oz	Nitroglycerine

Primer	
Type:	Center Fire, Berdan

Bullet		
Type:	Blank, NA	
Design:	NA	
Weight:	NONE	
Length:	NA	0 in
Tracer:	NA	

Characteristics			
Chamber Pressure:	0 bars	psi	
Velocity:	m/sec	ft/sec	0 mach
Kinetic Energy (Ek)	0	0	

Velocity to Speed of Sound



Special Features

The M200 cartridge is designed for simulated firing in training exercises and for saluting purposes. The cartridge is identified by a rosette-crimp closure of the case mouth.

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Appendix B

Ballistics

Ballistics is the science of the processes that occur from the time a firearm is fired to the time when the bullet impacts its target. Soldiers must be familiar with the principles of ballistics as they are critical in understanding how the projectiles function, perform during flight, and the actions of the bullet when it strikes the intended target. The profession of arms requires Soldiers to understand their weapons, how they operate, their functioning, and their employment.

B-1. The flight path of a bullet includes three stages: the travel down the barrel, the path through the air to the target, and the actions the bullet takes upon impact with the target. These stages are defined in separate categories of ballistics; internal, external, and terminal ballistics.

INTERNAL BALLISTICS

B-2. **Internal ballistics** – is the study of the propulsion of a projectile. Internal ballistics begin from the time the firing pin strikes the primer to the time the bullet leaves the muzzle. Once the primer is struck the priming charge ignites the propellant. The expanding gases caused by the burning propellant create pressures which push the bullet down the barrel. The bullet engages the lands and grooves (rifling) imparting a spin on the bullet that facilitates stabilization of the projectile during flight. Internal ballistics ends at shot exit, where the bullet leaves the muzzle. (See figure B-1.)

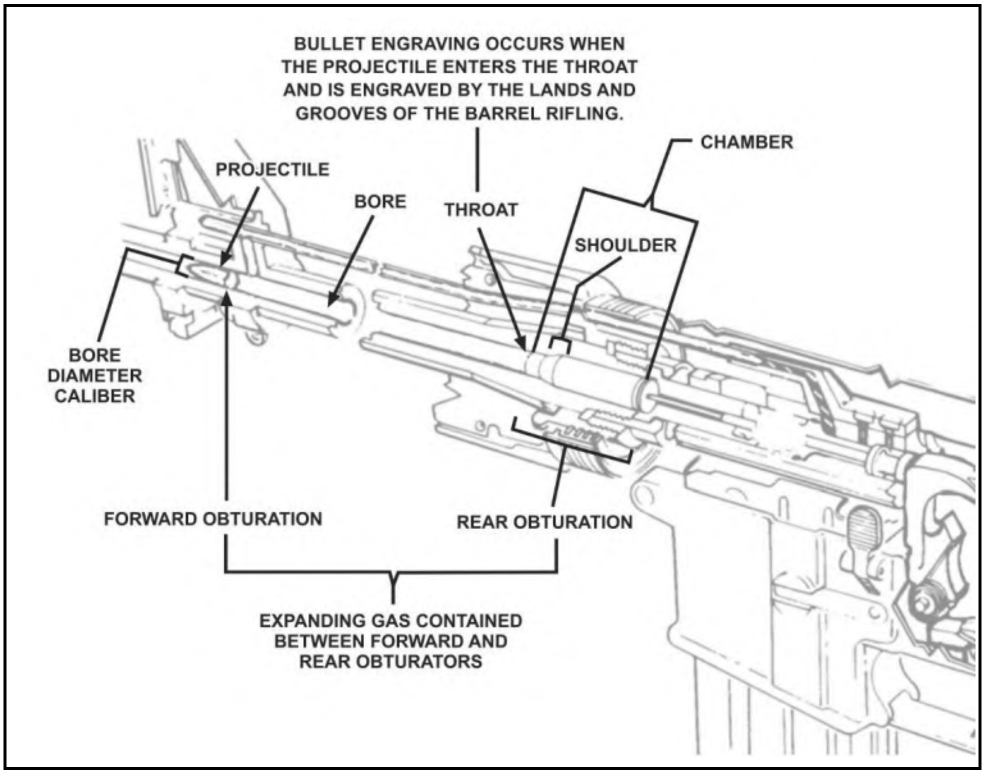


Figure B-1. Internal ballistic terms

B-3. Several key terms are used when discussing the physical actions of internal ballistics —

- **Bore** – the interior portion of the barrel forward of the chamber.
- **Chamber** – the part of the barrel that accepts the ammunition for firing.
- **Grain (gr)** – a unit of measurement of either a bullet or a projectile. There are 7000 grains in a pound, or 437.5 grains per ounce.
- **Pressure** – the force developed by the expanding gasses generated by the combustion (burning) of the propellant. Pressure is measure in pounds per square inch (psi).
- **Shoulder** – the area of the chamber that contains the shoulder, forcing the cartridge and projectile into the entrance of the bore at the throat of the barrel.
- **Muzzle** – the end of the barrel.
- **Throat** – the entrance to the barrel from the chamber. Where the projectile is introduced to the lands and grooves within the barrel.

EXTERNAL BALLISTICS

B-4. **External ballistics** is the study of the physical actions and effects of gravity, drag, and wind along the projectile's flight to the target. It includes only those general physical actions that cause the greatest change to the flight of a projectile. (See figure B-2.) External ballistics begins at shot exit and continues through the moment the projectile strikes the target.

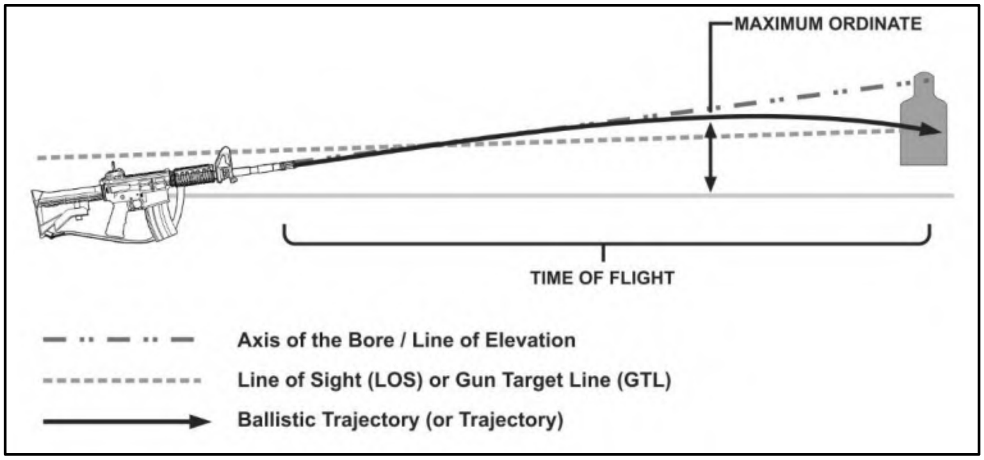


Figure B-2. External ballistic terms

B-5. The following terms and definitions are used to describe the actions or reactions of the projectile during flight. This terminology is standard when dealing with any weapon or weapon system, regardless of caliber. (See figure B-3.)

- **Axis of the bore** (Line of Bore) – the line passing through the center of the bore or barrel.
- **Line of sight (LOS) or gun target line (GTL)** – a straight line between the sights or optics and the target. This is never the same as the axis of the bore. The LOS is what the Soldier sees through the sights and can be illustrated by drawing an imaginary line from the firer's eye through the rear and front sights out to infinity. The LOS is synonymous with the GTL when viewing the relationship of the sights to a target.
- **Line of elevation (LE)** – the angle represented from the ground to the axis of the bore.
- **Ballistic trajectory** – the path of a projectile when influenced only by external forces, such as gravity and atmospheric friction.
- **Maximum ordinate** – the maximum height the projectile will travel above the line of sight on its path to the point of impact.
- **Time of flight** – the time taken for a specific projectile to reach a given distance after firing.

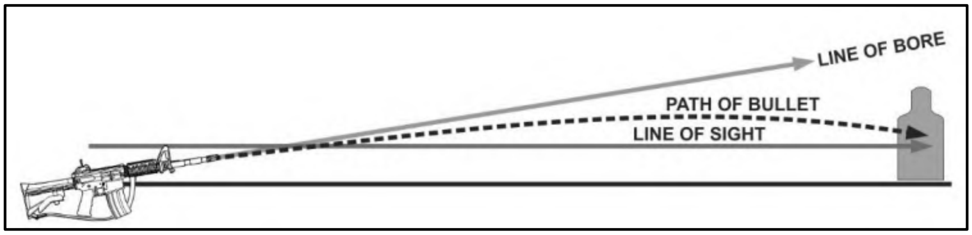


Figure B-3. Trajectory

- **Jump** – vertical jump in an upward and rearward direction caused by recoil. Typically, it is the angle, measured in mils, between the line of departure and the line of elevation.
- **Line of departure (LD)** – the line the projectile is on at shot exit.
- **Muzzle** – the end of the barrel.
- **Muzzle velocity or velocity** – the velocity of the projectile measured at shot exit. Muzzle velocity decreases over time due to air resistance. For small arms ammunition, velocity (V) is represented in feet per second (f/s).
- **Twist rate** – the rotation of the projectile within the barrel of a rifled weapon based on the distance to complete one revolution. The twist rate relates to the ability to gyroscopically spin-stabilize a projectile on rifled barrels, improving its aerodynamic stability and accuracy. The twist rate of the M4- or M16-series weapon is a right hand, one revolution in every seven inches of barrel length (or R 1:7 inches).
- **Shot exit** – the moment the projectile clears the muzzle of the barrel, where the bullet is not supported by the barrel.
- **Oscillation** – the movement of the projectile in a circular pattern around its axis during flight.
- **Drift** – the lateral movement of a projectile during its flight caused by its rotation or spin.
- **Yaw** – a deviation from stable flight by oscillation. This can be caused by cross wind or destabilization when the projectile enters or exits a transonic stage.
- **Grain (gr)** – a unit of measurement of either a bullet or a propellant charge. There are 7000 grains in a pound, or 437.5 grains per ounce.
- **Pressure** – the force developed by the expanding gases generated by the combustion (burning) of the propellant. For small arms, pressure is measured in pounds per square inch (psi).
- **Gravity** – the constant pressure of the earth on a projectile at a rate of about 9.8 meters per second squared, regardless of the projectile's weight, shape or velocity. Commonly referred to as bullet drop, gravity causes the projectile to drop from the line of departure. Soldiers must understand the effects of gravity on the projectile when zeroing as well as how it applies to determining the appropriate hold-off at ranges beyond the zero distance.

- **Drag (air resistance)** – the friction that slows the projectile down while moving through the air. Drag begins immediately upon the projectile exiting the barrel (shot exit). It slows the projectile's velocity over time, and is most pronounced at extended ranges. Each round has a ballistic coefficient (BC) that is a measurement of the projectile's ability to minimize the effects of air resistance (drag) during flight.
- **Trajectory** – the path of flight that the projectile takes upon shot exit over time. For the purposes of this manual, the trajectory ends at the point of impact.
- **Wind** – has the greatest variable effect on ballistic trajectories. The effects of wind on a projectile are most noticeable in three key areas between half and two-thirds the distance to the target:
  - **Time (T)** – the amount of time the projectile is exposed to the wind along the trajectory. The greater the range to target, the greater time the projectile is exposed to the wind's effects.
  - **Direction** – the direction of the wind in relation to the axis of the bore. This determines the direction of drift of the projectile that should be compensated.
  - **Velocity (V)** – the speed of the wind during the projectile's trajectory to the target. Variables in the overall wind velocity affecting a change to the ballistic trajectory include sustained rate of the wind and gust spikes in velocity.

TERMINAL BALLISTICS

B-6. Terminal ballistics is the science of the actions of a projectile from the time it strikes an object until it comes to rest (called terminal rest). This includes the terminal effects that take place against the target.

- **Kinetic Energy (E_K)** – a unit of measurement of the delivered force of a projectile. Kinetic energy is the delivered energy that a projectile possesses due to its mass and velocity at the time of impact. Kinetic energy is directly related to the *penetration capability* of a projectile against the target.
- **Penetration** – the ability or act of a projectile to enter a target's mass based on its delivered kinetic energy. When a projectile strikes a target, the level of penetration into the target is termed the impact depth. The impact depth is the distance from the point of impact to the moment the projectile stops at its terminal resting place. Ultimately, the projectile stops when it has transferred its momentum to an equal mass of the medium (or arresting medium).

B-7. Against any target, penetration is the most important terminal ballistic consideration. Soldiers must be aware of the penetration capabilities of their ammunition against their target, and the most probable results of the terminal ballistics.

B-8. The 5.56mm projectile's purpose is to focus the largest amount of momentum (energy) on the smallest possible area of the target to achieve the greatest penetration. They are designed to resist deformation on impact to enter the target's mass. The steel tip of the penetrator allows for reduced deformation through light skin armor or body armor, and the heavier steel penetrator allows for increased soft tissue damage.

ACTIONS AFTER THE TRIGGER SQUEEZE

B-9. Once the trigger is squeezed, the ballistic actions begin. Although not all ammunition and weapons operate in the same manner, the following list describes the general events that occur on the M4- and M16-series weapons when the trigger is squeezed.

- The hammer strikes the rear of the firing pin.
- The firing pin is pushed forward, striking the cartridge percussion primer assembly.
- The primer is crushed, pushing the primer composition through the paper disk, and on to the anvil, detonating the primer composition.
- The burning primer composition is focused evenly through the primer cup vent hole, igniting the propellant.
- The propellant burns evenly within the cartridge case.
- The cartridge case wall expand from the pressure of the burning propellant, firmly locking the case to the chamber walls.
- The expanded cartridge case, held firmly in place by the chamber walls and the face of the bolt provide rear obturation, keeping the burning propellant and created expanding gasses in front of the cartridge case.
- The projectile is forced by the expanding gasses firmly into the lands and grooves at the throat of the bore, causing engraving.
- Engraving causes the scoring of the softer outer jacket of the projectile with the lands and grooves of the bore. This allows the projectile to spin at the twist rate of the lands and grooves, and provides a forward obturation seal. The forward obturation keeps the expanding gasses behind the projectile in order to push it down the length of the barrel.
- As the propellant continues to burn, the gasses created continue to seek the path of least resistance. As the cartridge case is firmly seated and the projectile is moveable, the gas continues to exert its force on the projectile.
- Once the projectile passes the gas port on the top of the barrel, a small amount of gas is permitted to escape from propelling the projectile. This escaping gas is directed up through the gas port and rearward through the gas tube, following the path of least resistance. The diameter of the gas port limits the amount of gas allowed to escape.
- As the end of the projectile leaves the muzzle, it is no longer supported by the barrel itself. Shot exit occurs.
- Upon shot exit, most of the expanding and burning gasses move outward and around the projectile, causing the muzzle flash.
- At shot exit, the projectile achieves its maximum muzzle velocity. From shot exit until the projectile impacts an object, the projectile loses velocity at a steady rate due to air resistance.

- As the round travels along its trajectory, the bullet drops consistently by the effects of gravity.
- As the actual line of departure is an elevated angle from the line of sight, the projectile appears to rise and then descend. This rise and fall of the projectile is the trajectory.
- The round achieves the highest point of its trajectory typically over half way to the target, depending on the range to target. The high point is called the round's maximum ordinate or ***max ord***.
- From the max ord, the projectile descends into the target.
- The round strikes the target at the point of impact, which, depending on the firing event, may or may not be the desired point of impact, and is seldom the point of aim.

Note. The point of aim and point of impact only occur twice during the bullet's path to the target at distance; once when the trajectory crosses the line of sight approximately 25 meters from the muzzle, and again at the zero distance (300 meters for the Army standard zero).

- Once the projectile strikes a target or object, it delivers its kinetic energy (force) at the point of impact.
- Terminal ballistics begin.

B-10. Once terminal ballistics begin, no bullets follow the same path or function. Generally speaking, the projectile will penetrate objects where the delivered energy (mass times velocity squared, divided by 2) is greater than the mass, density, and area of the target at the point of the delivered force. There are other contributing factors, such as the angle of attack, yaw, oscillation, and other physical considerations that are not included in this ballistic discussion.

STRUCTURE PENETRATION

B-11. The following common barriers in built-up areas can prevent penetration by a 5.56-mm round fired at less than 50 meters (M855) including:

- Single row sandbags.
- A 2-inch thick concrete wall (not reinforced with rebar or similar item).
- A 55-gallon drum filled with water or sand.
- A metal ammunition can filled with sand.
- A cinder block filled with sand (the block may shatter).
- A plate glass windowpane at a 45-degree angle (glass fragments will be thrown behind the glass).
- A brick veneer.

Note. The M855A1 enhanced performance round (EPR) has increased capabilities for barrier penetration compared with M855 as shown above.

B-12. Although most structural materials repel single 5.56-mm rounds, continued and concentrated firing can breach (penetrate through) some typical urban structures.

B-13. The best method for breaching a masonry wall is by firing short bursts in a U-shaped pattern. The distance from the firer to the wall should be minimized for best results—ranges as close as 25 meters are relatively safe from ricochet.

B-14. Ball ammunition and armor-piercing rounds produce almost the same results, but are more likely to ricochet to the sides and rearward back at the firer (called spit-back).

Note. Soldiers must ensure the appropriate level of personal protective equipment is worn when conducting tactical and collective tasks, particularly at ranges less than 50 meters.

B-15. The 5.56-mm round can be used to create either a loophole (about 7 inches in diameter) or a breach hole (large enough for a man to enter). When used against reinforced concrete, the M16 rifle and M249 cannot cut the reinforcing bars.

SOFT TISSUE PENETRATION

B-16. A gunshot wound, or ballistic trauma, is a form of physical damage sustained from the entry of a projectile. The degree of tissue disruption caused by a projectile is related to the size of the cavities created by the projectile as it passes through the target's tissue. When striking a personnel target, there are two types of cavities created by the projectile; permanent and temporary wound cavities.

Permanent Wound Cavity

B-17. The permanent cavity refers specifically to the physical hole left in the tissues of soft targets by the pass-through of a projectile. It is the total volume of tissue crushed or destroyed along the path of the projectile within the soft target.

B-18. Depending on the soft tissue composition and density, the tissues are either elastic or rigid. Elastic organs stretch when penetrated, leaving a smaller wound cavity. Organs that contain dense tissue, water, or blood are rigid, and can shatter from the force of the projectile. When a rigid organ shatters from a penetrating bullet, it causes massive blood loss within a larger permanent wound cavity. Although typically fatal, striking these organs may not immediately incapacitate the target.

Temporary Wound Cavity

B-19. The temporary wound cavity is an area that surrounds the permanent wound cavity. It is created by soft, elastic tissues as the projectile passes through the tissue at greater than 2000 feet per second. The tissue around the permanent cavity is propelled outward (stretched) in an almost explosive manner from the path of the bullet. This forms a temporary recess or cavity 10 to 12 times the bullet's diameter.

B-20. Tissue such as muscle, some organs, and blood vessels are very elastic and can be stretched by the temporary cavity with little or no damage and have a tendency to absorb the projectile's energy. The temporary cavity created will slowly reduce in size over time, although typically not returning completely to the original position or location.

> ***Note.*** Projectiles that do not exceed 2000 feet per second velocity on impact do not provide sufficient force to cause a temporary cavity capable of incapacitating a threat.

B-21. The extent of the cavitation (the bullet's creation of the permanent and temporary cavities) is related to the characteristics of the projectile:

- **Kinetic energy (E_K)** – the delivered mass at a given velocity. Higher delivered kinetic energy produces greater penetration and tissue damage.
- **Yaw** – any yaw at the point of impact increases the projectiles surface area that strikes the target, decreasing kinetic energy, but increasing the penetration and cavity size.
- **Deformation** – the physical changes of the projectile's original shape and design due to the impact of the target. This increases the projectile's surface area and the size of the cavity created after penetration.
- **Fragmentation** – the fracturing of a projectile into multiple pieces or sub-projectiles. The multiple paths of the fragmented sub-projectiles are unpredictable in size, velocity, and direction. The bullet jacket, and for some types of projectiles, the lead core, fracture creating small, jagged, sharp edged pieces that are propelled outward with the temporary cavity. Fragments can sever tissue, causing large, seemingly explosive-type. Bone fragments caused by the bullet's strike can have the same effect.
- **Tumbling** – the inadvertent end-over-end rotation of the projectile. As a projectile tumbles as it strikes the target, the bullet travels through the tissues with a larger diameter. This causes a more severe permanent cavity as it passes through the soft tissue. A tumbling projectile can change direction erratically within the body due to its velocity and tendency to strike dense material with a larger surface area.

B-22. Once inside the target, the projectile's purpose is to destroy soft tissues with fragmentation. The ball ammunition is designed to not flatten or expand on impact, which would decrease velocity and delivered energy. For the M855-series cartridge, the penetrator tends to bend at the steel-core junction, fracture the weaker jacketed layer, and fragment into pieces when striking an object.

Incapacitation

B-23. Incapacitation with direct fire is the act of ballistically depriving a target of the ability, strength, or capability to continue its tactical mission. To assist in achieving the highest probability of incapacitation with a single shot, the projectile is designed with the ability to tumble, ricochet, or fragment after impact.

B-24. The projectile or its fragments then must hit a vital, blood-bearing organ or the central nervous system to effectively incapacitate the threat. The projectile's limited fragmentation potential after entry maximizes the soft tissue damage and increases the potential for rapid incapacitation.

Lethal Zones

B-25. The Soldier's primary point of aim at any target by default is center of visible mass. This allows for a tolerance that includes the greatest margin of error with the highest probability of a first round hit. The combat conditions may require more precise fires at partially exposed targets or targets that require immediate incapacitation.

B-26. Ideally, the point of aim is anywhere within a primary switch area. This point will maximize the possibility of striking major organs and vessels, rendering a clean, one-shot kill (see figure B-4.)

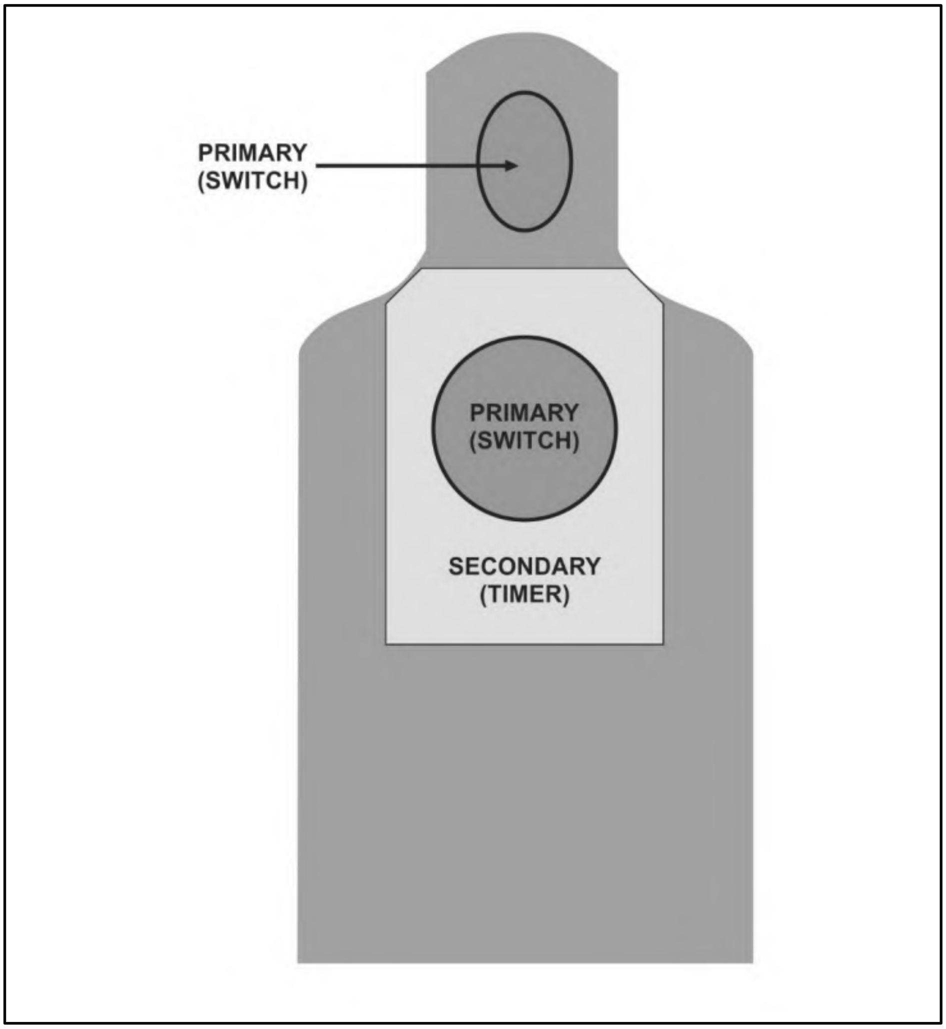


Figure B-4. Lethal zone example

B-27. Shots to the head should be weighed with caution. The head is the most frequently moved body part and are the most difficult to hit with precision. Shots to other exposed body parts, such as the pelvic area, should be considered for the shot.

B-28. Shots to the pelvic area are used when the target is not completely visible or when the target is wearing body armor that prevents the Soldier from engaging the primary zone. This area is rich in large blood vessels and a shot here has a good possibility of impeding enemy movement by destroying the pelvic or hitting the lower spine.

- Circuitry shots (switches).
- Hydraulic shots (timers).

Circuitry Shots (Switches)

B-29. Circuitry shots, or "switches," are strikes to a target that deliver its immediate incapacitation. Immediate incapacitation is the sudden physical or mental inability to initiate or complete any physical task. To accomplish this, the central nervous system must be destroyed by hitting the brain or spinal column. All bodily functions and voluntary actions cease when the brain is destroyed and if the spinal column is broken, all functions cease below the break.

Hydraulic Shots (Timer)

B-30. Hydraulic shots, or "timers," are impacts on a target where immediate incapacitation is not guaranteed. These types of ballistic trauma are termed "timers" as that after the strike of the bullet, the damage caused requires time for the threat to have sufficient blood loss to render it incapacitated. Hydraulic shots, although ultimately lethal, allow for the threat to function in a reduced capacity for a period of time.

B-31. For hydraulic shots to eliminate the threat, they must cause a 40 percent loss of blood within the circulatory system. If the shots do not disrupt that flow at a rapid pace, the target will be able to continue its mission. Once two (2) liters of blood are lost, the target will transition into hypovolemic shock and become incapacitated.

Appendix C

Complex Engagements

This appendix provides detailed information on the calculations for determining ***deliberate*** holds for complex engagements and various engagement techniques. It is designed for the advanced shooter; however, all Soldiers should be familiar with the contents of the appendix in order to build their mastery and proficiency with their individual weapon.

C-1. A complex engagement includes any shot that cannot use the ***CoVM*** as the point of aim to ensure a target hit. Complex engagements require a Soldier to apply various points of aim (called hold, hold-off, or holds) to successfully defeat the threat.

C-2. This appendix builds upon the concepts discussed in Chapter 7, Aim, and only include topics specific to deliberate hold determinations. These topics are:

- **Target conditions**:
  - Range to target.
  - Moving targets.
  - Oblique targets.
- **Environmental conditions**:
  - Wind.
  - Angled firing.
- **Compound conditions**:

C-3. Each of these firing conditions may require the Soldier to determine an appropriate aim point that is not the CoVM. During any complex engagement, the Soldier serves as the ballistic computer during the shot process. The hold represents a refinement or alteration of the center of visible mass point of aim at the target to counteract certain conditions during a complex engagement for—

- Range to target.
- Lead for targets based on their direction and speed of movement.
- Counter-rotation lead required when the Soldier is moving in the opposite direction of the moving target.
- Wind speed, direction, and duration between the shooter and the target at ranges greater than 300 meters.
- Greatest lethal zone presented by the target to provide the most probable point of impact to achieve immediate incapacitation.

C-4. The Soldier will apply the appropriate aim (hold) based on the firing instances presented. Hold determinations will be discussed in two formats; immediate and deliberate.

TARGET CONDITIONS

C-5. Soldiers must consider several aspects of the target to apply the proper point of aim on the target. The target's posture, or how it is presenting itself to the shooter, consists of—

- Range to target.
- Nature of the target.
- Nature of the terrain (surrounding the target).

RANGE TO TARGET

C-6. Rapidly determining an accurate range to target is critical to the success of the Soldier at mid and extended ranges. There are several range determination methods shooters should be confident in applying to determine the proper hold-off for pending engagements.

Deliberate Range Determination

C-7. The deliberate methods afford the shooter a reliable means of determining the range to a given target; however, these methods require additional time. (See figure C-1.) With practice and experience, the time to determine the range with these methods is reduced significantly. The various methods of deliberate range determination are:

- Reticle relationship (mil or MOA).
- Recognition method.
- Bracketing method.
- Halving method.

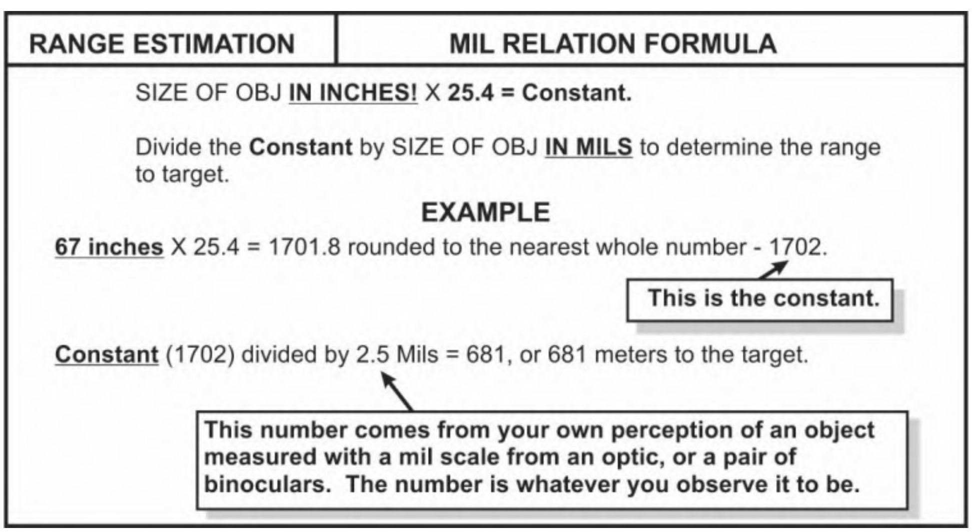
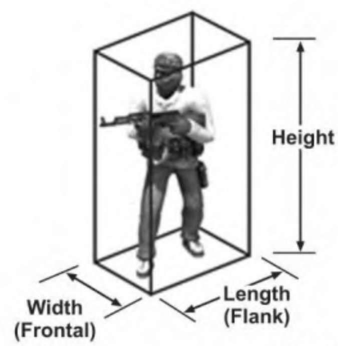


Figure C-1. Mil Relation Formula example

Reticle Relationship Method

C-8. With this method, shooters use their aiming device's reticle to determine the range to target based on standard target information. To use the appearance of objects method based on how they align to an aiming device's reticle, shooters must be familiar with the sizes and details of personnel and equipment at known distances as shown in figure C-2.

NOTE: The height is measured from the ground to the head. The width and length are measured from the shoulders. Do not include any weapon the individual is holding.

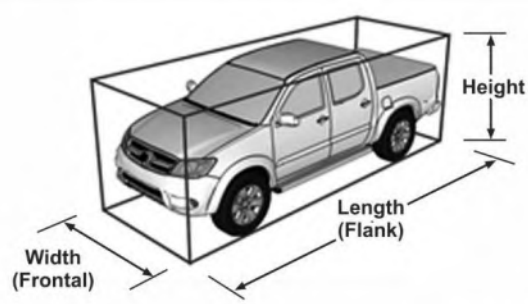


NOT TO SCALE

DISMOUNT	LENGTH		WIDTH		HEIGHT	
	AVERAGE		AVERAGE		AVERAGE	
	12 IN	30 CM	20 IN	50 CM	60 IN	150 CM

The measurements listed above are the average approximate measurements of a dismounted insurgent and should be used as a guideline. in = inch, cm = centimeter

NOTE: The height is measured from the ground to the top of the vehicle. Do not include any weapon systems that might be mounted on the truck that are higher than the cab.



NOT TO SCALE

UNARMORED TRUCK	LENGTH		WIDTH		HEIGHT	
	AVERAGE		AVERAGE		AVERAGE	
	196 IN	500 CM	78 IN	200 CM	60 IN	150 CM

The measurements listed above are the average approximate measurements of most unarmored trucks. in = inch, cm = centimeter

Figure C-2. Standard dismount threat dimensions example

C-9. Knowing the standard dimensions to potential targets allows for the Soldier to assess those dimensions using the aiming device's reticle. The Soldier will apply the mil or MOA relationship as they pertain to the aiming device and the target. Figure C-3 and figure C-4 on page C-5, show various reticle relationship examples.

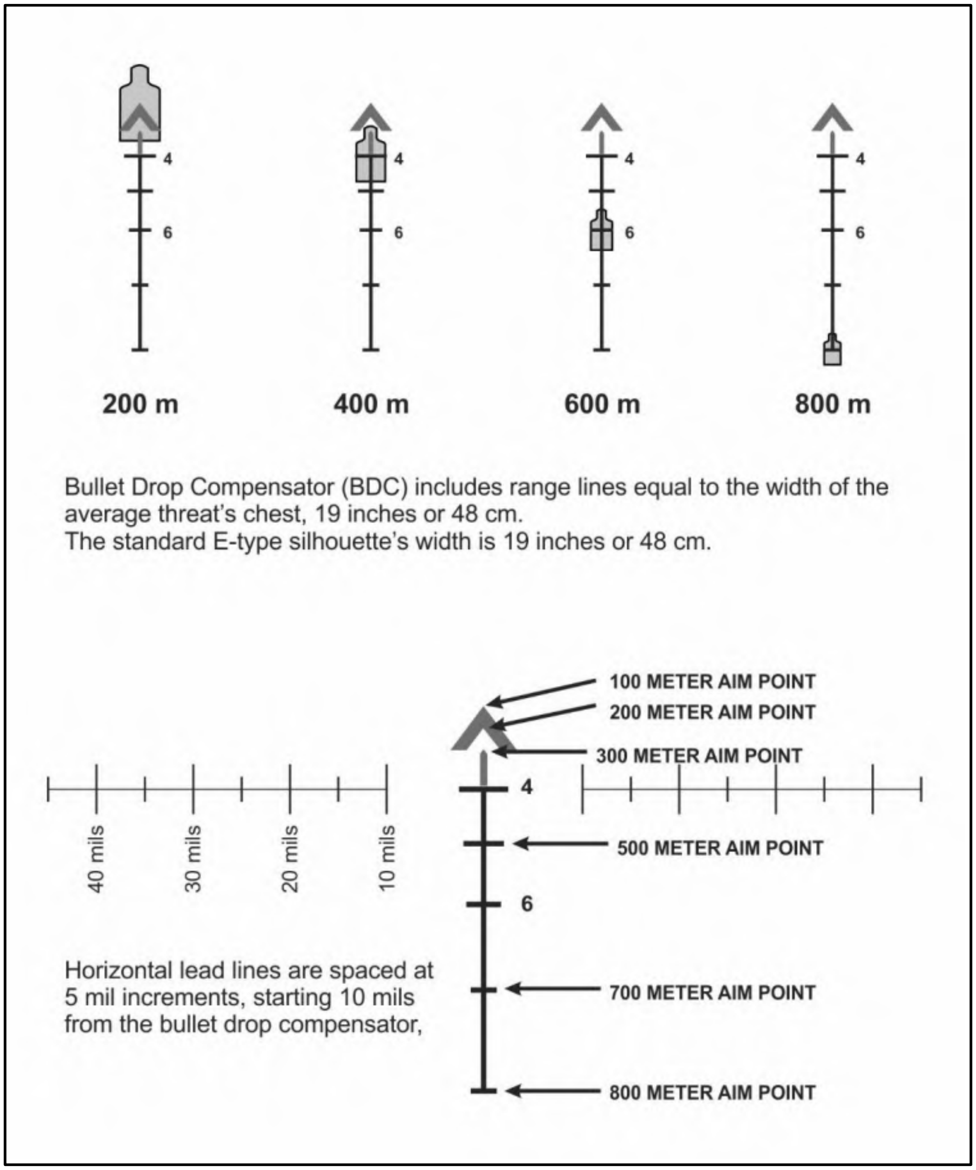


Figure C-3. RCO range determination using the bullet drop compensator reticle

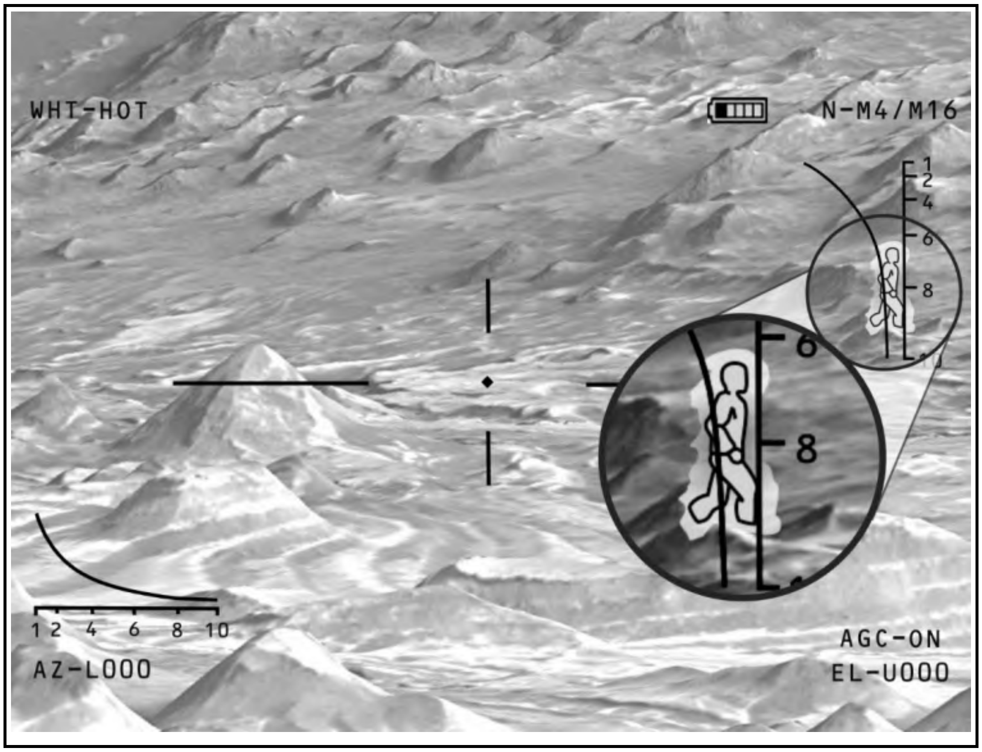


Figure C-4. Reticle relationship using a stadiametric reticle example

C-10. Anything that limits the visibility (such as weather, smoke, or darkness) will also limit the effectiveness of this method. To become proficient in using the appearance of objects method with accuracy, shooters must be familiar with the characteristic details of objects as they appear at various ranges.

MOVING TARGETS

C-11. Moving targets are those threats that appear to have a consistent pace and direction. Targets on any battlefield will not remain stationary for long periods of time, particularly once a firefight begins. Soldiers must have the ability to deliver lethal fires at a variety of moving target types and be comfortable and confident in the engagement techniques. There are two methods for defeating moving targets; tracking and trapping.

Tracking Method

C-12. The tracking method is used for a moving target that is progressing at a steady pace over a well-determined route. If a Soldier uses the tracking method, he tracks the target with the rifle's sight while maintaining sight alignment and a point of aim on or ahead of (leading) the target until the shot is fired.

C-13. When establishing a lead on a moving target, the rifle sights will not be centered on the target and instead will be held on a lead in front of the target. The basic lead formula for moving targets that are generally perpendicular to the shooter (moving across the sector of observation), is—

$$\frac{1}{100}R(7) = L$$

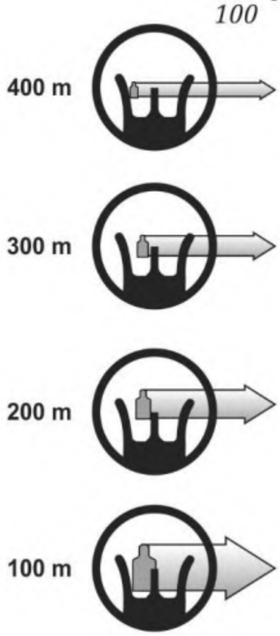
$$or$$

$$\frac{1}{100} Range\ to\ Target\ x\ 7 = Lead\ in\ Inches$$

C-14. This formula is used to determine the baseline lead in the direction of travel of the target when its pace is approximately 3 mph or 4.5 feet per second (fps). Figure°C-5, on page C-7, shows the application of this formula at a notional moving target:

Target moving at a moderate pace (3 mph or 4.5 fps)

$$\frac{1}{100}\ \textit{Range to Target} \times 7 = \textit{Lead in inches}$$



$$\frac{1}{100}\ 400(7) = 28''$$

$$\frac{1}{100}\ 300(7) = 21''$$

$$\frac{1}{100}\ 200(7) = 14''$$

$$\frac{1}{100}\ 100(7) = 7''$$

BASE LEAD

$$\frac{1}{100}\ R(7) = L$$

Range to Target (R)	Lead (L) (inches)
100 m	7"
200 m	14"
300 m	21"
400 m	28"
500 m	35"

Figure C-5. Deliberate lead formula example

C-15. To execute the tracking method, a Soldier performs the following steps:

- Swing the muzzle of the rifle through the target (from the rear of the target to the front) to the desired lead (point of aim). The point of aim may be on the target or some point in front of the target depending upon the target's range, speed, and angle of movement.
- Track and maintain focus on the rifle's sight while acquiring the desired sight picture. It may be necessary to shift the focus between the rifle's sight and the target while acquiring the sight picture, but the focus must be on the rifle's sight when the shot is fired. Engage the target once the sight picture is acquired. While maintaining the proper lead,—
  - Follow-through so the lead is maintained as the bullet exits the muzzle.
  - Continue to track in case a second shot needs to be fired on the target.

Trapping Method

C-16. The trapping method (see figure C-6) is used when it is difficult to track the target with the aiming device, as in the prone or sitting position. The lead required to effectively engage the target determines the engagement point and the appropriate hold-off.

C-17. With the sights settled, the target moves into the predetermined engagement point and creates the desired sight picture. The trigger is pulled simultaneously with the establishment of sight picture. To execute the trapping method, a Soldier performs the following steps:

- Select an aiming point ahead of the target – where to set the trap.
- Obtain sight alignment on the aiming point.
- Hold sight alignment until the target moves into vision and the desired sight picture is established.
- Engage the target once sight picture is acquired.
- Follow-through so the rifle sights are not disturbed as the bullet exits the muzzle.

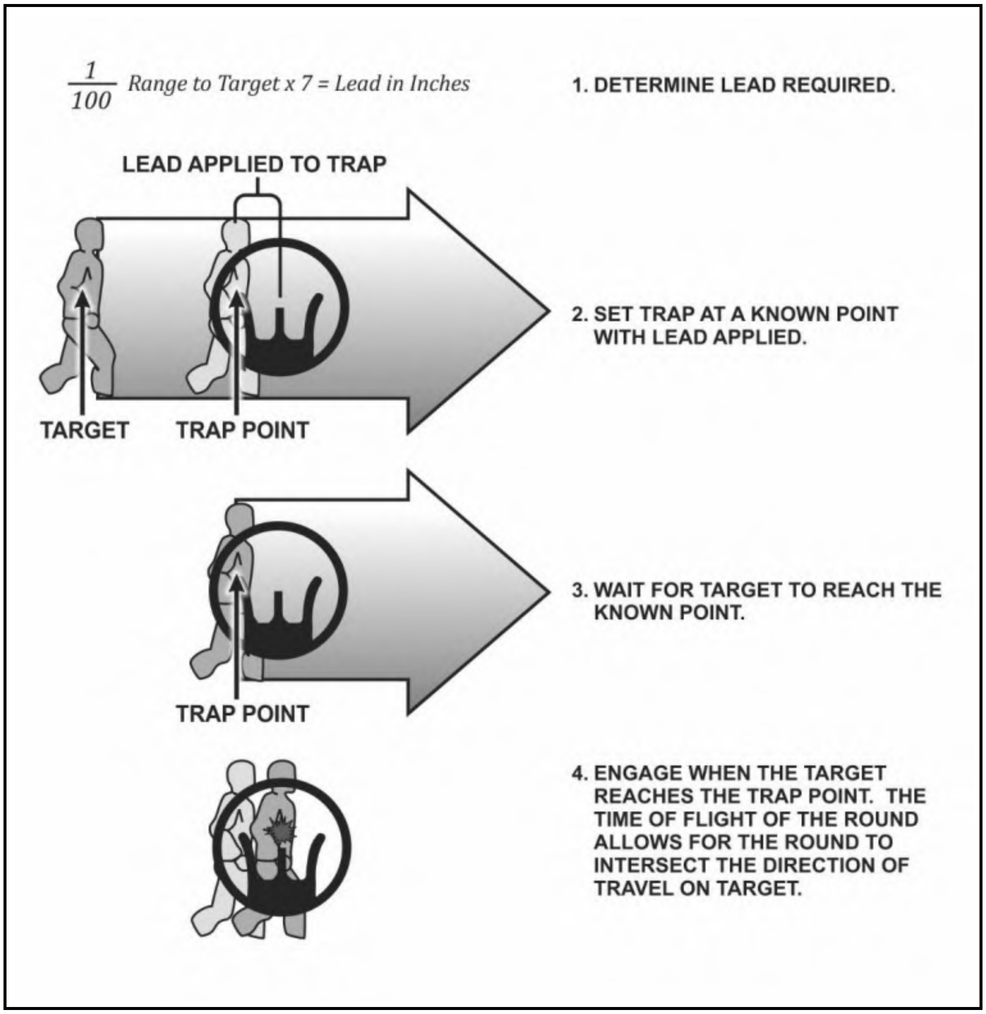


Figure C-6. Deliberate trapping method example

OBLIQUE TARGETS

C-18. Threats that are moving diagonally toward or away from the shooter are oblique targets. They offer a unique problem set to shooters where the target may be moving at a steady pace and direction; however, their oblique posture makes them appear to move slower.

C-19. Soldiers should adjust their hold-off based on the angle of the target's movement from the gun-target line. The following guide (see figure C-7) will help Soldiers determine the appropriate percentage of hold-off to apply to engage the oblique threats as they move.

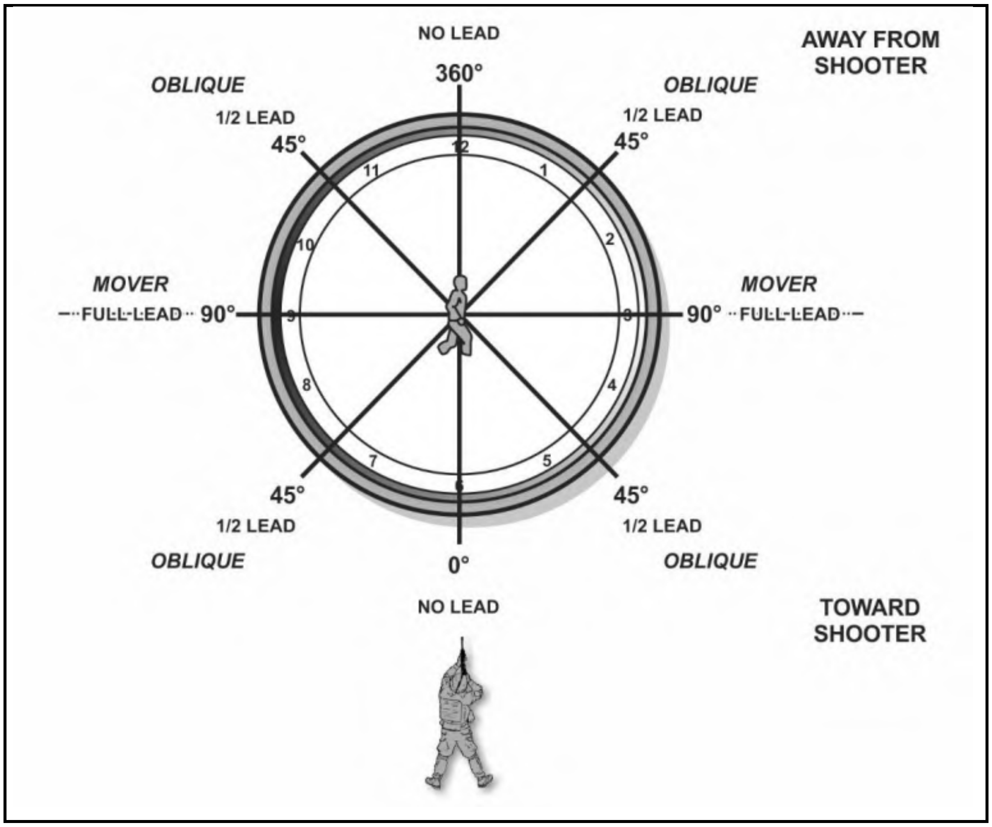


Figure C-7. Oblique target example

ENVIRONMENTAL CONDITIONS

C-20. The environment can complicate the shooter's actions during the shot process with excessive wind or requiring angled firing limited visibility conditions. Soldiers must understand the methods to offset or compensate for these firing occasions, and be prepared to apply these skills to the shot process. This includes when multiple complex conditions compound the ballistic solution during the firing occasion.

WIND

C-21. Wind deflection is the most influential element in exterior ballistics. Wind does not push the projectile causing the actual deflection. The bullet's tip is influenced in the direction of the wind slightly, resulting in a gradual drift of the bullet in the direction of the wind. The effects of wind can be compensated for by the shooter provided they understand how wind effects the projectile and the terminal point of impact. The elements of wind effects are—

- The **time** the projectile is exposed to the wind (range).
- The **direction** from which the wind is blowing.
- The **velocity** of the wind on the projectile during flight.

Wind Direction and Value

C-22. Winds from the left cause an effect on the projectile to drift to the right, and winds from the right cause an effect on the projectile to drift to the left. The amount of the effect depends on the time of (projectile's exposure) the wind speed and direction. To compensate for the wind, the firer must first determine the wind's direction and value. (See figure C-8 on page C-11.)

C-23. The clock system can be used to determine the direction and value of the wind. Picture a clock with the firer oriented downrange towards 12 o'clock.

C-24. Once the direction is determined, the value of the wind is next. The value of the wind is how much effect the wind will have on the projectile. Winds from certain directions have less effect on projectiles. The chart below shows that winds from 2 to 4°o'clock and 8 to 10 o'clock are considered full-value winds and will have the most effect on the projectile. Winds from 1, 5, 7, and 11 o'clock are considered half-value winds and will have roughly half the effect of a full-value wind. Winds from 6 and 12°o'clock are considered no-value winds and little or no effect on the projectile.

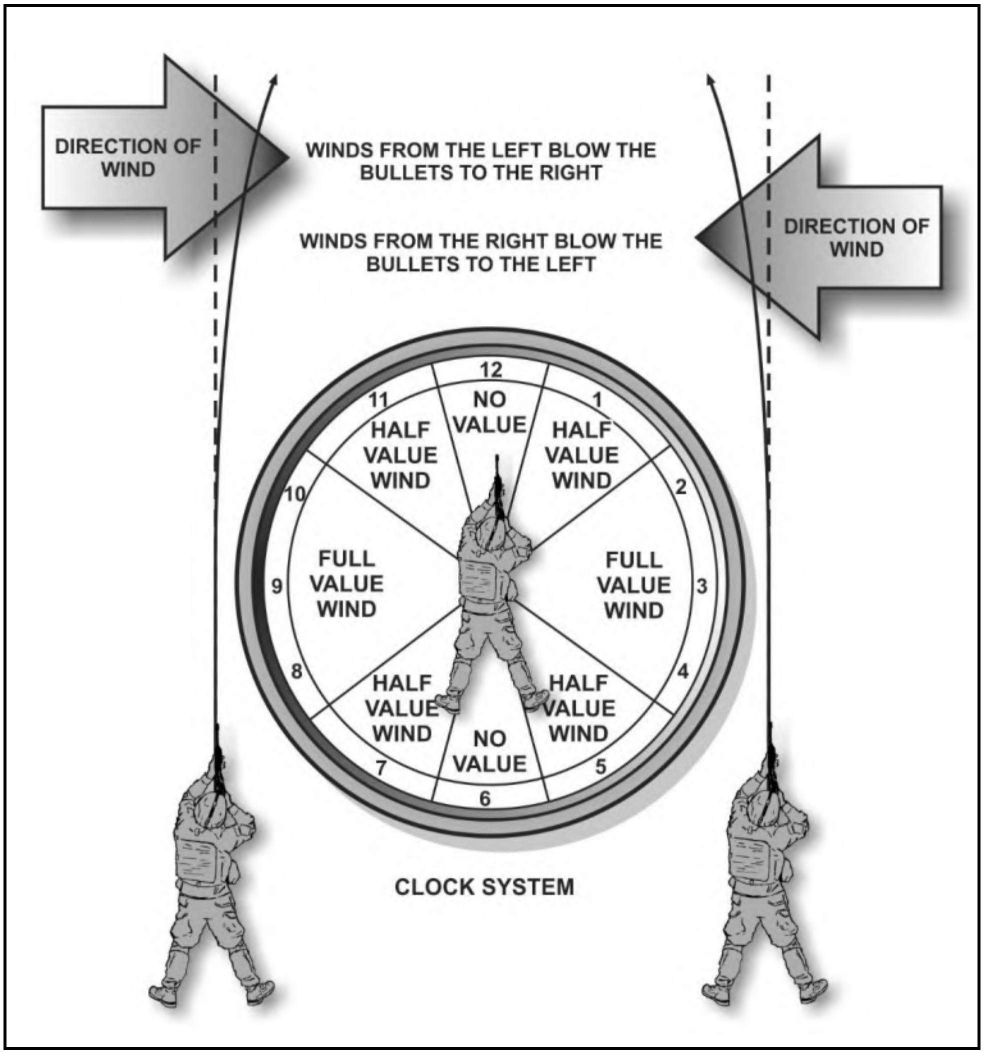


Figure C-8. Wind value

C-25. The wind will push the projectile in the direction the wind is blowing (see figure C-9). The amount of effects on the projectile will depend on the time of exposure, direction of the wind, and speed of the wind. To compensate for wind the Soldier uses a hold in the direction of the wind.

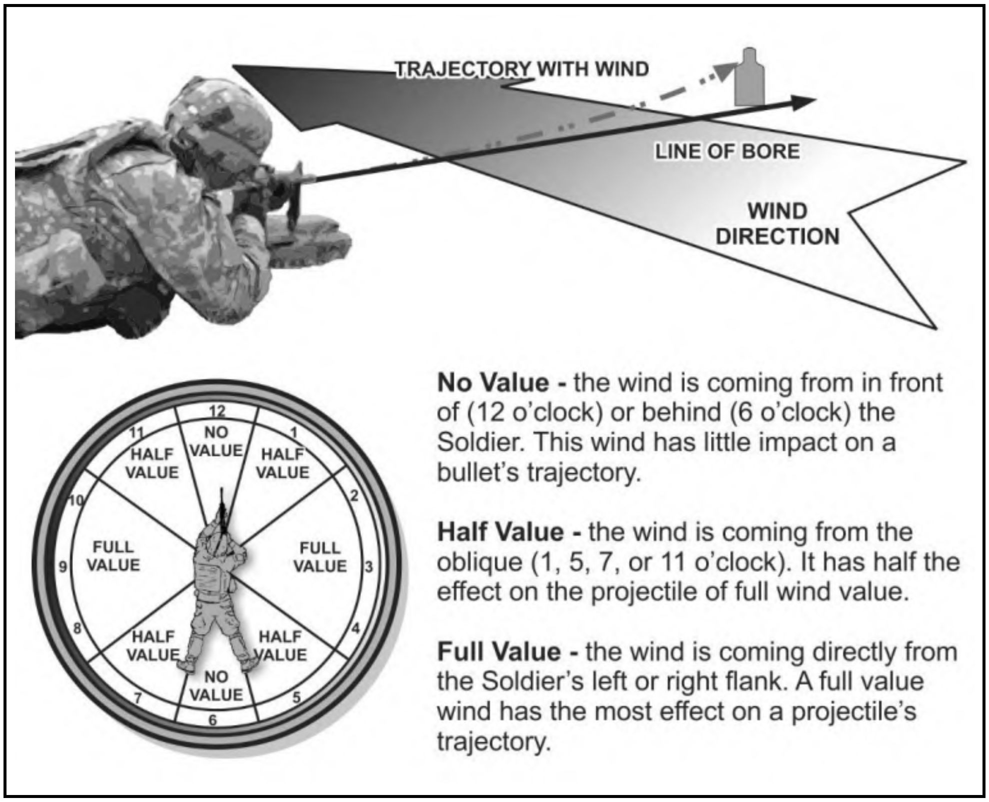


Figure C-9. Wind effects

Wind Speed

C-26. Wind speeds can vary from the firing line to the target. Wind speed can be determined by taking an average of the winds blowing on the range. The firer's focus should be on the winds between the firer and the target. The front 1/3 of the trajectory plays the most significant role in determining the bullet's wind drift deflection, but with increasing range, the firer must consider the wind speed at midpoint and the target area to make the best overall assessment.

C-27. The Soldier can observe the movement of items in the environment downrange to determine the speed. Each environment will have different vegetation that reacts differently.

C-28. Downrange wind indicators include the following:

- 0 to 3 mph = Hardly felt, but smoke drifts.
- 3 to 5 mph = Felt lightly on the face.
- 5 to 8 mph = Keeps leaves in constant movement.
- 8 to 12 mph = Raises dust and loose paper.
- 12 to 15 mph = Causes small trees to sway.

C-29. The wind blowing at the Soldiers location may not be the same as the wind blowing on the way to the target.

Wind Estimation

C-30. Soldiers must be comfortable and confident in their ability to judge the effects of the wind to consistently make accurate and precise shots. Soldiers will use wind indicators between the Soldier and the target that provide windage information to develop the proper compensation or hold-off.

C-31. To estimate the effects of the wind on the shot, Soldiers need to determine three windage factors:

- Velocity (speed).
- Direction.
- Value.

Determining Wind Drift

C-32. Once wind velocity, direction, and value have been determined, Soldiers determine how to compensate for the effects of wind. For the Soldier, there are three methods of determining the appropriate hold-off to adjust for excessive wind; using the wind formula, wind estimation, or referencing a generalized ballistic windage chart.

C-33. Once the range to target and wind speed are known, the formula below is used to determine drift. The output from the formula is in MOA. The final answer is rounded off to make the calculation quicker to perform. This formula (see figure C-10) will allow the Soldier to adjust for the distance that the wind displaces his projectile.

Wind Hold Estimation Formula for 5.56 mm

$$MOA\ of\ Drift = \frac{(\frac{1}{100}R)V}{7} = \frac{\frac{1}{100}Range\ (meters) \times Velocity\ (mph)}{7}$$

$$\frac{(\frac{1}{100}\ 400\ meters) \times 7\ mph}{7} = \frac{4 \times 7}{7} = 4\ MOA = 16''$$

	meters	WIND SPEED (miles per hour {mph})			
		5	10	15	20
RANGE	300	6 inches	13 inches	19 inches	26 inches
	200	3 inches	5 inches	8 inches	11 inches
	100	1 inch	1 inch	2 inches	3 inches

NOTE: This chart represents ballistic information for M855 ammunition.
MOA - minute of angle
mm - millimeter

Figure C-10. Wind formula and ballistics chart example

C-34. The ballistics chart shows the wind drift in inches at ranges from 100 meters – 300 meters and wind speeds up to 20 mph. The data from the 100-m (meter) line shows that even in a 20-mph wind there is very little deflection of the round. At 300 meters, it can be seen that the same 20-mph wind will blow the bullet 26 inches. This illustrates the fact that the bullet is effected more by the wind the further it starts out from the target.

Windage Hold

C-35. Using a hold involves changing the point of aim to compensate for the wind drift. For example, if wind causes the bullet to drift 12 inches to the left, the aiming point must be moved 12 inches to the right. (See figure C-11 on page C-15.)

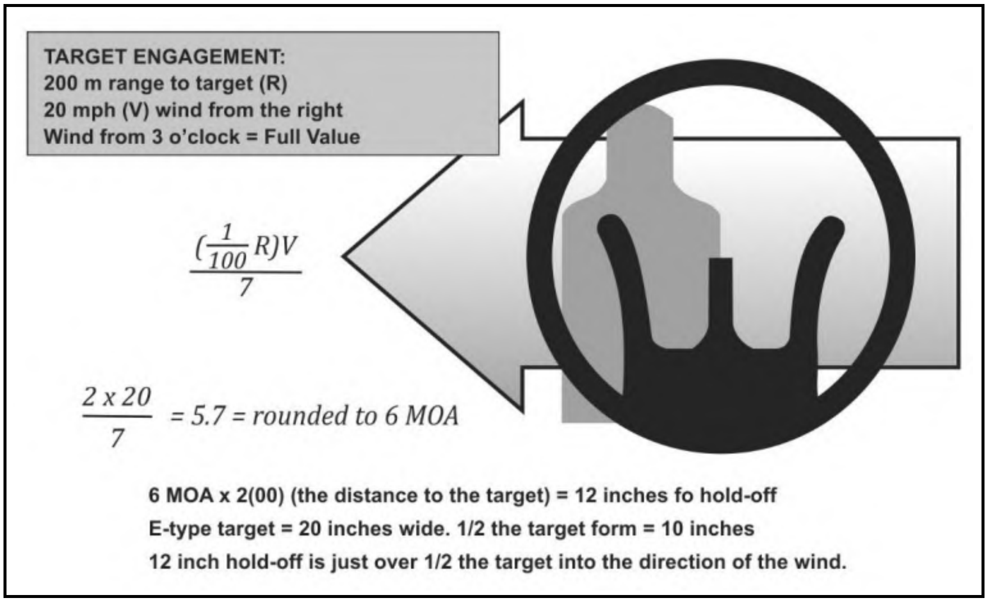


Figure C-11. Hold-off example

> ***Note.*** The aiming point is center mass of the visual target, allowing for the greatest possibility of impacting the target. The hold off is based on the distance ***from*** center mass. Soldiers apply the hold-off creating the new point of aim.

C-36. Firers must adjust their points of aim into the wind to compensate for its effects. If they miss a distant target and wind is blowing from the right, they should aim to the right for the next shot. A guide for the initial adjustment is to split the front sight post on the edge of the target facing the wind.

C-37. Newly assigned Soldiers should aim at the target's center of visible mass for the first shot, and then adjust for wind when they are confident that wind caused the miss. Experienced firers should apply the appropriate hold-off for the first shot, but should follow the basic rule—when in doubt, aim at the center of visible mass.

ANGLED FIRE

C-38. Firing uphill or downhill at angles greater than 30 degrees, the firer must account for the change in the strike of the round from a horizontal trajectory. Rounds fired at excessive angles at extended ranges beyond the weapon's zero distance strike high on the target. To compensate for this, firers can rapidly determine a correct firing solution using the Quick High Angle Formula.

C-39. The first step is to determine the appropriate hold for the range to target beyond zero distance. Table C-1 provides the approximate holds for M855A1, 5.56mm, Ball, Enhanced Performance Round (EPR) at ranges beyond the Army standard 300 meter zero—

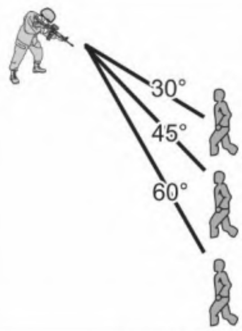
Table C-1. Standard holds beyond zero distance example

Range (meters)	Drop from Point of Aim (inches)	MOA Hold	Mil Hold
400	-11.9	2.6	0.7
500	-31.4	5.5	1.6
600	-59.7	8.7	2.5

C-40. Next, the firer estimates the angle of fire to either 30, 45, or 60 degrees. The firer then applies that information to the Quick High Angle Formula to determine the approximate high angle hold. This formula is built to create a rapid hold adjustment that will get the shot on target.

C-41. Figure C-12 shows the quick high angle formula with an example in both MOA and mils. The example is based on a target at 500 meters, and provides effective solutions for the three angle categories; 30, 45, and 60 degrees.

QUICK HIGH ANGLE FORMULA



DOWN ANGLE	MOA ADJUSTMENT/ 100 METERS	Mil ADJUSTMENT/ 100 METERS
30°	-1/2 MOA	0.15 mils
45°	-1 MOA	0.3 mils
60°	-2 MOA per 100 meters, then add 1 MOA	0.6 mils per 100 meters, then add 0.3 mils

MINUTE OF ANGLE (MOA) EXAMPLE at 500 meters

DEGREES	RANGE HOLD		ANGLE OFFSET (-)		60 DEGREE OFFSET (+)		HIGH ANGLE HOLD
30°	5.5 MOA	-	2.5 MOA	+		=	3 MOA
45°	5.5 MOA	-	5 MOA	+		=	1/2 MOA
60°	5.5 MOA	-	10 MOA	+	1 MOA	=	-3 1/2 MOA

MILS EXAMPLE at 500 meters

DEGREES	RANGE HOLD		ANGLE OFFSET (-)		60 DEGREE OFFSET (+)		HIGH ANGLE HOLD
30°	1.6 mils	-	0.75 mils			=	+0.85 mils
45°	1.6 mils	-	1.5 mils			=	+0.1 mils
60°	1.6 mils	-	3 mils	+	0.3 mils	=	-1.1 mils

60° Rule of Thumb is Range Hold -2 MOA / 0.6 mil + High Angle Hold

Figure C-12. Quick high angle formula example

COMPOUND CONDITIONS

C-42. When combining difficult target firing occasion information, Soldiers can apply the rules specific to the situation together to determine the appropriate amount of hold-off to apply.

C-43. The example below shows the application of different moving target directions with varying speed directions. This is a general example to provide the concept of applying multiple hold-off information to determine complex ballistic solutions for an engagement. (See figure C-13.)

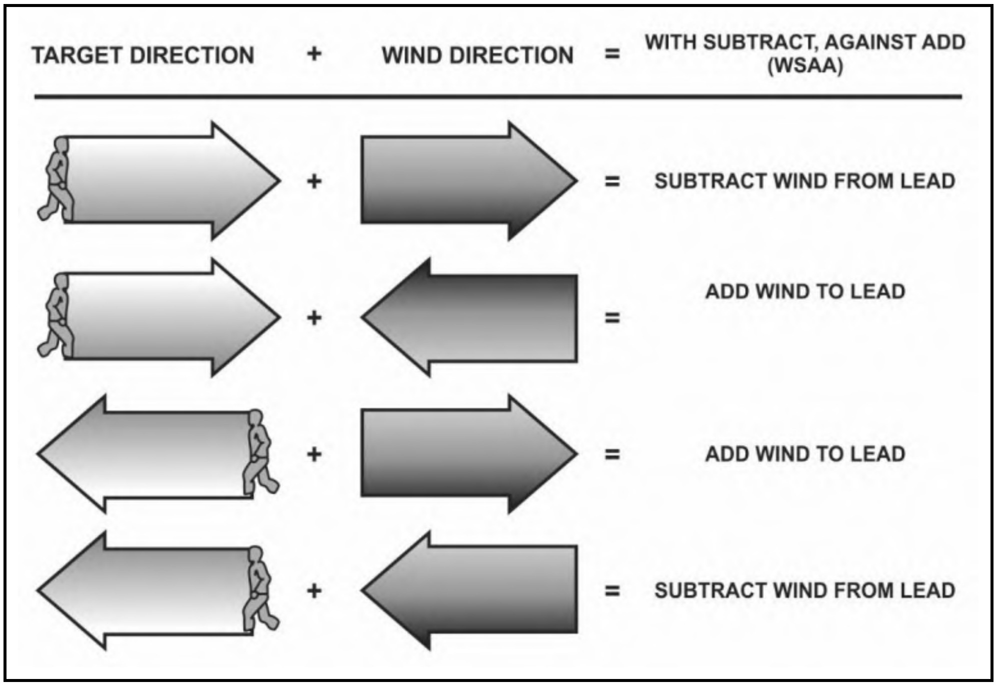


Figure C-13. Compound wind and lead determination example

Appendix D

Drills

This appendix describes the various drills for the rifle and carbine, and their purpose. The drill structure is standardized for all individual and crew served weapons in order to reinforce the most common actions all Soldiers need to routinely execute with their assigned equipment during training and combat.

These drills are used during Table III of the integrated weapons training strategy, as well as during routine maintenance, concurrent training, and during deployments. The drills found within this appendix are used to build and maintain skills needed to achieve proficiency and mastery of the weapon, and are to be ingrained into daily use with the weapon.

D-1. Each drill is designed to develop confidence in the equipment and Soldier actions during training and combat operations. As they are reinforced through repetition, they become second nature to the Soldier, providing smooth, consistent employment during normal and unusual conditions.

D-2. The drills provided are designed to build the Soldier's proficiency with the following principles:

- **Mindset** – the Soldier's ability to perform tasks quickly and effectively under stress.
- **Efficiency** – ensure the drills require the least amount of movement or steps to complete correctly. Make every step count.
- **Individual tactics** – ensure the drills are directly linked to employment in combat.
- **Flexibility** – provide drills that are not rigid in execution. Units may alter the procedural steps depending on their equipment, configuration, or tactical need.

MINDSET

D-3. Continuous combat is inherently stressful. It exhausts Soldiers and causes physiological changes that reduce their ability to perform tasks as quickly or effectively as necessary. The Soldier's ability to function under stress is the key to winning battles, since, without the Soldier, weapons and tactics are useless. Individual and unit military effectiveness depend on the Soldier's ability to think clearly, accurately, quickly, all with initiative, motivation, physical strength, and endurance.

D-4. The impact of physiological changes caused by the stress of combat escalates or de-escalates based on the degree of stimulation, causing Soldiers to attain different levels of awareness as events occur in the continually transitioning operational area around them. Maintaining a tactical mindset involves understanding one's level of awareness and transitioning between the levels of awareness as the situation requires escalation or de-escalation.

Note. Stress can be countered using the principles associated with Soldier resilience and performance enhancement. The Comprehensive Soldier and Family Fitness (CSF2) is designed to increase a Soldier's ability and willingness to perform an assigned task or mission and enhance his performance by assessing and training mental resilience, physical resilience, and performance enhancement techniques and skills. This initiative introduces many resources used to train Soldiers on skills to counter stress. For more information about CSF2, see http://csf2.army.mil/.

EFFICIENCY

D-5. Efficiency is defined as the minimization of time or resources to produce a desired outcome. Efficient movements are naturally faster than movements that contain excessive or wasteful actions.

D-6. By reducing the amount of effort, mental, and/or physical, the movement becomes repeatable and the effect becomes predictable. This allows the Soldier to focus on the tactics while still maintaining the ability to produce accurate and precise fires.

INDIVIDUAL TACTICS

D-7. Individual tactics are actions independent of unit standard operating procedures (SOPs) or situations that maximize the Soldier's chance of survival and victory in a small arms, direct fire battle.

D-8. Examples of individual tactics include use of cover and standoff, or the manipulation of time and space between a Soldier and his enemy.

FLEXIBILITY

D-9. The techniques presented in this publication are not meant to be prescriptive, as multiple techniques can be used to achieve the same goal. In fact, there is no singular "one size fits all" solution to rifle fire; different types of enemies and scenarios require the use of different techniques.

D-10. However, the techniques presented are efficient and proven techniques for conducting various rifle-related tasks. Should other techniques be selected, they should meet the following criteria:

RELIABLE UNDER CONDITIONS OF STRESS

D-11. Techniques should be designed for reliability when it counts; during combat. The technique should produce the intended results without fail, under any conditions and while wearing mission-essential equipment.

D-12. It should also be tested under as high stress conditions as allowed in training.

REPEATABLE UNDER CONDITIONS OF STRESS

D-13. As combat is a stressor, a Soldier's body responds much as it does to any other stressful stimulus; physiological changes begin to occur, igniting a variable scale of controllable and uncontrollable responses based on the degree of stimulation.

D-14. The technique should support or exploit the body's natural reaction to life-threatening stress.

EFFICIENCY IN MOTION

D-15. The technique should be designed to create the greatest degree of efficiency of motion. It should contain only necessary movement. Excessive or unnecessary movement in a fighting technique costs time to execute. In a violent encounter, time can mean the difference between life and death.

D-16. Consider the speed at which violent encounters occur; An unarmed person can cover a distance of 20 feet in approximately 1 second. Efficiency decreases the time necessary to complete a task, which enhances the Soldier's safety.

DEVELOP NATURAL RESPONSES THROUGH REPETITION

D-17. When practiced correctly and in sufficient volume, the technique should build reflexive reactions that a Soldier applies in response to a set of conditions. Only with correct practice will a Soldier create the muscle memory necessary to serve him under conditions of dire stress. The goal is to create automaticity, the ability to perform an action without thinking through the steps associated with the action.

LEVERAGE OVERMATCH CAPABILITIES

D-18. Engagements can occur from 0 to 600 meters and any variance in between. Fast and efficient presentation of the rifle allows more time to stabilize the weapon, refine the aim, and control the shot required to deliver precise fires. This rapidly moves the unit toward the goal of fire superiority and gains/maintains the initiative. Speed should be developed throughout the training cycle and maintained during operations.

D-19. As distance between the Soldier and a threat decreases, so does the time to engage with well-place lethal fires. As distance increase, the Soldier gains time to refine his aim and conduct manipulations.

DRILLS

D-20. To build the skills necessary to master the functional elements of the shot process, certain tasks are integrated into drills. These drills are designed specifically to capture the routine, critical tasks or actions Soldiers must perform fluently and as a second nature to achieve a high level of proficiency.

D-21. Drills focus on the Soldier's ability to apply specific weapons manipulation techniques to engage a threat correctly, overcome malfunctions of the weapon or system, and execute common tasks smoothly and confidently.

DRILL A – WEAPON CHECK

D-22. The weapon check is a visual inspection of the weapon by the Soldier. A weapon check includes at a minimum verifying:

- Weapon is clear.
- Weapon serial number.
- Aiming device(s) serial number.
- Attachment points of all aiming devices, equipment, and accessories.
- Functions check.
- Proper location of all attachments on the adaptive rail system.
- Zero information.
- Serviceability of all magazines.

D-23. The weapon check is initiated when first receiving the weapon from the arms room or storage facility. This includes when recovering the weapon when they are stacked or secured at a grounded location.

D-24. Units may add tasks to Drill A as necessary. Units may direct Soldiers to execute Drill A at any time to support the unit's mission.

DRILL B – SLING/UNSLING OR DRAW/HOLSTER

D-25. This drill exercises the Soldier's ability to change the location of the weapon on demand. It reinforces their ability to maintain situational and muzzle awareness during rapid changes of the weapon's sling posture. If also provides a fitment check between the weapon, the Soldier's load bearing equipment, and the Soldier's ability to move between positions while maintaining effective use of the weapon.

D-26. When conducting this drill, Soldiers should:

- Verify the proper adjustment to the sling.
- Rotate the torso left and right to ensure the sling does not hang up on any equipment.
- Ensure the weapon does not interfere with tactical movement.

DRILL C – EQUIPMENT CHECK

D-27. This drill is a Pre-Combat Check (PCC) that ensures the Soldier's aiming devices, equipment, and accessories are prepared –

- Batteries.
- Secured correctly.
- Equipment does not interfere with tactical movement.
- Basic load of magazines are stowed properly.

DRILL D – LOAD

D-28. This is predominantly an administrative loading function. This allows the Soldier to develop reliable loading techniques.

DRILL E – CARRY (FIVE/THREE)

D-29. This is a series of five specific methods of carrying the weapon by a Soldier. These five methods are closely linked with range operations in the training environment, but are specifically tailored to combat operations. This drill demonstrates the Soldier's proficiency moving between:

- Hang.
- Safe hang.
- Collapsed low ready.
- Low ready.
- High ready (or ready up).

D-30. A leader will announce the appropriate carry term to initiate the drill. Each carry method should be executed in a random order a minimum of three times.

DRILL F – FIGHT DOWN

D-31. The Fight Down drill builds the Soldier's understanding of how to move effectively and efficiently between firing postures. This drill starts at a standing position, and, on command, the Soldier executes the next lower position or the announced position by the leader. The Fight Down drill exercises the following positions in sequence:

- Standing.
- Kneeling.
- Sitting.
- Prone.

D-32. Each position should be executed a minimum of three times. Leaders will use Drill F in conjunction with Drill G.

DRILL G – FIGHT UP

D-33. The Fight Up drill builds the Soldier's timing and speed while moving from various positions during operations. This drill starts in the prone position, and, on command, the Soldier executes the next higher position or the announced position by the leader. The Fight Up drill exercises the following positions in sequence:

- Prone.
- Sitting.

- Kneeling.
- Standing.

D-34. Each position should be executed a minimum of three times. Leaders will use Drill F, Fight Down, in conjunction with Drill G, Fight Up.

D-35. Leaders may increase the tempo of the drill, increasing the speed the Soldier needs to assume the next directed position. After the minimum three iterations are completed (Drill F, Drill G, Drill F, Drill G, etc.), the leader may switch between Drill F and G at any time, at varying tempo.

DRILL H – GO-TO-PRONE

D-36. The Go-To-Prone drill develops the Soldier's agility when rapidly transitioning from a standing or crouched position to a prone firing position. Standard time should be below 2 seconds.

D-37. Leaders announce the starting position for the Soldier to assume. Once the Soldier has correctly executed the start position to standard, the leader will announce GO TO PRONE. This drill should be conducted a minimum of five times stationary and five times while walking.

D-38. Leaders should not provide preparatory commands to the drill, and should direct the Soldier to go to prone when it is unexpected or at irregular intervals. Leaders may choose to include a tactical rush with the execution of Drill H.

DRILL I – RELOAD

D-39. The Tactical Reload drill is executed when the Soldier is wearing complete load bearing equipment. It provides exercises to assure fast reliable reloading through repetition at all firing positions or postures.

D-40. The Soldier should perform Drill I from each of the following positions a minimum of seven times each:

- Standing.
- Squatting.
- Kneeling.
- Prone.

D-41. Leaders may include other drills while directing Drill I to the Soldier to reinforce the training as necessary.

DRILL J – CLEAR MALFUNCTION

D-42. This drill includes the three methods to clear the most common malfunctions on a rifle or carbine in a rapid manner, while maintaining muzzle and situational awareness. Soldiers should perform all three variations of clearing a malfunction based on the commands from their leader.

D-43. Each of the three variations of Drill J should be executed five times. Once complete, leaders should incorporate Drill J with other drills to ensure the Soldier can execute the tasks at all positions fluently.

DRILL K – UNLOAD / SHOW CLEAR

D-44. This is predominantly an administrative unloading function, and allows the Soldier to develop reliable clearing techniques. This drill should be executed in tandem with Drill D, Load. It should be executed a minimum of seven times in order to rotate through the Soldier's magazine pouch capacity, and reinforce the use of a "dump pouch" or pocket, to retain expended magazines during operations.

D-45. This drill can be executed without ammunition in the weapon. Leaders may opt to use dummy ammunition or spent cartridge cases as desired. In garrison environments, Leaders should use Drill K on demand, particularly prior to entering buildings or vehicles to reinforce the Soldier's skills and attention to detail.

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Appendix E

Zeroing

Zeroing a weapon is not a training exercise, nor is it combat skills event. Zeroing is a maintenance procedure that is accomplished to place the weapon in operation, based on the Soldier's skill, capabilities, tactical scenario, aiming device, and ammunition. Its purpose is to achieve the desired relationship between the line of sight and the trajectory of the round at a known distance. The zeroing process ensures the Soldier, weapon, aiming device, and ammunition are performing as expected at a specific range to target with the least amount of induced errors.

For Soldiers to achieve a high level of accuracy and precision, it is critical they zero their aiming device to their weapon correctly. The Soldier must first achieve a consistent grouping of a series of shots, then align the mean point of impact of that grouping to the appropriate point of aim. Soldiers use the process described in this appendix with their weapon and equipment's technical manuals to complete the zeroing task.

BATTLESIGHT ZERO

E-1. The term battlesight zero means the combination of sight settings and trajectory that greatly reduces or eliminates the need for precise range estimation, further eliminating sight adjustment, holdover or hold-under for the most likely engagements. The battlesight zero is the default sight setting for a weapon, ammunition, and aiming device combination.

E-2. An appropriate battlesight zero allows the firer to accurately engage targets out to a set distance without an adjusted aiming point. For aiming devices that are not designed to be adjusted in combat, or do not have a bullet drop compensator, such as the M68, the selection of the appropriate battlesight zero distance is critical.

ZEROING PROCESS

E-3. A specific process should be followed when zeroing. The process is designed to be time-efficient and will produce the most accurate zero possible.

E-4. The zero process includes mechanical zero, laser borelight, 25-m grouping and zeroing, and zero confirmation out to 300 meters.

Note. Although wind and gravity have the greatest effect on the projectile's trajectory, air density and elevation must also be taken into consideration.

LASER BORELIGHT

E-5. The borelight is an eye-safe laser that is used to boresight optics, iron sights, and aiming lasers. The borelight assists the first shot group hitting the 25-m zeroing target when zeroing the weapon. Using the borelight will save range time and require less rounds for the zeroing process. Borelighting is done with a borelight, which is centered in the bore of the weapon, and with an offset target placed 10 meters from the muzzle of the weapon.

25-M GROUPING AND ZEROING

E-6. After successfully boresighting the weapon, the next step is to perform grouping and zeroing exercises. Grouping and zeroing is done at 25 meters on a 25-m zero target or at known distance range.

25-M GROUPING

E-7. The goal of the grouping exercise is for the shooter to fire tight shot groups and consistently place those groups in the same location. Tight, consistently placed shot groups show that the firer is applying proper aiming and smooth trigger control before starting the zeroing process. The firer should not start the zeroing process until they have demonstrated their ability to group well.

25-M ZEROING

E-8. Once the firer has shown their ability to accurately group, they should begin adjusting the aiming device to move the groups to the center of the target. During the zeroing process, the firer should attempt to center their groups as much as possible. Depending on the aiming device used, there may be a zero offset that needs to be used at 25 meters. During the zeroing process it is important that the firer adjusts their groups as close to the offset mark as possible.

ZERO CONFIRMATION OUT TO 300 METERS

E-9. The most important step in the zeroing process is zero confirmation out to 300 meters. Having a 25 m zero does not guarantee a center hit at 300 meters. The only way to rely on a 300-m hit, is to confirm a 300-m zero.

E-10. Confirmation can be done on any range where Soldiers can see the impacts of their rounds. Groups should be fired and aiming devices should be adjusted. At a minimum, the confirmation should be done at 300 meters. If rounds are available, groups can be fired at various ranges to show the firers where their impact will be.

E-11. When confirming zero at ranges past 100 meters, the effects of the wind needs to be considered and acted upon, if necessary. If a zero is confirmed at 300 meters on a windy day, and then the weapon is fired at a later date in different wind conditions or no wind at all, the impact will change. (See figure E-1 on page E-3.)

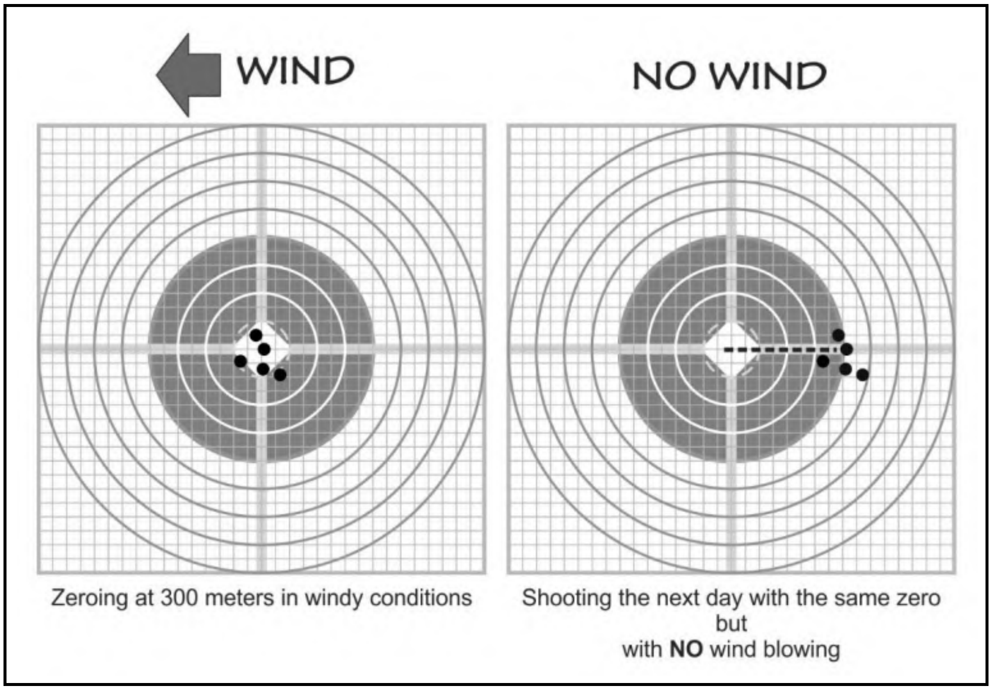


Figure E-1. Wind effects on zero at 300 meters

DOWNRANGE FEEDBACK

E-12. Feedback must be included in all live-fire training. Soldiers must have precise knowledge of a bullet strike; feedback is not adequate when bullets from previous firings cannot be identified. To provide accurate feedback, trainers ensure that Soldiers triangulate and clearly mark previous shot groups on a zeroing target or receive a hard copy from the tower on an automated range.

E-13. After zeroing, downrange feedback should be conducted. If modified field fire or known distance ranges are not available, a series of scaled silhouette targets can be used for training on the 25-m range.

E-14. With the M4- and M16-series of weapons, this range is 25 to 300 meters. This means, that with a properly zeroed rifle, the firer can aim center mass of a target between 25 meters and 300 meters and effectively engage it. A properly trained rifleman should be able to engage targets out to 600 meters in the right circumstances.

Note. A common misconception is that wearing combat gear will cause the zero to change. Adding combat gear to the Soldier's body does not cause the sights or the reticle to move. The straight line between the center of the rear sight aperture and the tip of the front sight post either intersects with the trajectory at the desired point, or it does not. Soldiers should be aware of their own performance, to include a tendency to pull their shots in a certain direction, across various positions, and with or without combat gear. A shift in point of impact in one shooting position may not correspond to a shift in the point of impact from a different shooting position.

E-15. Figure E-2, on page E-5, shows the zeroing target for use for the M16A2/M16A4. Figure E-3, on page E-6, M4-/M16-series weapons.

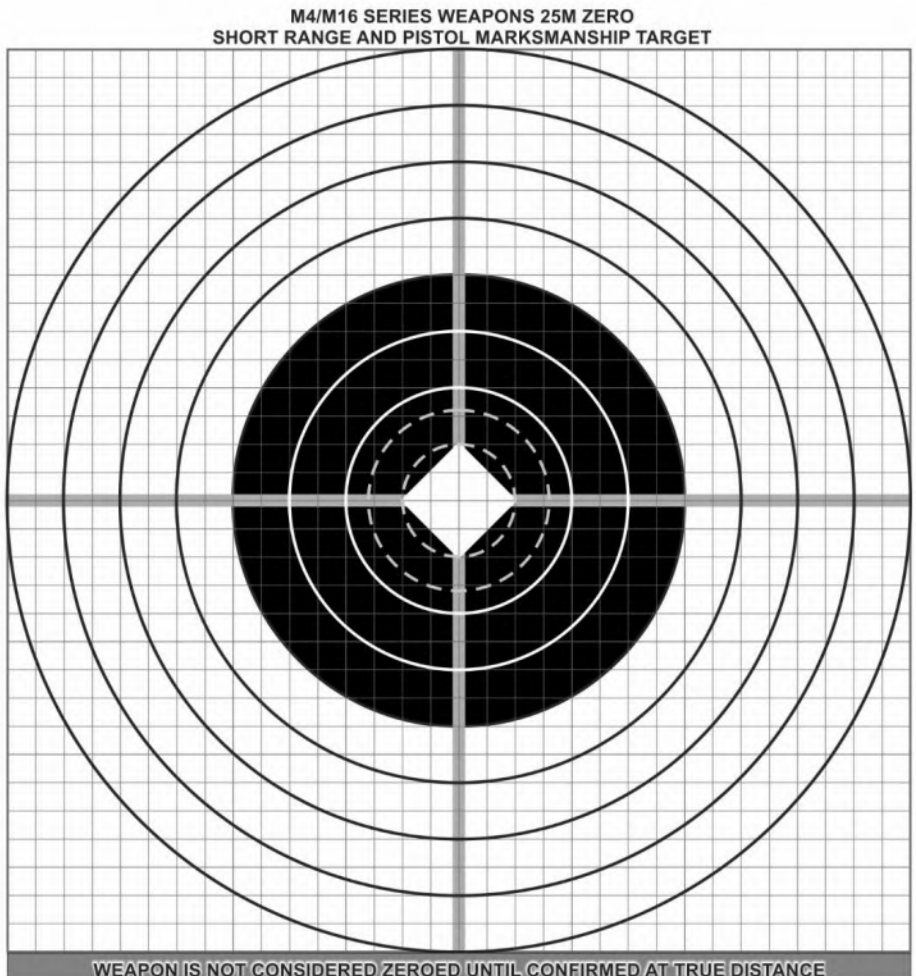
ZERO TARGET DATA FOR M16A2/ M16A4 RIFLE

1- FOR ZEROING AT 25 METERS WITH BACK-UP IRON SIGHTS, PLACE THE ELEVATION KNOB ON THE **200-METER SETTING**. THE POINT OF IMPACT FOR THE ROUNDS WILL BE A 4 X 4 CM SQUARE WITH THE CENTER OF THE SQUARE 2.5 CM DOWN FROM CENTER MASS.

2- FOR ZEROING AT 25 METERS WITH THE CLOSE COMBAT OPTIC, PLACE THE DOT CENTER MASS ON THE TARGET. THE POINT OF IMPACT FOR THE ROUNDS WILL BE A 4 X 4 CM SQUARE WITH THE CENTER OF THE SQUARE 3 CM DOWN FROM CENTER MASS.

3- FOR THE ADVANCED COMBAT OPTICAL GUNSIGHT 25 M ZERO, SOLDIERS SHOULD USE THE **300 -METER** POINT OF AIM (TIP OF 300 METER POST CENTER MASS ON THE TARGET) AND POINT OF IMPACT (A 4 X 4 CM SQUARE DRAWN IN 1.5 CM DOWN). 100 METER TRUE-ZERO IS THE PREFERRED ZEROING TECHNIQUE FOR THE ACOG. WHEN ENGAGING TARGETS AT 200 METERS WITH THE ACOG, USE THE 200 METER AIMING POINT (TIP AT THE INSIDE OF THE CHEVRON) IF TIME ALLOWS.

Figure E-2. M16A2 / M16A4 weapons 25m zero target



EACH BLOCK REPRESENTS 1 MOA AT 25M

SIGHTING SYSTEM	ELEVATION in MOA	WINDAGE in MOA
CCO	0.5	0.5
M150 RCO/TA-01*	0.5	0.5
M4/M4A1 REAR SIGHT (BUIS)	0	0.75
M4/M4A1 FRONT SIGHT	1.75	0
M16A2/A3/A4 REAR SIGHT (BUIS)	0	0.5
M16A2/A3/A4 FRONT SIGHT	1.25	0

* Internal knobs .333 MOA

Figure E-3. M4-/M16-series weapons 25m zero short range and pistol marksmanship target

E-16. A good zero is necessary to be able to engage targets accurately. Whenever the Soldier deploys or does training in a new location, they should confirm the zero on their rifle if possible, as elevation, barometric pressure, and other factors will affect the trajectory of a round. There are multitudes of factors that can affect a zero, and the only sure way to know where the rounds are going, is to fire the rifle to confirm.

E-17. The zero on each assigned rifle WILL NOT transfer to another rifle. For example, if the windage zero on the Soldier's iron sights was three minutes (3MOA) left of center, putting that same setting on another rifle does not make it zeroed. This is due to the manufacturing difference between the weapons.

E-18. It is recommended that Soldiers setup their equipment and dry practice in position with gear on before coming to the range.

E-19. Standard in Training Commission (STRAC) Department of the Army Pamphlet (DA PAM) 350-38 allocates ammunition to conduct zeroing procedures using three-shot groups. The preferred method is to use a five-shot grouping, allowing the firer to more accurately analyze their shot group. Figure E-4 shows similar three-shot and five-shot groups with one shot on the right edge of the group. If all the shots were taken into account in the three-shot group, the firer would probably adjust their zero from the right edge of the four-cm circle. It is possible that the shot on the right was a poor shot and should not be counted in the group. The five-shot group on right is in the same place as the one on the left with the exception of the one shot out to the right. With four out of five shots in a tight group, the wide shot can be discounted and little or no change to the windage is necessary.

E-20. Part of the grouping and zeroing process is the marking and analysis of shot groups.

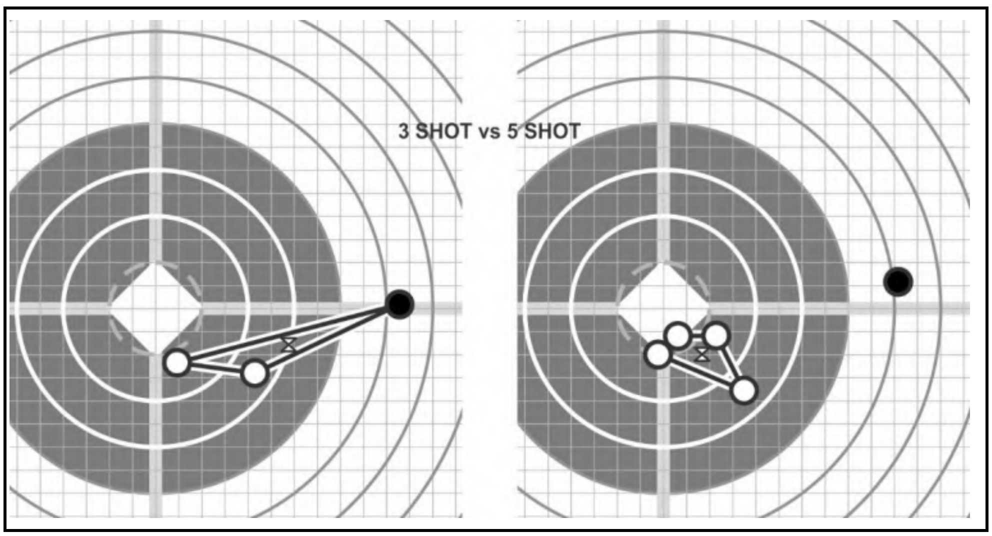


Figure E-4. Grouping

MARKING THE SHOT GROUP

E-21. If possible, shot groups should be marked using different colored markers so the firer can track their progress. Figure E-5 shows a technique for marking shot groups on a zero target. This technique allows the firer and coach to track their progress throughout the grouping and zeroing phase.

E-22. All sight adjustments are from the center of the group, called the ***mean point of impact (MPI)***, and not from the location of a single shot. When using five-shot group, a single shot that is outside of the rest of the group should not be counted in the group for sight adjustment purposes.

Note. This figure depicts the color variations in shades of gray.

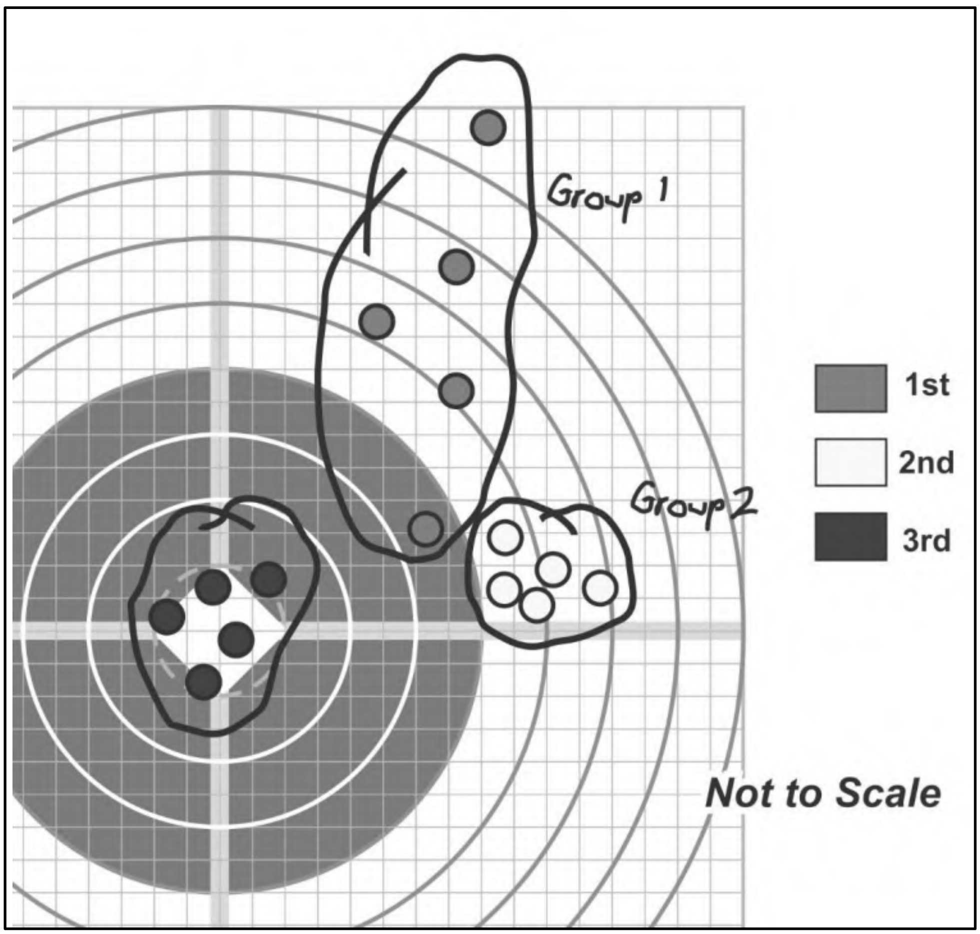


Figure E-5. Marking shot groups

E-23. The firer shoots and marks their first shot group with a colored marker. The color of the first group is noted by placing a line with that marker next to the 1 on the right side of the zero target. Groups are fired and marked until they are consistently in the same location.

E-24. Each sight adjustment is annotated in the same color as the group that was just fired.

COACHING

E-25. Coaching is the process of having another Soldier observe the firer during the firing process to look for shooting errors that the firer themselves may not consciously know they are making.

TYPES OF COACHES

E-26. Firing a rifle properly requires the consistent and proper application of the elements of employment. It is about doing the right thing, the same way, every shot. The small arms trainer is also the validation point for any questions during employment training. In most cases, once group training is completed, it will be the firer's responsibility to realize and correct his own firing errors but this process can be made easier through the use of a coach.

E-27. Two types of coaches exist, the experienced coach and the peer coach. Although each should execute coaching the same way, experienced coaches have a more thorough understanding of employment and should have more knowledge and practice in firing than the Soldiers they are coaching. Knowledge and skill does not necessarily come with rank therefore Soldiers serving as experienced coaches should be carefully selected for their demonstrated firing ability and their ability to convey information to firers of varying experience levels.

EXPERIENCED COACHES

E-28. Experienced coaches are generally in shorter supply throughout the Army and are generally outnumbered by less skilled firers. This lack of experienced coaches usually leads to one experienced coach watching multiple firers dependent upon the table or period of employment being fired. It often helps the experienced coach to make notes of errors they observe in shooters and discuss them after firing that group. It is often difficult for the coach to remember the errors that they observe in each and every firer.

PEER COACHES

E-29. Using a peer coach, although generally not as effective as using an experienced coach, is still a very useful technique. The advantage of using a peer coach is two-fold: a peer coach may use their limited knowledge of employment to observe the firer when an experienced coach is not available or is occupied with another firer and can either talk the firer through the shooting errors that they have observed or bring any observed shooting errors to the attention of the experienced coach. The other advantage of using a peer coach is that the peer coach themselves, through the act of coaching, may be able to observe mistakes made by the firer and learn from them before making the mistakes themselves. Many people grasp instruction more deeply when they are coaching others than when they are simply told to do something.

Note. Peer coaches can be limited by their level of training.

E-30. Except for aiming, the coach can observe most of the important aspects of the elements of employment. To determine the unobservable errors of shooting the coach and the firer must have an open dialog and there must be a relaxed environment for learning. The firer cannot be hesitant to ask questions of the coach and the coach must not become a stressor during firing. The coach must have the ability to safely move around the firer to properly observe. There is no one ideal coaching position. The following section will discuss the elements of shooting and how best to observe them as a coach.

STABILIZE

E-31. For the coach to observe how stable the shooter is, they may have to move to different sides of the shooter. To observe the shooter's non-firing elbow (to ensure it makes contact with the ground), the coach will need to be on the shooter's non-firing side. To observe the cant of the weapon (the sights on the weapon should be pointing towards 12 o'clock position, not 11 or 1 o'clock positions), the coach will need to watch the relationship of the front sight to the barrel from behind the shooter. The coach should look for all the other aspects of good positions as outlined in chapter 6 of this publication. The coach should also observe the total amount of weapon movement on recoil. A good stable position will have minimal movement under recoil.

AIMING

E-32. Determining the aspects of the firer's aiming (sight picture, sight alignment, point of focus) requires dialogue between the firer and the coach. Often, a shooter will not realize his aiming errors until he discovers them on his own. The only method a coach has to observe aiming errors is to use of an M16 sighting device (A2, left and right, DVC-T 7-84), but this device can only be used on rifles with carrying handle sights. Without the use of a sighting device, the coach must rely on drawings, discussions, or the use of an M15A1 aiming card (DVC-T 07-26) to determine where the firer is aiming on the target, his focus point during firing (which should be the front sight), and where his front sight was at the moment of firing in relation to the rear sight aperture and the point of aim on the target. The technique of having the firer call his shots should also be used. This technique involves calling the point on the target where the sights were located at the moment of firing and matching the point called with the impact locations on the target. Calling the shot helps the firer learn to focus on the front sight during the entire firing process.

E-33. When optics are being used, the shooter can tell the coach where he was holding. This is of particular importance with the RCO. Coaches must insure the 300m aim point is used when zeroing at 25-m.

CONTROL

E-34. The ideal position to observe trigger squeeze is from the non-firing side because the coach will have a better view of the speed of pull, finger position on the trigger, and release or pressure on the trigger after firing. The coach can look from behind the shooter to observe the barrel for lateral movement caused by slapping the trigger during firing.

COACHING FACTORS

E-35. All firing happens at the weapon. This means that the coach should be focused solely on the shooter during firing and not on what is happening down range.

E-36. There is no way for a coach to observe only the bullets impact on target and know what errors the firer made. The coach must watch the shooter during firing to determine errors and use the impacts to confirm their assumptions.

E-37. For a coach to properly observe all aspects of firing they must be able to observe the shooter, safely, from both sides and the back. There is no prescribed coaching position.

E-38. Coaching requires a relaxed atmosphere with open communication between the firer and the coach.

SHOT GROUP ANALYSIS

E-39. Shot group analysis involves the firer correlating the shots on paper with the mental image of how the shots looked when fired. An accurate analysis of the shot group cannot be made by merely looking at the holes in the paper. It is more important to observe the firer than to try and analyze the target. All firing takes place at the weapon, and the holes in the paper are only an indicator of where the barrel was pointed when the rifle was fired. When coaches are analyzing groups, they must question the firer about the group to make a determination of what caused the placement of the shots.

E-40. For example, if the firer has a tight group – minus one shot that is well outside of the group, the firer should have observed the outlying shot while firing. The firer would discount this shot when marking their group. (See figure E-6a and figure E-6b.) If a coach is analyzing the group, the firer would tell them that they performed poorly on the one shot that is out of the group.

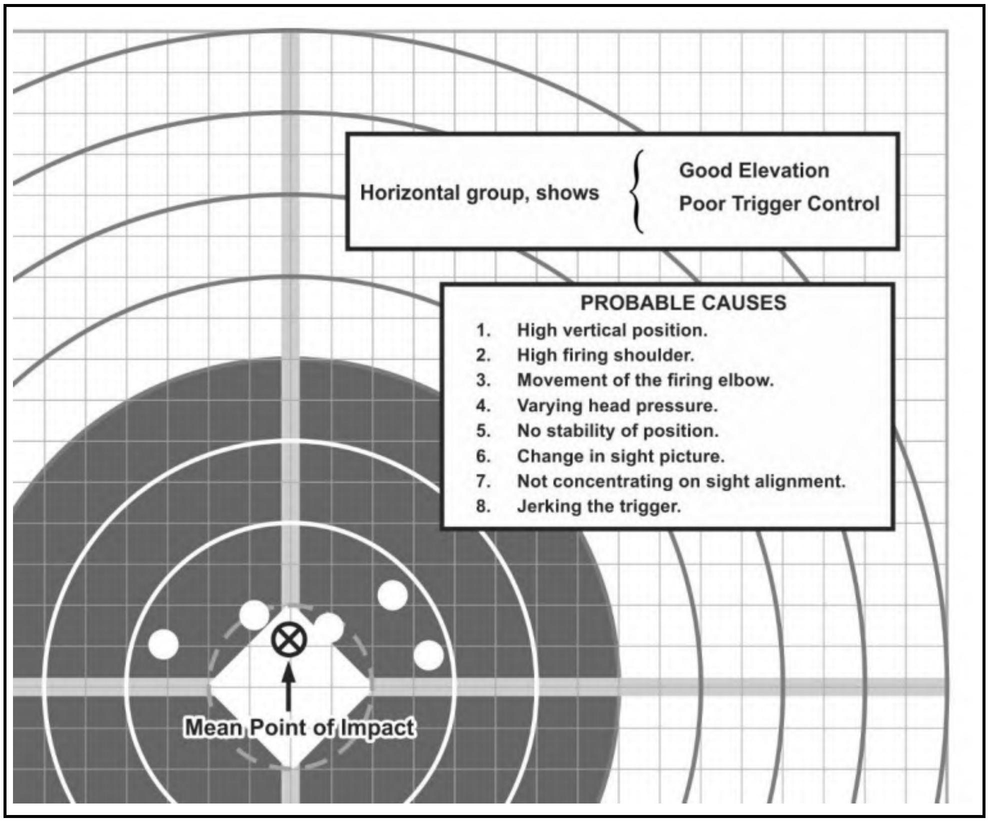


Figure E-6a. Horizontal diagnostic shots

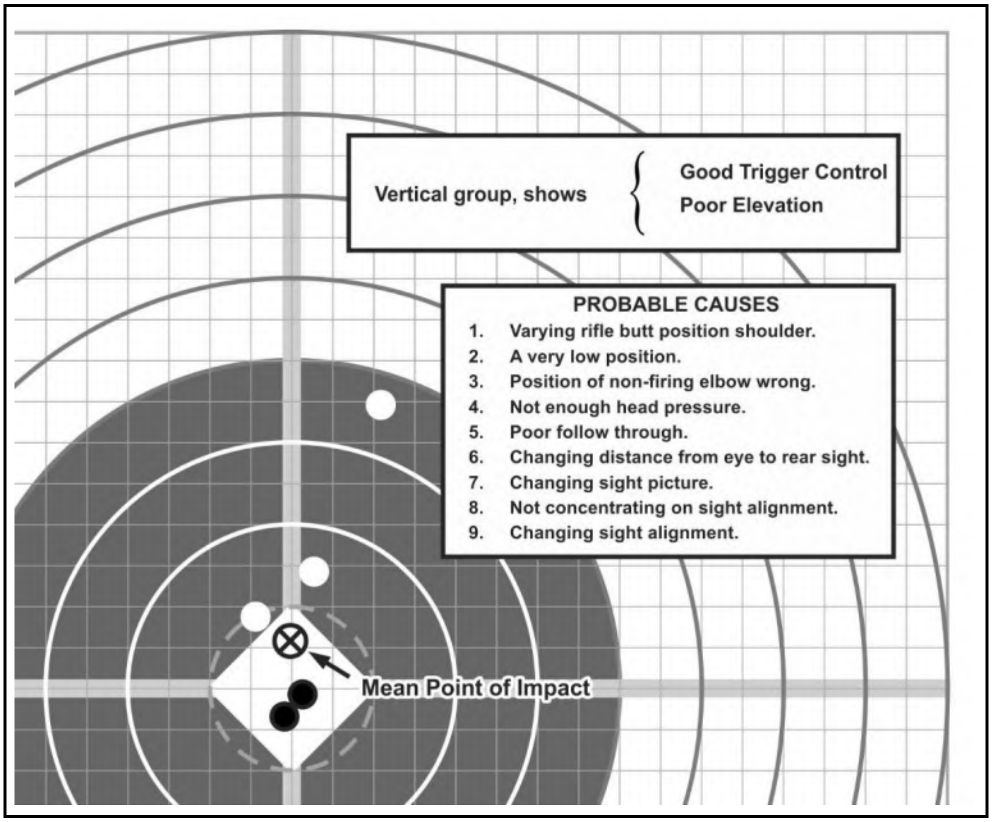


Figure E-6b. Vertical diagnostic shots

E-41. Novice shooters may benefit from not marking their own shot group. When marking a shot group an inexperienced or stressed Soldier may unintentionally make mental corrections. These mental corrections along with the mechanical corrections to their weapon will cause further issues during follow on shot groups. The experienced Soldier is less likely to make adjustments to their sight placement along with the mechanical changes to the weapon, knowing the zero process is aligning the sights to the location of the impact of the rounds. Having a coach or the employment instructor simply inform the Soldier of mechanical changes needed to the aiming device is an effective way to accomplish this method.

E-42. Observing the shooter must be accomplished before analyzing the target can become effective. Bullets strung vertically do not necessarily mean a breathing issue, nor do bullets strung horizontally absolutely indicate a trigger squeeze problem. Coaches must learn to identify shooter errors during firing and use the bullet's impacts on target to confirm their observations. There are often several firing errors that can be the cause of certain misplacements of impacts. The coach has to realize that bullets only go where the barrel is pointed, so he has to determine what happened that caused the barrel to be pointed in those directions, and those causes can be many.

E-43. They key to proper coaching is becoming a shooting DETECTIVE. The coach needs to observe the shooter, question the shooter, look at the evidence down range, question the shooter again, make assumptions based upon the evidence available, and then act upon his assumptions. The coach and shooter must have a free and open dialog with each other in a relaxed atmosphere. Remember if a Soldier learns to shoot poorly they will only be capable of shooting poorly.

Displacement of Shots Within a Group (Flyers)

E-44. The capability of the weapon to shoot groups varies dependent on the number of rounds fired through the barrel over its lifetime. The average expected group size is 1 inch (approximately 2.5 centimeters) at 25 meters; some guns may shoot slightly larger than this. If a shooter is firing groups larger than a normal group size the next step should be to have a known skilled shooter attempt to fire and group with the shooter's weapon. If a proven skilled shooter is able to fire groups of the normal size it is most likely an issue with the original shooter. If however the skilled shooter cannot fire within the accepted group size there may be something wrong with the gun or barrel.

E-45. When looking at groups where there are one to two shots away from the group body (one shot away for a three round group, one or two shots away for a five round group), the coach must look objectively at the overall consistency of group placement. A bad shot or group might not indicate a poor grasp of the elements; every shooter will have a bad shot now and again, and some shooters may even have a bad group now and again. Coaches need to use their experience and determine whether or not the firer had a bad shot, a bad group, or doesn't have a clear grasp of the elements and take the necessary steps to get the shooter to the end-state. The coach may have the firer shoot again and ignore the bad group or bad shot, instead hoping that the new group matches up with the previous shot groups or the coach may need to pull the shooter off the line and cover the basic elements. Contrary to popular belief, having a firer shoot over and over again in one sitting, until the firer GETS IT RIGHT is not a highly effective technique.

Bullets Dispersed Laterally on Target

E-46. Bullets displaced in this manner could be caused by a lateral movement of the barrel due to an unnatural placement of the trigger finger on the trigger. Reasons for this could include—

- The shooter may be slightly misaligning the sights to the left and right.
- The shooter may have the sights aligned properly but may have trouble keeping the target itself perfectly centered on the tip of the front sight.
- Shooter may be closing eyes at the moment of firing or flinching.

Bullets Dispersed Vertically on Target

E-47. Bullets displaced in a vertical manner could be caused by the following:

- Shooter may be misaligning the front sight in the rear sight aperture vertically. May be caused by the shooter watching the target instead of the front sight. Happens more frequently from less stable positions (kneeling, unsupported positions) due to the natural movement of the weapon.
- Shooter may have trouble seeing the target and keeping the tip of the front sight exactly centered vertically on the target. Coach may consider using a larger target or a non-standard aiming point such as a 5-inch circle. Many shooters find it easier to find the center of a circle than a man shaped target.
- Shooter may not have good support, which causes him to readjust their position every shot and settle with the sights slightly misaligned.
- Shooter may be flinching or closing eyes at the moment of firing.
- Shooter may be breathing while firing the rifle. (This is not normally the case, most shooters instinctively hold their breath just before the moment of firing).

Large Groups

E-48. Large groups are most commonly caused by the shooter looking at the target instead of the front sight. This causes the shooter to place the front sight in the center of the target without regard for its location in the rear sight aperture. A small misalignment of the sights will result in a large misplacement of shots downrange.

E-49. Most likely it is not a point of aim issue; most shooters will not fire when their properly aligned sights are pointed all over the target.

Good Groups That Change Position on the Target

E-50. When the shooter has good groups but they are located at different positions on the target, there can be a number of reasons. These include the following:

- May be caused by the shooter properly aligning sights during shooting but picking up a different point of aim on the target each time.
- May be caused by the shooter settling into a position with the front sight on target but the sights misaligned. The shooter maintains the incorrect sight picture throughout the group but aligns the sights incorrectly and in a different manner during the next group. Tell the firer to focus on the front sight and have them check natural point of aim before each group.

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Appendix F

10-Meter Boresight Offsets and 25-Meter Zero Offsets

This appendix provides the 10-meter target offsets and the 25-meter zero offsets for M16- and M4-series weapons mounted with iron sights, optics, MILES, TWSs, or aiming lasers.

"The general purpose of the 10 meter borelight offset targets and the 25m live-fire zero offset targets is to ensure the firer has properly borelighted their rifle."

Note. The borelight is a visible laser. The purpose of boresighting is to obtain an initial setting on the firer's sights, optics, and/or night equipment (aiming lights and TWS) to enable the firer to hit the 25m zero live-fire target when starting the zero process, resulting in efficient use of range time. Borelighting is conducted prior to live-fire zeroing. It is not a substitute for live-fire zeroing.

F-1. The boresight target shows the desired relationship between the bore of the weapon and the firer's aiming point, which varies with the weapon/sight system combination. Different symbols are used for designating different sights/optics, and so forth. All borelighting is done at 10 meters. This is a dry-fire exercise. Sight settings based on borelight procedures must be verified with live-fire zero at 25 meters.

F-2. A blank, reproducible 10-meter target offset (figure F-2 on page F-3) and an example of each weapon configuration (figure F-3 on page F-4, figure F-4 on page F-9, and figure F-5 on page F-10) are provided. The M16A2 300-meter zeroing target is used for 25-meter zeroing with all weapon configurations, except when zeroing with iron sights.

MARKING 10-METER TARGET OFFSETS

F-3. To mark the proper 10-meter target offsets—

- Find the correct template for the weapon configuration.
- Starting from the center of the borelight circle on the offset, count the number of squares to the desired point of aim.

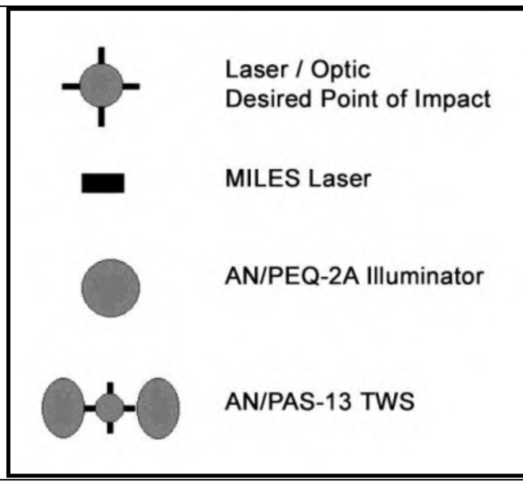
EXAMPLE

L2.0, U2.4

Starting from the center of the borelight circle (0.0, 0.0), move left 2 squares and up 2.4 squares.

Note. Each template also provides a number formula for the proper offset.

- Place the appropriate symbol or mark. (See figure F-1.)



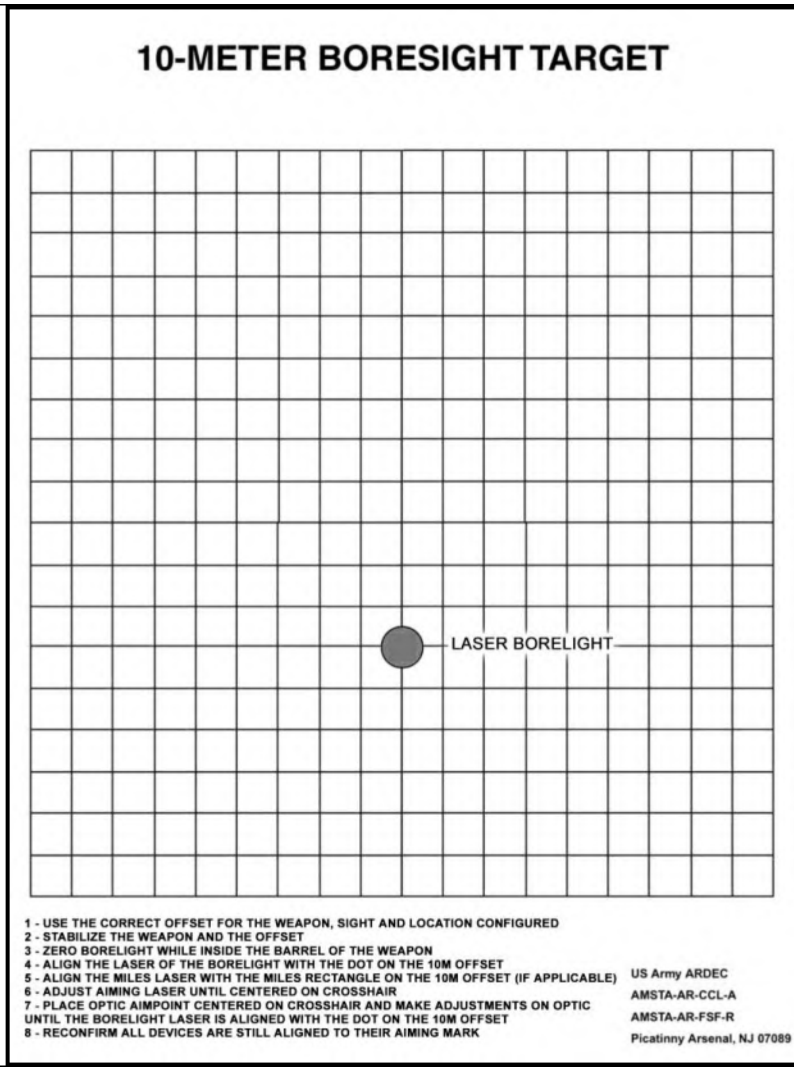
Legend: MILES = Multiple-Integrated Laser Engagement System, TWS = thermal weapon sight

Figure F-1. 10-meter target offset symbols

Notes.

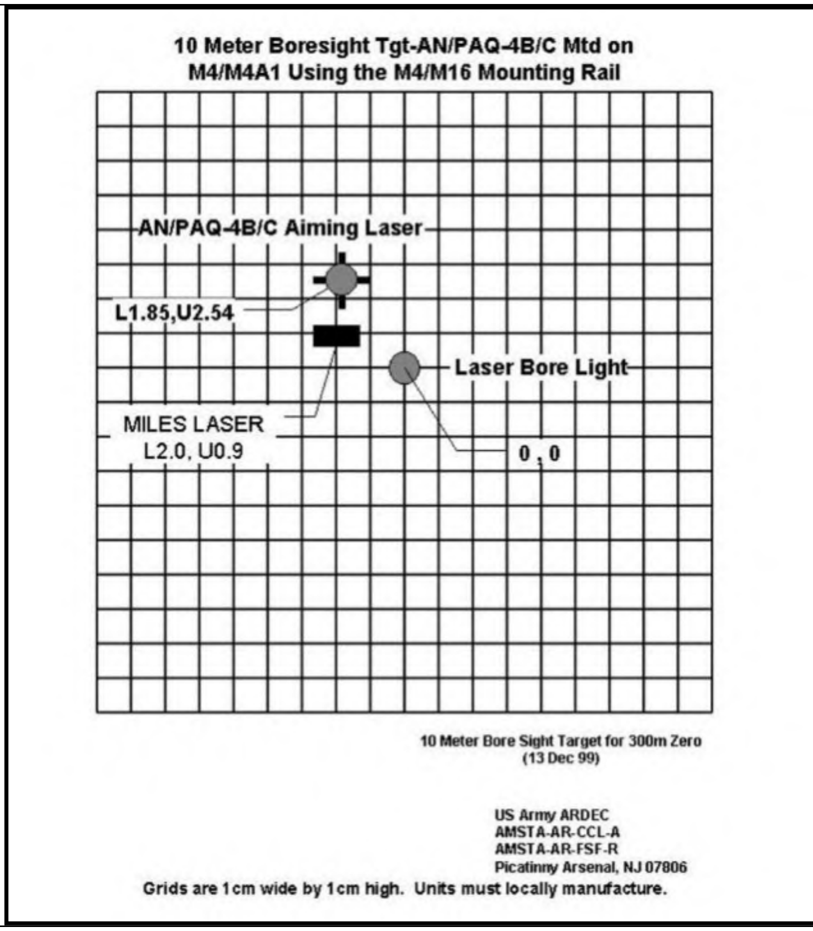
1. To reproduce the 10-meter target offset, obtain a copy of the blank 10-meter target offset and place the example of the weapon being used on the back. This reproducible copy can be laminated and used repeatedly.

2. Table F-1 on page F-5 provides offset mounting information for various weapon configurations.



Legend: ARDEC = Armament Research, Development and Engineering Center, M = meter

Figure F-2. Blank 10-meter target offset



Legend: L= left, MILES = Multiple-Integrated Laser Engagement System, Mtd = mounted, ARDEC = Armament Research, Development and Engineering Center, Tgt = target, U = up

Figure F-3. M16A2 10-meter boresighting target

Table F-1. Offset mounting

WEAPON	ACCES-SORY	RAIL GRAB-BER	MOUNT	LOCA-TION	RANGE TO ZERO	ZERO OFFSET	BORE-SIGHT TARGET	MILES OFF-SET
M16A2	Iron sight	N/A	N/A	N/A	300 m	0.0 0.0	0.0 4.2U	2.0L 0.9U
M16A2	M68	N/A	M68 goose-neck bracket	Carrying handle	300 m	0.0 1.4 cm DN	0.0 5.2U	2.0L 2.4U
M16A2	LTWS	TWS	TWS bracket assem-bly	Carrying handle	300 m	0.0 10D	0.0 13.4U	2.0L 2.4U
M16A2	TWS	N/A	TWS bracket assem-bly	Carrying handle	300 m	0.0 8.1D	0.0 11.5U	2.0L 2.4U
M16A2	AN/PAQ-4B/C	N/A	M4/M16 bracket	Hand guards	300 m	1.5R 0.5U	1.85L 2.54U	2.0L 0.9U
M16A2	AN/PEQ-2A/B	N/A	M4/M16 bracket	Hand guards	300 m	1.5L 0.5U	1.8R 2.4U	2.0L 0.9U
M16/M203	AN/PAQ-4B/C	N/A	Spacer	Carrying handle	300 m	1.85R 2.6D	1.85L 8.6U	2.0L 3.9U
M4/M4A1	BUIS	N/A	N/A	Upper receiver	300 m	0.0 0.0	0.0 4.01U	2.0L 0.9U
M4/M4A1	AN/PAQ-4B/C	N/A	M4/M16 bracket	Hand guards	300 m	1.5R 2.5U	1.85L 2.54U	2.0L 0.9U
M4/M4A1	LTWS	TWS	N/A	Upper receiver	300 m	0.0 4.5D	0.0 7.9U	TBD
M4/M4A1	TWS	Picatinny	TWS spacer and rail grabber	Upper receiver	300 m	0.0 5.7D	0.0 9.4U	2.0L 2.4U
M4/M4A1	AN/PEQ-2A/B	N/A	M4/M16 bracket	Hand guards	300 m	1.0L 0.3U	1.8R 2.4U	2.0L 0.9U
M4/M4A1	M68	M68	Half-moon spacer	Upper receiver	300 m	0.0 1.4 cm DN	0.0 5.63U	2.0L 2.4U
M4/M203	BUIS	N/A	N/A	Upper receiver	300 m	0.0 0.0	0.0 6.01U	2.0L 0.9U
M4/M203	AN/PAQ-4B/C	N/A	Spacer	Carrying handle	300 m	1.3R 1.9D	1.85L 8.6U	2.0L 0.9U

Note. Target offsets not yet developed are indicated by TBD.

Legend: BUIS = back up iron sight, cm = centimeters, D or DN = down, L = left, LTWS = light thermal weapon sight, m = meter, R = right, N/A = not applicable, TBD -= to be developed, TWS = thermal weapon sight, U = up

Table F-1. Offset mounting (continued)

WEAPON	ACCES-SORY	RAIL GRAB-BER	MOUNT	LOCA-TION	RANGE TO ZERO	ZERO OFFSET	BORE-SIGHT TARGET	MILES OFFSET
M4 MWS	BUIS	N/A	N/A	Upper receiver	300 m	0.0 0.0	0.0 4.01U	2.0L 0.9U
M4 MWS	M68	M68	Rail grabber	Upper receiver	300 m	0.0 1.4 cm DN	0.0 5.63U	2.0L 2.4U
M4 MWS	LTWS	TWS	N/A	Upper receiver	300 m	0.0 4.5D	0.0 7.9U	2.0L 2.4U
M4 MWS	TWS	TWS	Spacer	Upper receiver	300 m	0.0 5.7D	0.0 9.4U	2.0L 2.4U
M4 MWS	ANPEQ -2A	Insight	N/A	Left	300 m	TBD	4.5L 1.0D	2.0L 0.9U
M4 MWS	AN/PEQ -2A/B	Insight	N/A	Right	300 m	N/A	5.5R 5.4D	2.0L 0.9U
M4 MWS	AN/PEQ -2A/B	Insight	N/A	Top	300 m	1.5L 0.5D	2.9R 2.3U	2.0L 0.9U
M4 MWS	AN/PEQ -2A/B	Picatinny	Spacer	Top	300 m	N/A	1.95R 4.1U	2.0L 0.9U
M4 MWS	AN/PEQ -2A/B	Picatinny	Spacer	Right	300 m	N/A	6.35R 4.4D	2.0L 0.9U
M4 MWS	AN/PEQ -2A/B	Picatinny	Spacer	Left	300 m	6.9R 2.0U	6.2L 0.60D	2.0L 0.9U
M4MWS	AN/PEQ -2A/B	Insight	Training adapter	Top	300 m	2.0L 1.5D	N/A	2.0L 0.9U
M4 MWS	AN/PAQ -4B/C	Picatinny	AN/PA Q-4B/C bracket adapter	Top	300 m	4.9R 6.1U	1.75L 3.9U	2.0L 0.9U
M4 MWS	AN/PAQ -4B/C	Picatinny	AN/PA Q-4B/C bracket adapter (spacer)	Right	300 m	N/A	6.9R 0.9D	2.0L 0.9U
M4 MWS	AN/PAQ -4B/C	Insight	N/A	Top	300 m	N/A	1.75L 2.15U	2.0L 0.9U
M4MWS	AN/PAQ -4B/C	Insight	N/A	Right	300 m	N/A	4.35R 0.65D	2.0L 0.9U
M4MWS	AN/PAQ -4B/C	Insight	N/A	Left	300 m	N/A	4.30L 4.25D	2.0L 0.9U

Legend: BUIS = back up iron sight, cm = centimeters, D or DN = down, L = left, LTWS = light thermal weapon sight , m = meter, MWS = modular weapon system, R = right, N/A = not applicable, TBD = to be developed, TWS = thermal weapon sight, U = up

Table F-1. Offset mounting (continued)

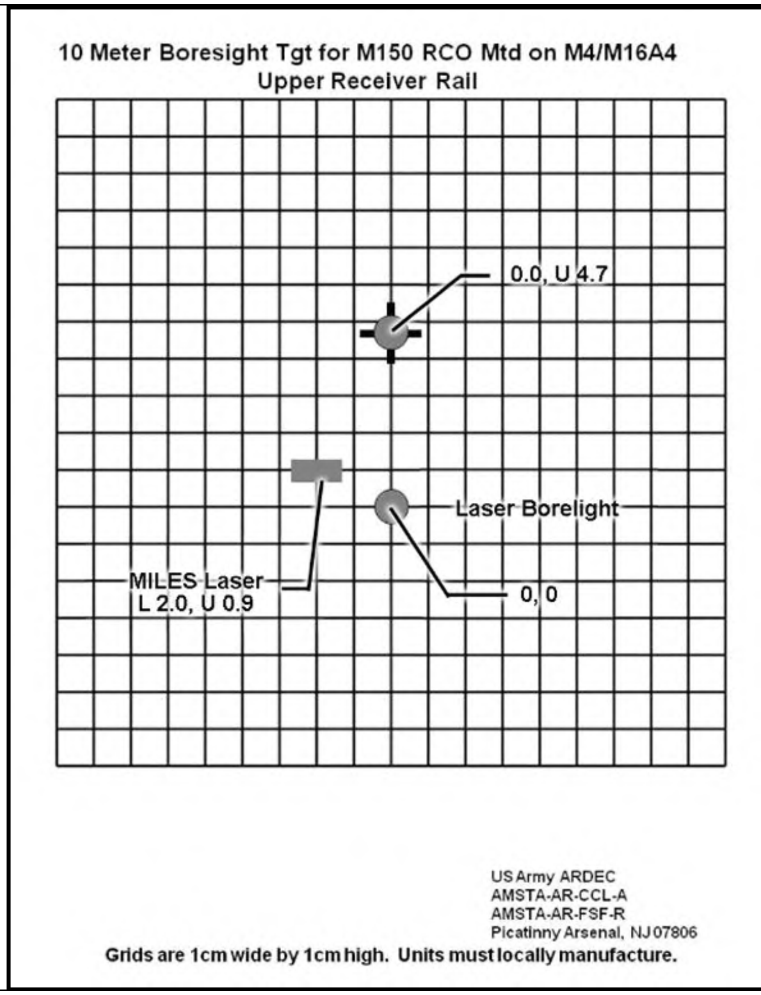
WEAPON	ACCES-SORY	RAIL GRAB-BER	MOUNT	LOCA-TION	RANGE TO ZERO	ZERO OFFSET	BORE-SIGHT TARGET	MILES OFFSET
M4 MWS M203	BUIS	N/A	N/A	Upper receiver	300 m	0.0 0.0	0.0 6.01U	2.0L 0.9U
M4 MWS M203	AN/PAQ -4B/C	Picatinny	Bracket adapter (spacer)	Left	300 m	4.9R 6.1U	6.0L 4.0D	2.0L 3.9U
M16A4 MWS	BUIS	N/A	N/A	Upper receiver	300 m	0.0 0.0	0.0 4.01U	2.0L 0.9U
M16A4 MWS	AN/PAQ -4B/C	Picatinny	AN/PAQ-4B/C bracket adapter (spacer)	Left	300 m	6.5R 8.1U	6.03L 4.25D	2.0L 0.9U
M16A4 MWS	TWS	TWS	Spacer	Upper receiver	300 m	0.0 6.0D	0.0 9.4U	2.0L 2.4U
M16A4 MWS	M68	M68	N/A	Upper receiver	300 m	0.0 1.4 cm DN	0.0 5.63U	2.0L 2.4U
M16A4 MWS	AN/PEQ -2A/B	Insight	N/A	Left	300 m	3.0R 3.0U	4.5L 1.0D	2.0L 0.9U
M16A4 MWS M203	BUIS	N/A	N/A	Upper receiver	300 m	0.0 0.0	0.0 6.01U	2.0L 0.9U
M16A4 MWS M203	AN/PAQ -4B/C	Picatinny	AN/PAQ-4B/C bracket adapter (spacer)	Left	300 m	6.5R 8.1U	6.0L 4.0D	2.0L 3.9U
M16A4 MWS	AN/PEQ -2A/B	Picatinny	Spacer	Left	300 m	6.0R 2.0U	6.2L 0.60D	2.0L 0.9U
M16A4 MWS	AN/PEQ -2A/B	Picatinny	Spacer	Right	300 m	TBD	6.35R 4.4D	2.0L 0.9U
M16A4 MWS	AN/PEQ -2A/B	Picatinny	Spacer	Top	300 m	TBD	1.95R 4.1U	2.0L 0.9U
M16A4 MWS	AN/PEQ -2A/B	Insight	N/A	Right	300 m	TBD	5.5R 5.4D	2.0L 0.9U
M16A4 MWS	AN/PEQ -2A/B	Insight	N/A	Top	300 m	1.5L 0.5D	2.0R 2.3U	2.0L 0.9U

Note. Target offsets not yet developed are indicated by TBD.

Legend: BUIS = back up iron sight, cm = centimeter, D or DN = down, m = meter, L = left, MWS = modular weapon system, R = right, N/A = not applicable, TBD = to be developed, TWS = thermal weapon sight, U = up

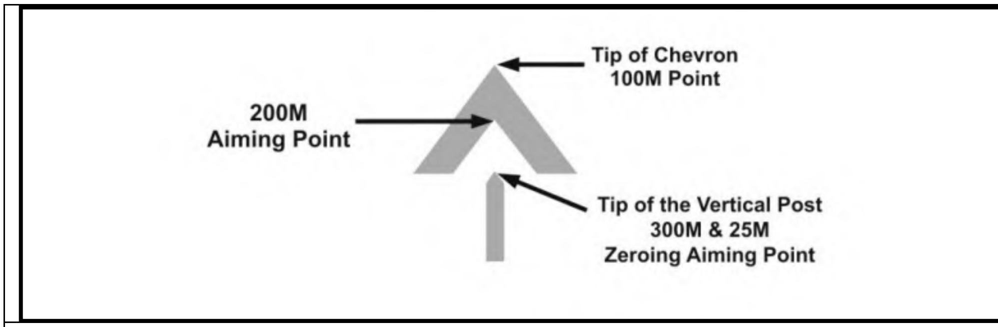
Table F-1. Offset mounting (continued)

WEAPON	ACCES-SORY	RAIL GRAB-BER	MOUNT	LOCA-TION	RANGE TO ZERO	ZERO OFFSET	BORE-SIGHT TARGET	MILES OFFSET
M16A4 MWS	AN/PEQ -2A/B	Insight	Training adapter	Top	300 m	2.0L 1.5D	TBD	2.0L 0.9D
M16A4 MWS	AN/PAQ -4B/C	Picatinny	AN/PAQ-4B/C bracket adapter	Top	300 m	4.9R 6.1U	1.75L 3.9U	2.0L 0.9U
M16A4 MWS	AN/PAQ -4B/C	Picatinny	AN/PAC-4B/C bracket adapter	Right	300 m	N/A	6.0R 0.9D	2.0L 0.9U
M16A4 MWS	AN/PAQ -4B/C	Insight	N/A	Top	300 m	N/A	1.75L 2.15U	2.0L 0.9U
M16A4 MWS	AN/PAQ -4B/C	Insight	N/A	Right	300 m	N/A	4.35R 0.65D	2.0L 0.9U
M16A4 MWS	AN/PAQ -4B/C	Insight	N/A	Left	300 m	N/A	4.30L 4.25D	2.0L 0.9U
Note. Target offsets not yet developed are indicated by TBD).								
Legend: D = down, L = left, m = meter, MWS = modular weapon system, N/A = not applicable, R = right, TBD = to be developed, TWS = thermal weapon sight, U = up								



Legend: ARDEC = Armament Research, Development and Engineering Center, cm = centimeter, L = left, MILES = Multiple-Integrated Laser Engagement System, Mtd = mounted, RCO = rifle combat optic, Tgt = target, U = up

Figure F-4. 300-meter zero of the advanced combat optical gunsight



Legend: M = meter

Figure F-5. Advanced combat optical gunsight points of aim (100 to 300 meters)

Glossary

The glossary lists acronyms and terms with Army or joint definitions. Where Army and joint definitions differ, (Army) precedes the definition. Terms for which TC 3-22.9 is the proponent are marked with an asterisk. The proponent manual for other terms is listed in parentheses after the definition.

SECTION I – ACRONYM/ABBREVIATIONS

AM	arc of movemet
ARNG	Army National Guard
ARNGUS	Army National Guard of the United States
ARS	adapter rail system
ATPIAL	advanced target pointer illuminator aiming light
BC	ballistic coefficient
BDC	bullet drop compensater
BUIS	back up iron sight
BZO	battle sight zero
CBRN	chemical, biological, radiological, and nuclear
CCO	close combat optic
CSF2	Comprehensive Soldier and Family Fitness
CoVM	center of visible mass
DA	Department of the Army
DBAL-A2	dual beam aiming laser-advanced2
DMC	digital magnetic compass
DOTD	Directorate of Training and Doctrine
DODIC	Department of Defense Identification Code
EENT	end evening nautical twilight
Ek	kinectic energy
fps	feet per second
FOV	field of view
GTL	gun target line
HTWS	heavy thermal weapons sight
I2	image intensifier
IR	infrared
LASER	light amplified stimulated emitted radiation
LCD	liquid crystal display
LRF	laser range finder
LWTS	light weapons thermal sight
MASS	modular accessory shotgun system

MCoE	United States Army Maneuver Center of Excellence
METT-TC	mission, enemy, terrain and weather, troops and support-time available, and civil considerations
MIL STD	military standard
m	meter
mm	millimeter
mph	mile per hour
MOA	minutes of angle
MTBF	mean time between failures
MWO	modified word order
MWS	modular weapon system
MWTS	medium weapon thermal sight
NATO	North Atlantic Treaty Organization
NOD	night observation device
PAM	pamphlet
PMCS	preventative maintenance checks and services
POA	point of aim
POI	point of impact
NSN	National Stock Number
RCO	rifle combat optic
SAA	small arms ammunition
SOP	standard operating procedure
STANAG	Standardized Agreement
STRAC	Standard in Training Commission
STORM	illuminator, integrated, small arms
TACSOP	tactical standard operating procedure
TC	Training Circular
TES	tactical engagement simulation
TM	Technical Manual
T	time
TWS	thermal weapon sight
µm	micrometer
USAR	United States Army Reserve
U.S.	United States
VAL	visible aim laser
VFG	vertical foregrip
V	velocity
WCS	weapon control status
WTS	weapons thermal sights

SECTION II – TERMS

***employment**

The application of the functional elements of the shot process and skills to accurately and precisely fire a weapon at stationary or moving targets.

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Entries are listed by paragraph numbers unless mentioned otherwise.

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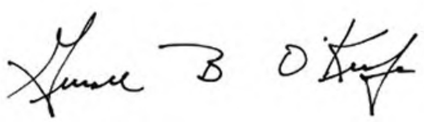
TC 3-22.9
13 May 2016

By Order of the Secretary of the Army:

MARK A. MILLEY
General, United States Army
Chief of Staff

Official:



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