TC 3-22.84

M3 Multi-Role, Anti-Armor Anti-Personnel Weapon System

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M3 Multi-Role, Anti-Armor Anti-Personnel Weapon System

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Preface

The principal audience for TC 3-22.84 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 (FM 27-10).

TC 3-22.84 uses joint terms where applicable. Selected joint and Army terms and definitions appear in both the glossary and the text. For definitions shown in the text, the term is italicized and the number of the proponent publication follows the definition. This publication is not the proponent for any Army terms.

TC 3-22.84 applies to the Active Army, Army National Guard/Army National Guard of the United States and United States Army Reserve unless otherwise stated.

The proponent of TC 3-22.84 is the United States Army Maneuver Center of Excellence. The preparing agency is the United States Army Maneuver Center of Excellence. Send comments and recommendations on DA Form 2028 (*Recommended Changes to Publications and Blank Forms*) to Commander, Maneuver Center of Excellence, Directorate of Training and Doctrine, Doctrine and Collective Training Division, ATTN: ATZK-TDD, 1 Karker Street, Fort Benning, GA 31905-5410; by email to usarmy.benning.mcoe.mbx.doctrine@mail.mil; or submit an electronic DA Form 2028.

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Chapter 1
Overview

Chapter 1 describes the principles of proper weapons handling, tactical applications, and control measures for employing the M3 Multi-role, Anti-armor, Anti-personnel Weapon System (MAAWS). The gunner is responsible for placing accurate and effective rounds on threat targets with the weapon. To do this each Soldier must understand 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 essential to building the Soldier's proficiency with their weapon system. The combination of knowledge and practice builds and sustains the skills to achieve accurate and consistent precise shots during combat operations (see figure 1-1).

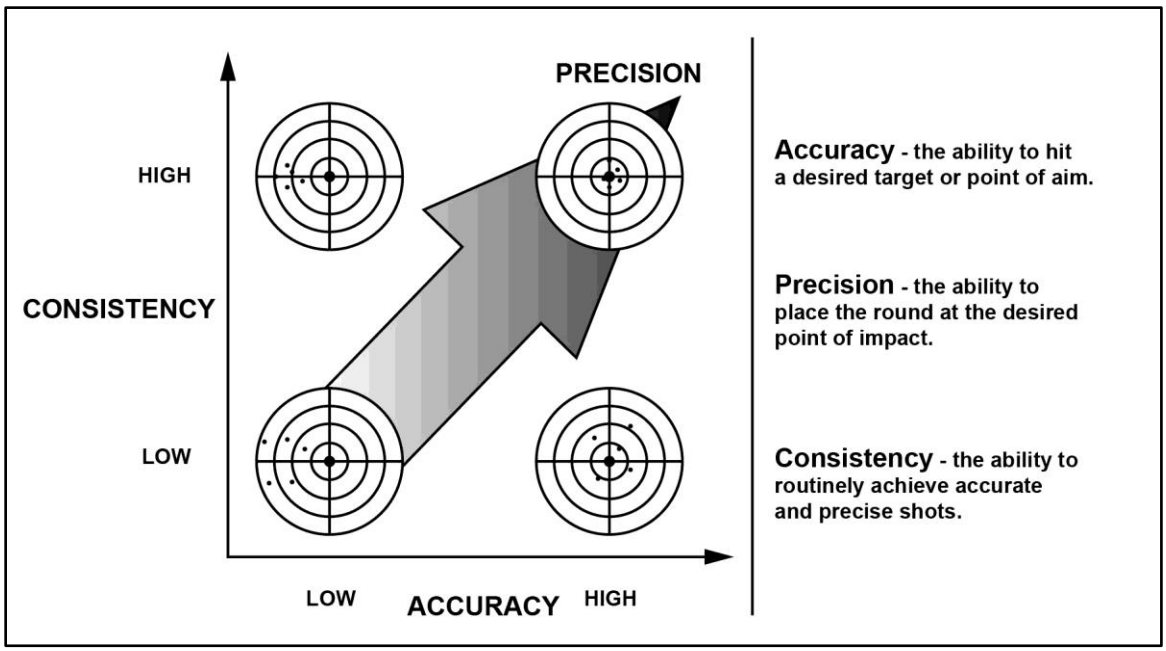


Figure 1-1. Employment skills

SAFE WEAPONS HANDLING

1-1. Safe weapons handling procedures are consistent and standardized methods for Soldiers to handle, operate, and employ the weapon safely and effectively. The Soldier, the weapon, and the environment are the three components of weapons handling.

1-2. The Soldier must maintain situational understanding of friendly forces, the status of the weapon, and the ability to evaluate the environment to handle any weapon properly. The smart, adaptive, and disciplined Soldier is the primary safety mechanism for all weapons under their control.

1-3. The weapon is an additional tool the Soldier can utilize to defeat threats in combat. The Soldier must know how to operate the mechanical safeties built into the weapons they use, as well as the weapon's principles of operation.

1-4. The environment is the Soldier's surroundings. The gunner and assistant gunner must be aware of the weapon's orientation, the nature of the target, and what is behind the target. They must be aware of the location of all friendly forces prior to engaging a threat as well.

1-5. Soldiers must be cognitively aware of three distinct weapons handling measures, listed below, to safely and effectively handle weapons:

- Rules of firearms safety.
- Weapons safety status.
- Weapons control status.

1-6. The weapon handling measures directly support the components of safe weapons handling. The design of the weapons handling measures provides redundant safety measures when handling any weapon or weapon system.

1-7. Redundancy allows 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 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

1-8. Any weapon a Soldier may employ has standardized rules of firearms safety. 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

1-9. Soldiers must treat any weapon 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. Soldiers must take the appropriate actions to ensure they apply proper weapon status during operations, whether in combat or training.

RULE 2: NEVER POINT THE WEAPON AT ANYTHING YOU DO NOT INTEND TO DESTROY

1-10. Soldiers must be aware of the orientation of their weapon's muzzle and what is in the projectile's path if the weapon fires. Soldiers must ensure the path between the muzzle and target, including the backblast area, is clear of friendly forces, noncombatants, or anything the Soldier does not want to strike.

1-11. 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 firearms safety.

RULE 3: KEEP FINGER STRAIGHT AND OFF THE TRIGGER UNTIL READY TO FIRE

1-12. Soldiers must not place their fingers 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, a Soldier must not rely upon them solely for safe operation knowing that mechanical measures may fail.

1-13. Whenever possible, the gunner should move the weapon to mechanical safe when they are unable to engage a target. The assistant gunner is constantly monitoring the backblast area with their right-hand over the venturi locking lever, which provides an additional safety factor in preventing the weapon from firing, if needed. The gunner's trigger finger acts as the primary safety.

RULE 4: ENSURE POSITIVE IDENTIFICATION OF THE TARGET AND ITS SURROUNDINGS

1-14. The disciplined Soldier can positively identify the target and knows what is in front of and what is beyond it. The gunner is responsible for all rounds fired from their weapon including the projectile's final destination.

1-15. Application of this rule minimizes the possibility of fratricide, collateral damage, or damage to infrastructure or equipment. The rule also prepares the gunner to re-engage the target when required.

WEAPON SAFETY STATUS

1-16. Weapon safety status is a standard code that uses common colors (green, amber, red, and black) to represent the level of readiness for a given weapon. Each color represents a specific series of actions that Soldiers apply to a weapon. They use the colors 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 (see table 1-1, page 1-4). Soldiers use the following weapon safety statuses for the M3 MAAWS.

Note. If the component, assembly, or part described is unclear, refer to the weapon's technical manual or chapter 2 of this publication.

GREEN

1-17. The cocking lever is to the rear and the firing assembly mechanism is on fire, F. The weapon is not loaded. The assistant gunner is on alert.

Note. The command given to direct a GREEN safety status is GREEN AND CLEAR or GO GREEN.

AMBER

1-18. The weapon safety status, amber, does not apply for the M3 MAAWS.

RED

1-19. The red signifies that the weapon is loaded, the cocking lever is cocked, and the safety catch on the firing mechanism is set to the S safe position. The finger is off the trigger.

Note. The command given to direct a RED safety status is LOAD.

BLACK

1-20. The color black signifies that the weapon is loaded, the cocking lever is fully forward, and the firing mechanism is on F. The gunner is on the target and ready to engage.

Note. The rules of engagement, or the command, FIRE, drive the command given to direct a BLACK safety status.

Table 1-1. Weapons safety status for M3 MAAWS

Status	*Green*	*Amber*	*Red*	*Black*
Function	Clear	N/A	Ready, safe	Ready, fire
Commands	CLEAR	N/A	LOAD	ROE, SOP, FIRE
Ammunition	None	N/A	Loaded	Loaded
Cocking Lever	Uncocked	N/A	Cocked	Cocked
Safety	Fire	N/A	Safe	Fire
Trigger	Finger off	N/A	Finger off	Finger on
Assistant Gunner	Alert	N/A	Loads ammo and states, "Ready." Places hand over the venturi locking lever.	Checks backblast area. If clear, states, "Backblast area clear".
Legend: N/A – not applicable; ROE – rules of engagement; SOP – standard operating procedure				

WEAPONS CONTROL STATUS

1-21. When applicable, the leader may impose a weapon control status (WCS) in addition to the weapon safety status. The weapon control status outlines the conditions based on target identification criteria, under which friendly elements may engage. This status is adjustable, as necessary, based on the current rules of engagement established for the area of operations.

1-22. Table 1-2 provides a description of the standard weapons control status used during tactical operations, both in training and combat. Table 1-2 describes when the firer is authorized to engage a threat target once the threat conditions have been met.

Table 1-2. Weapons control status, example

WEAPON 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.

Chapter 2

Principles of Operation

Chapter 2 discusses the characteristics, description, major components, and principles of operation for the M3 MAAWS. The chapter provides an overview of the mechanics and theory of how the weapon operates, and the key terms and definitions related to its functioning.

DESCRIPTION

2-1. The M3 MAAWS is an 84-mm breech loaded and laterally, percussion fired recoilless rifle. The barrel has an internal steel liner. The liner is made with a laminate of epoxy and carbon fiber. The weapon is recoilless as part of the propellant gases escape rearwards through the venturi, equalizing the recoil force. The normal sight of the weapon is the telescopic sight; with the open sights being an auxiliary means of aiming.

2-2. The design of the M3 MAAWS allows it to engage lightly armored targets at ranges up to 700 meters, and soft-skinned vehicles and similar targets at ranges up to 1300 meters. Gunners can fire the M3 MAAWS from standing, kneeling, sitting, or prone positions. A subcaliber adapter (known as SCA) 553B is available for realistic live fire training with the M3 MAAWS. Table 2-1, page 2-2, provides the equipment technical data for the M3 MAAWS.

2-3. The M3 MAAWS consists of components, assemblies, subassemblies, and individual parts listed below. Soldiers must be familiar with these items and how they interact during operation:

- Components are a 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 as 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 a specific set of functions during operation and cannot be used independently for any other purpose.
- Subassemblies are a group of fitted parts that perform a specific set of functions during operation. Subassemblies are compartmentalized to complete a 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.

MAJOR COMPONENTS

2-4. Figure 2-1 illustrates the major components of the M3 MAAWS.

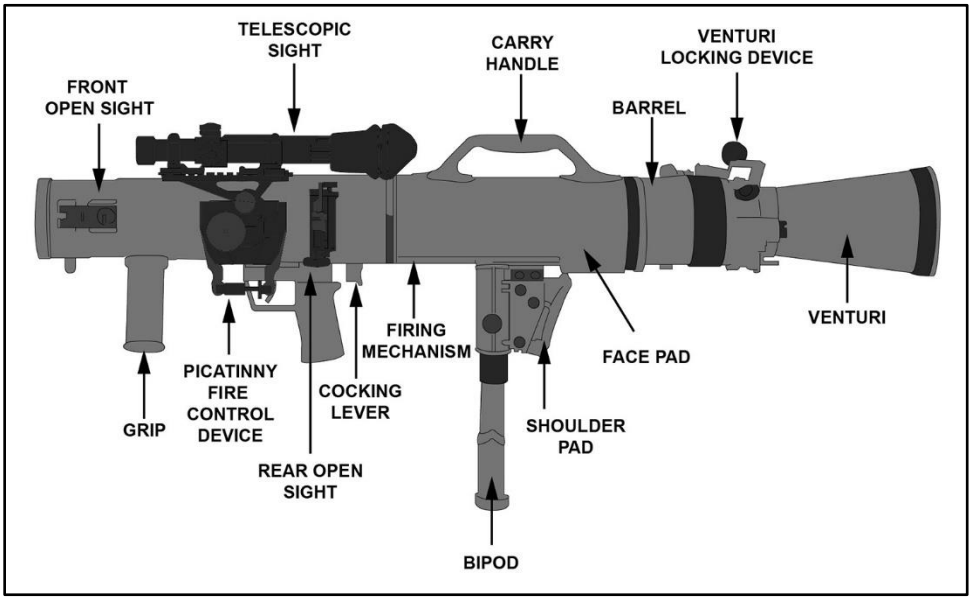


Figure 2-1. Major components

TECHNICAL DATA

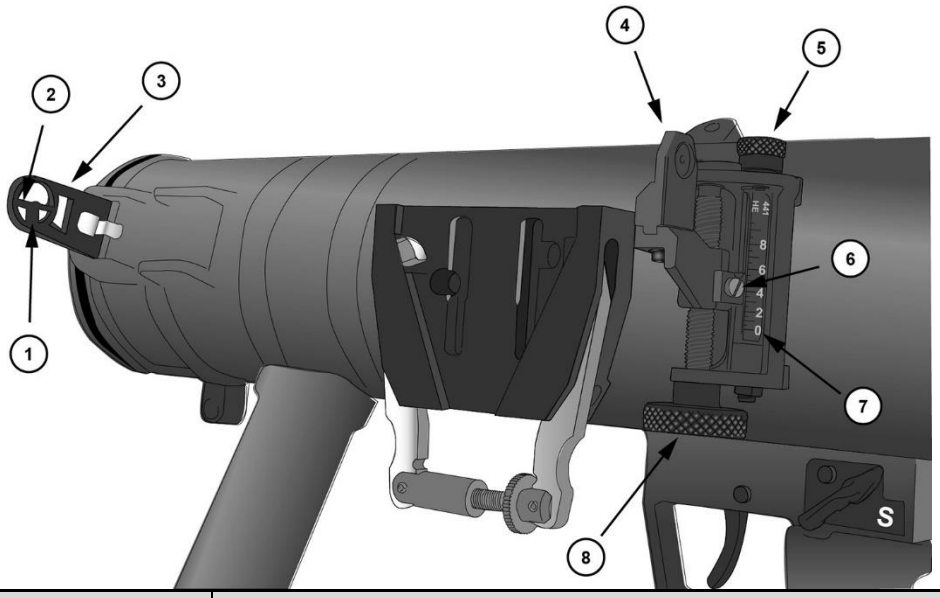
2-5. Table 2-1 lists the technical data of the M3 MAAWS as follows:

Table 2-1. Equipment technical data

EQUIPMENT TECHNICAL DATA	
Caliber	84 mm
Weight	20 lbs (approximately 9 kgs)
Weight with bipod and telescopic sight	22.6 lbs (approximately 10 kgs)
Weight with ITWS and STORM	23.8 lbs (approximately 11 kgs)
Weight of telescopic sight	2.0 lbs (0.09 kgs)
Weight of bipod	0.60 lbs (0.25 kgs)
Length	41.93 inches (1065 mm)
Weight of transport package with weapon and accessories	64 lbs (approximately 29 kgs)
Dimensions of transport package	26.18 x 17.83 x 10.55 inches (1173 x 453 x 268 mm)
Practical rate of fire	Approximately 6 rounds per minute
Legend: ITWS – integrated thermal weapon sight; kgs – kilograms; lbs – pounds; mm – millimeter; STORM – small, tactical. optical rifle—mounted	

OPEN SIGHTS

2-6. The open sights (see figure 2-2) consist of the folding, front, and rear sights. The rear sight has a pillar with range scales for different types of ammunition, a range indicator, and a range setting knob. Refer to chapter 3 for more information about open sights.



Item	*Name*	*Description/Function*
1	Center Post	Align with center mass when engaging stationary targets or vehicle travelling towards or away from firer.
2	Lead Marks	Lead marks are used when engaging moving targets. Refer to appendix C for detailed information.
3	Front Sight Aperture Ring	Align edge of front sight aperture ring with center mass if vehicle is travelling at 30 km/h (19 mph).
4	Rear Sight Aperture	Rear sight aperture is used for aiming with open sights. It adjusts left and right for azimuth adjustments when boresighting.
5	Pillar Knob	Pillar assembly is used for ammunition selection.
6	Range Elevation Indicator	Range indicator is used in conjunction with the range scale to select desired target engagement range and adjust round temperature setting.
7	Ammunition Range Scales	Ammunition type is indicated at the top of each range scale. The range scale compensates for ballistics associated with selected ammunition type.
8	Elevation Knob	Elevation knob facilitates elevation adjustment of the rear sight assembly.

Figure 2-2. Open sights

Note. The locations and mounting of the sights for the MAAWS are tailored for right-hand, right eye dominant firers.

TELESCOPIC SIGHT ASSEMBLY

2-7. The telescopic sight assembly (see figure 2-3) consists of the telescope and the Picatinny fire control device (known as PFCD). The telescopic sight has 3x magnification and a 12-degree field of view (FOV). The telescope is fitted with two adjustment drums for boresighting.

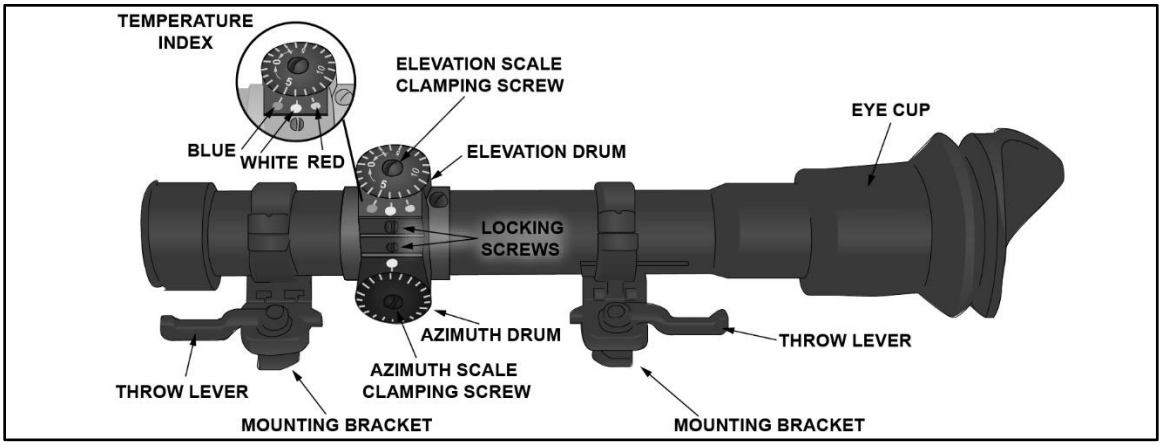


Figure 2-3. Telescopic sight

2-8. The PFCD (see figure 2-4) consists of a MIL-STD-1913 rail for mounting optics, v-slide mounting block to attach the PFCD to the MAAWS, range drum with four preset ammunition settings, and range setting knob. Two luminous grooves form a V on the bottom left-hand side of the PFCD to determine the weapon's proper elevation when firing illumination rounds.

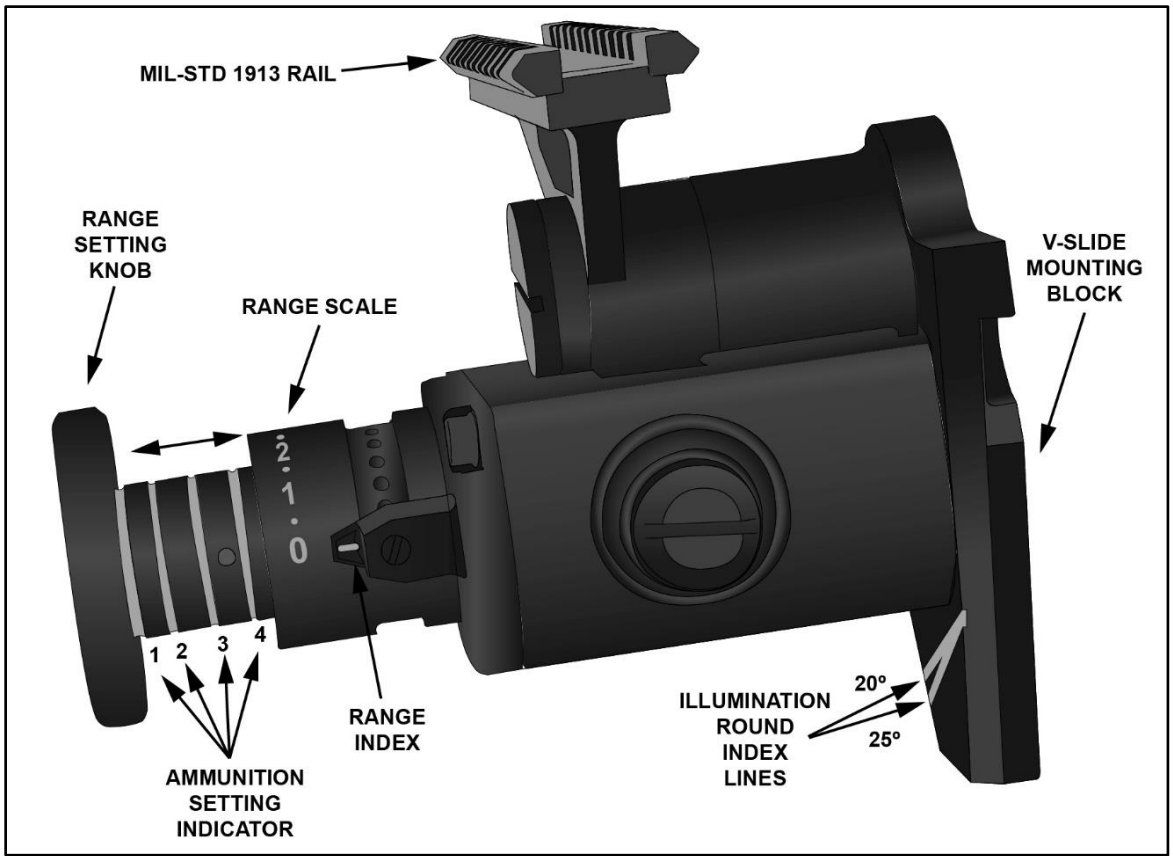


Figure 2-4. Picatinny fire control device

CAUTION

Return range drum to 0 meters before adjusting the ammunition setting on the PFCD. Failure to return to 0 meters will result in PFCD damage.

BARREL WITH CARRYING HANDLE

2-9. The barrel consists of a steel liner wound with a laminate of epoxy and carbon fiber. The liner has 24, right-hand twist rifling grooves. The chamber has a recess for the cartridge case rim and is fitted with a guide that aligns the percussion cap of the cartridge case with the firing pin (see figure 2-5).

2-10. There are hard mounting points on the outside of the barrel for the front grip, shoulder pad, open sights, and sling swivels, as well as dovetails for the telescopic sight supporting bracket and projection slots for the firing mechanism. The carrying handle is cemented to the top of the barrel.

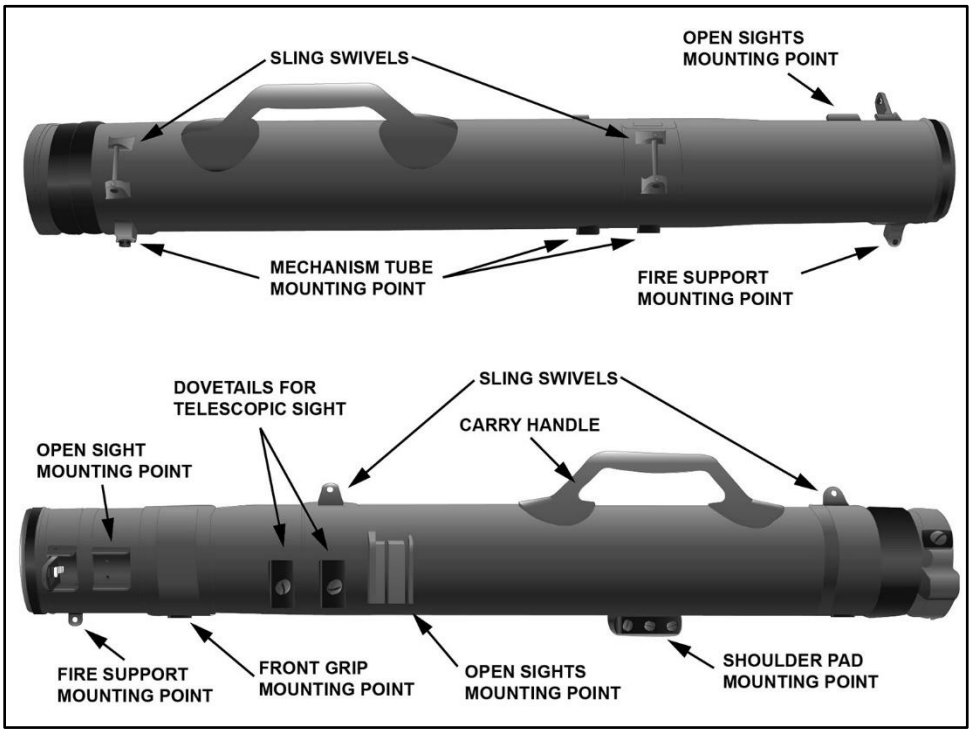


Figure 2-5. Barrel with carrying handle

VENTURI LOCKING LEVER

2-11. The venturi locking lever is semicircular in shape and has a knob at the top to facilitate movement towards the muzzle (see figure 2-6).

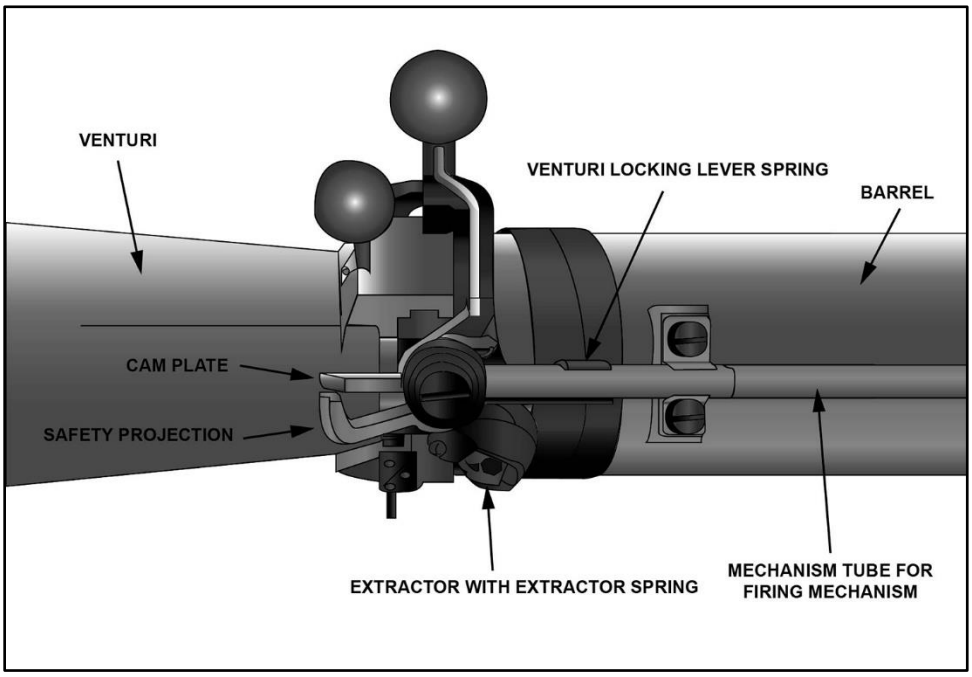


Figure 2-6. Venturi locking lever assembly

Venturi Locking Lever Projections

2-12. The locking lever has the following three projections (see figure 2-7):

- A locking projection, which locks the venturi in the closed position.
- A stop projection, which retains the venturi locking lever in the forward position when the venturi is open.
- A safety projection, which provides a safety factor to prevent the gun from being fired before the venturi is locked in the fully closed position.

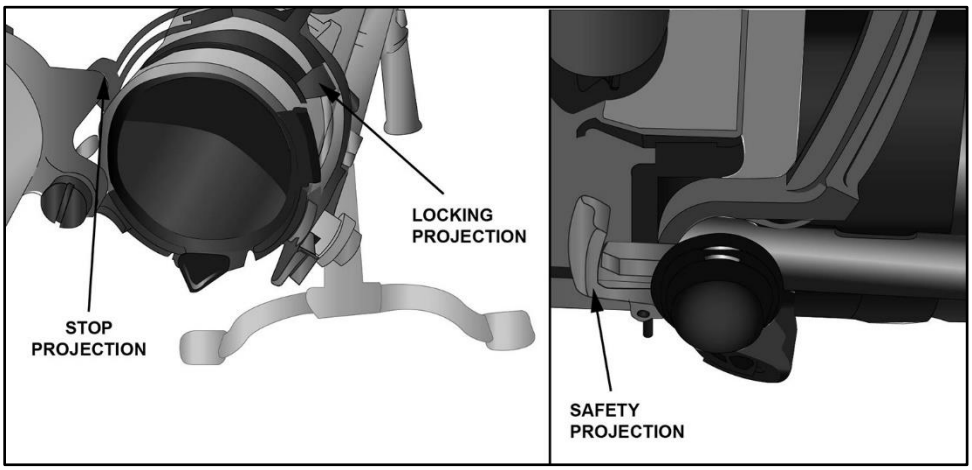


Figure 2-7. Venturi locking lever projections

Mechanical Safety

2-13. Unless the firing mechanism is cocked, the venturi cannot be opened since the end of the firing rod cam plate protrudes through the aperture of the firing pin housing. In this position, the cam plate rests on top of the safety projection of the venturi locking lever, thus making the venturi inoperative (figure 2-9, page 2-8).

2-14. Should the venturi be fully closed and locked (see figure 2-8), the safety projection will clear the cam plate allowing the firing rod to complete the final stage of its movement.

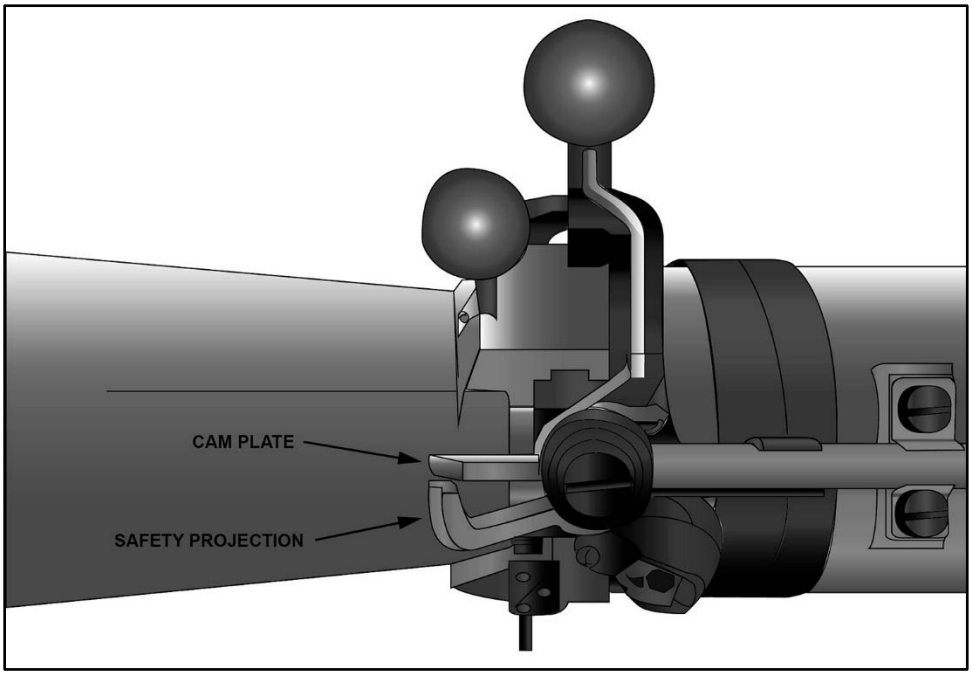


Figure 2-8. Venturi closed cam plate of firing rod, unblocked

2-15. When the venturi is open, the stop projection retains the locking lever in the forward position. The safety projection masks the aperture in the firing pin housing (see figure 2-9. page 2-8).

2-16. Should the safety catch be set to F (fire) and the trigger is operated when the venturi is open, the trigger sear withdraws from the cocking notch, and the firing rod moves to the rear under the pressure of the main spring. The safety projection blocks the end of the firing rod cam plate, preventing the mechanism from firing (see figure 2-9, page 2-8).

2-17. The safety projection prevents the gun from firing before the venturi is locked in the fully closed position. Pushing the venturi locking lever forward moves the safety projection up, blocking the firing rod cam plate's path. Should the Soldier operate the trigger, the pressure of the main spring is reduced to a minimum causing insufficient momentum in the firing rod cam plate to operate the firing mechanism.

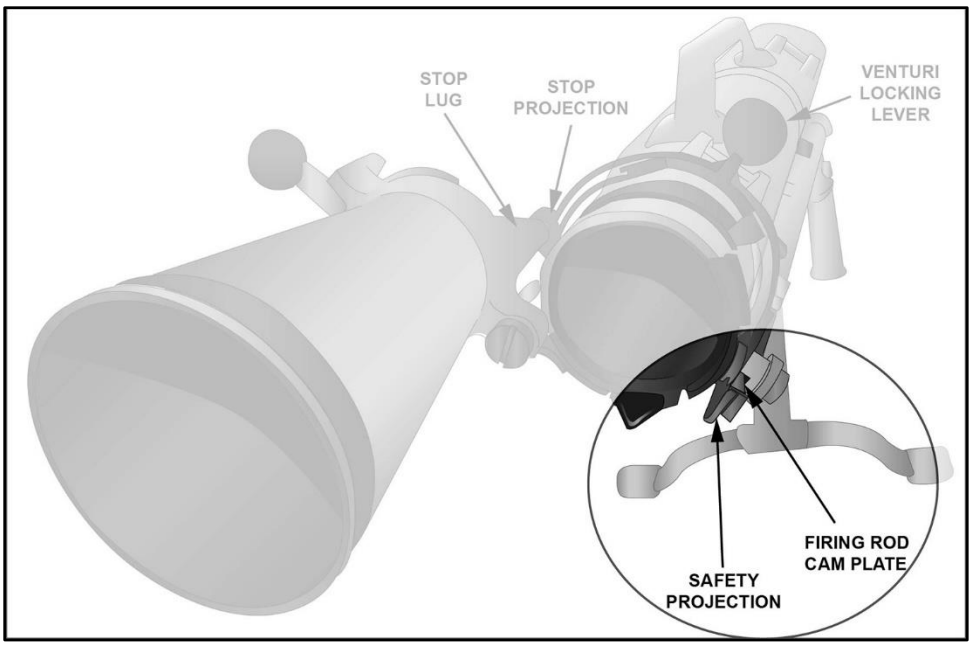


Figure 2-9. Venturi open–cam plate of firing rod, blocked

VENTURI

2-18. The funnel-shaped venturi is made of steel (see figure 2-10). The venturi pivots around the venturi axis pin. In the closed position, the guideway of the venturi locks over the guide on the barrel.

2-19. At the rear, there is a rubber band to prevent metallic resonance. At the front, there is a stop lug for the venturi locking lever.

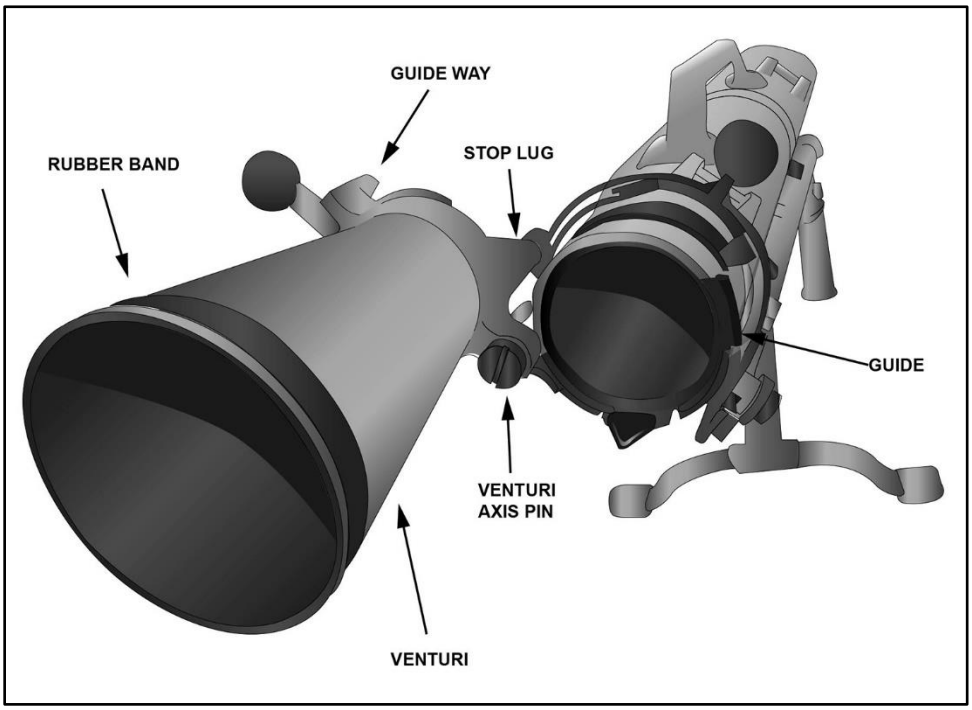


Figure 2-10. Venturi

SHOULDER PAD

2-20. Mounting plates and tension jaws attach the shoulder pad with bipod housing to the barrel. The bipod housing is bored to the receiver on the bipod's stem and has a spring-loaded retaining catch. The shoulder pad can attach to the barrel in two positions allowing 3/4 inch (20 millimeter [mm]) of horizontal adjustment (figure 2-12, page 2-10).

SHOULDER PAD ADJUSTMENT

2-21. Soldiers do the following to properly adjust the shoulder pad (see figure 2-11):

Note. The tension plates are different in shape and have rounded edges facing outwards.

- Remove the two tension jaw screws, left mounting plate, right mounting plate, and shoulder pad with attaching hardware.
- Adjust shoulder pad to desired position.
- Install and tighten left mounting plate, two tension jaw screws, and right mounting plate.

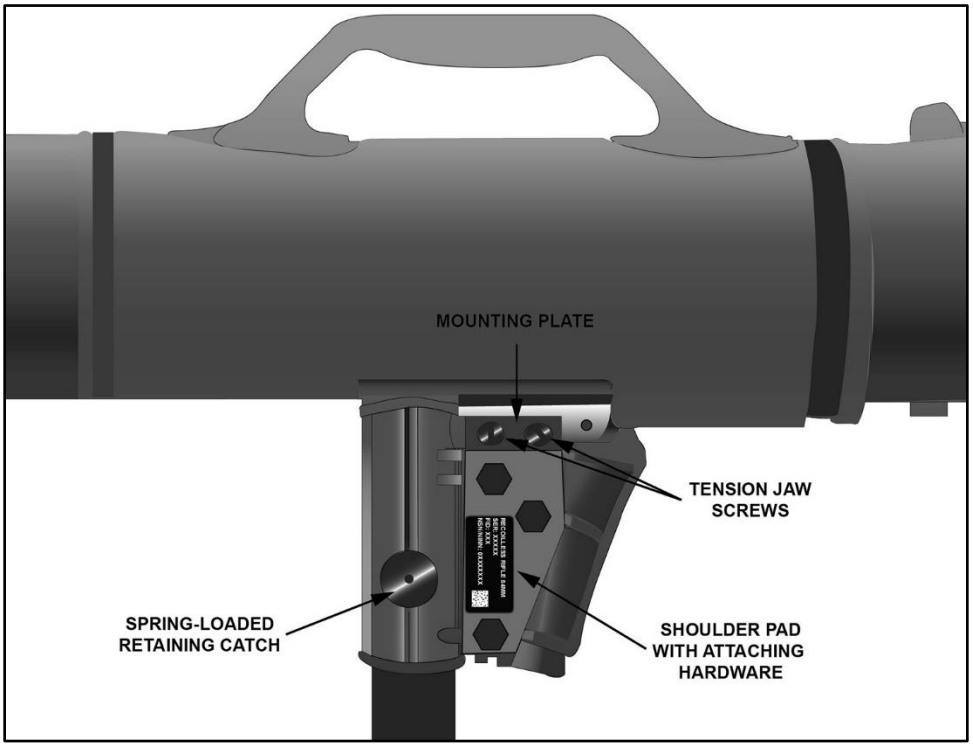


Figure 2-11. Shoulder pad

BIPOD

2-22. The bipod is made of rubber-coated alloy. The spring-loaded retaining catch retains the bipod housing. The catch fits into holes in the stem in two positions allowing 1.0-inch (25 mm) height adjustment of the weapon (see figure 2-12).

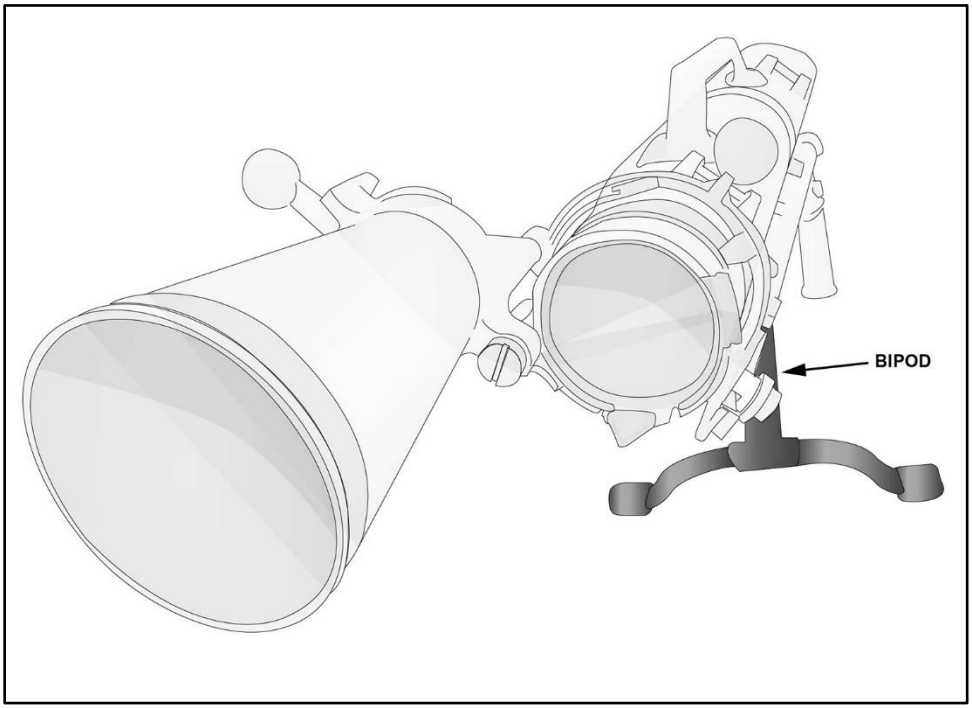


Figure 2-12. Bipod

FIRING MECHANISM ASSEMBLY

2-23. The firing mechanism is contained in a tube (see figure 2-13). The mechanism tube has front and rear assemblies. The front portion of the tube forms the housing for the trigger assembly. The rear portion of the tube houses the firing pin assembly. The firing rod and mainspring are located inside the mechanism tube.

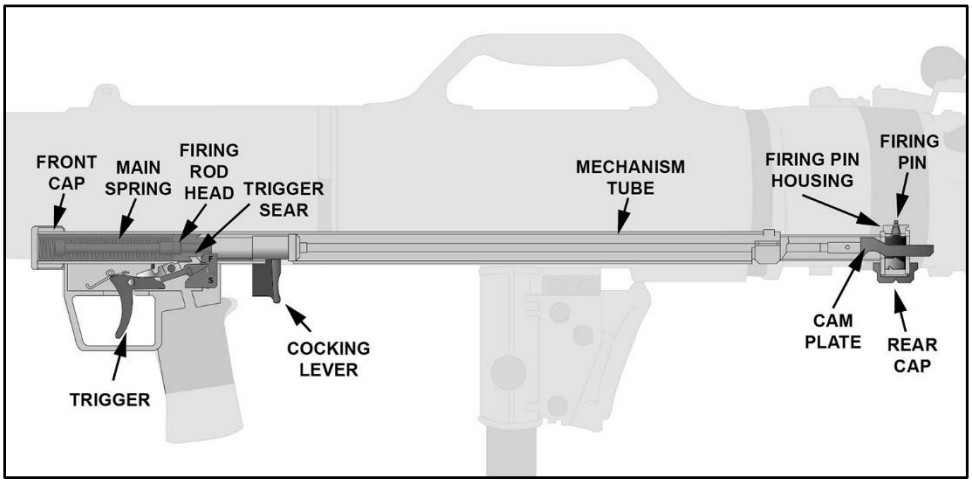


Figure 2-13. Firing mechanism assembly

V-SLIDE MOUNTING BRACKET

2-24. The V-slide mounting bracket, which attaches to the barrel assembly, provides the attaching point for the PFCD and the integrated thermal weapon, sight-mounting bracket (see figure 2-14).

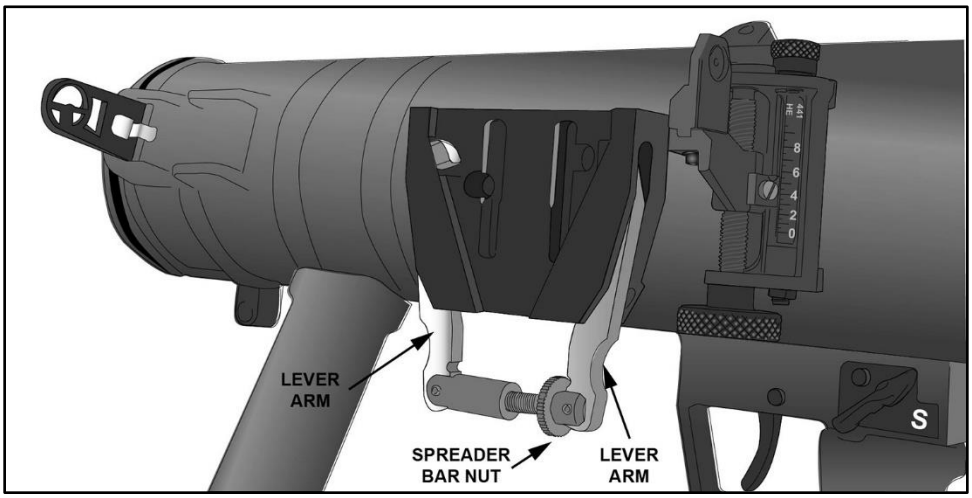


Figure 2-14. V-slide mounting bracket

FRONT GRIP

2-25. The front grip is made of plastic and attaches to a hard mounting point on the barrel. The hard mounting point has two threaded holes, which allow the front grip to adjust 0.6 inches (15 mm) horizontally.

ADJUSTMENT OF FRONT GRIP

2-26. To adjust the front grip (see figure 2-15)—

- Remove screw, washer, and front grip.
- Move the front grip to the desired position.
- Install washer and screw, and then tighten.

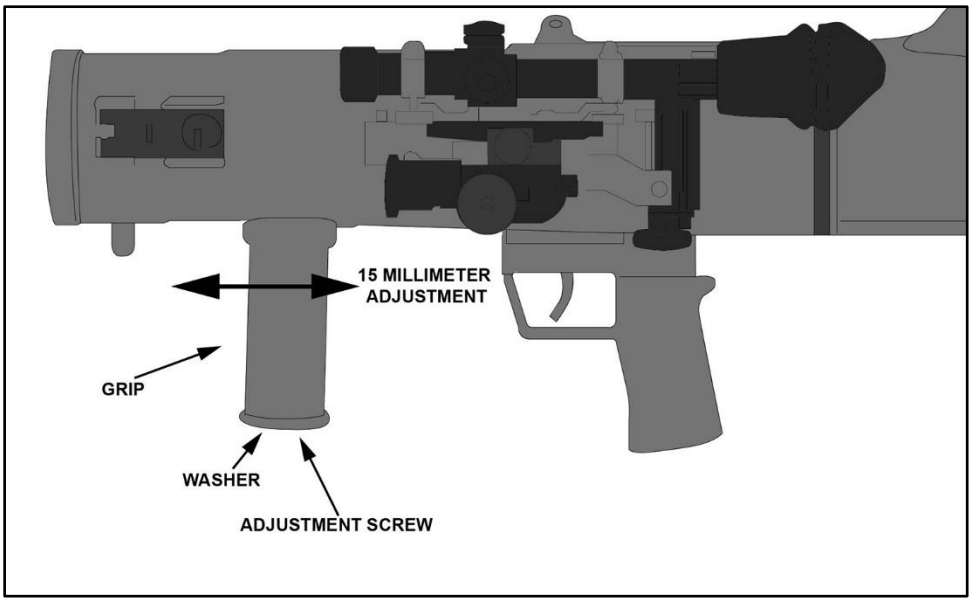


Figure 2-15. Front grip

BASIC ISSUE ITEMS

2-27. Table 2-2 lists the M3 MAAWS' basic issue items and figure 2-16 illustrates the basic issue items. The weapon is packed and sealed in a wooden box. TM 9-1015-262-10, located inside the main compartment, has additional information on the M3 MAAWS.

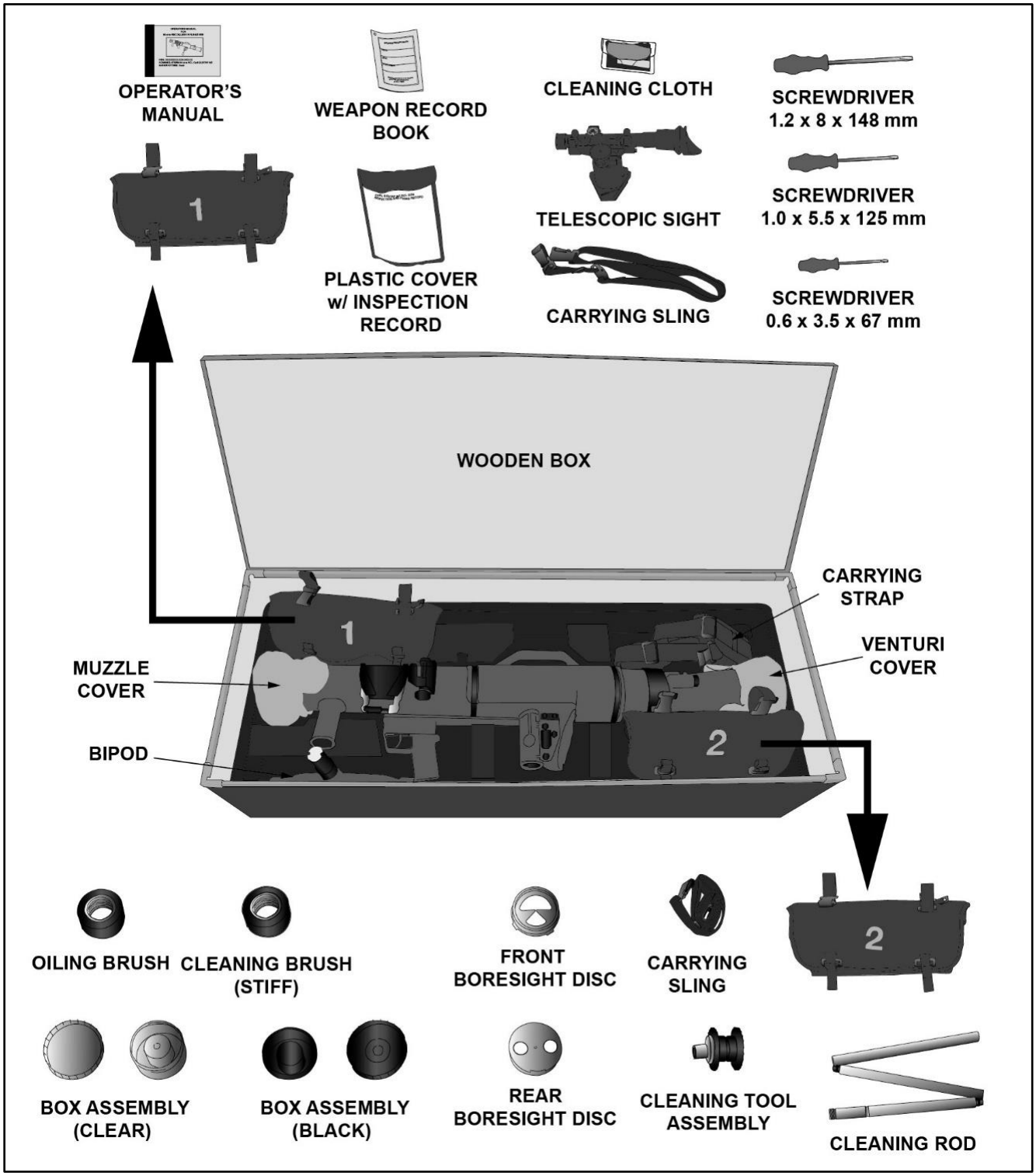


Figure 2-16. Basic issue items

Table 2-2. Basic issue items

Basic Issue Items	
Main Compartment	
Wooden box	
Bipod	
Venturi and muzzle cover	
Carrying strap	
Plastic cover with inspection and firing record	
Operator's manual	
Description M3 MAAWS	
Description telescopic sight 557B	
Two bags of accessories designated bag #1 and #2	
Bag 1	Bag 2
Screwdriver 1.2 x 8 x 148 mm	
Screwdriver 1.0 x 5.5. x 125 mm	Oiling brush
Screwdriver 0.6 x 3.5 x 67 mm	Cleaning brush (stiff)
Operator's manual	Box assembly (black)
Weapon record book	Cleaning tool assembly
Cleaning cloth	Front boresight disc
Plastic cover with inspection record	Rear boresight disc
Telescopic sight	Carrying sling
Carrying sling	
Box containing the following items:	
Cocking lever screws	
Firing pin	
Screw, 3M, and extractor spring screw; one of each	
Rear cap	
Front cap	
Measure plate	
Extractor spring	
Legend: MAAWS – Multi-role, Anti-armor, Anti-personnel Weapon System; mm – millimeter	

CYCLE OF OPERATION

2-28. The cycle of operation is the mechanical process a weapon follows during operation. The information provided below is specific to the M3 MAAWS cycle of operation.

2-29. The ten-step cycle of function begins with the venturi closed and ends with the venture open and able to be reloaded if needed. The order of the cycle of function phases are—

- Cocking.
- Unlocking.
- Feeding.
- Chambering.
- Locking.
- Firing.
- Cocking.
- Unlocking.
- Extracting.
- Ejecting.

COCKING

2-30. Pushing the cocking lever forward moves the firing rod in the same direction. As the firing rod moves forward, the firing rod head compresses the main spring. Cocking is complete when the cocking notch of the firing rod head has engaged with the cocking tooth of the trigger sear and the weapon safety catch is placed in the S position (see figure 2–17).

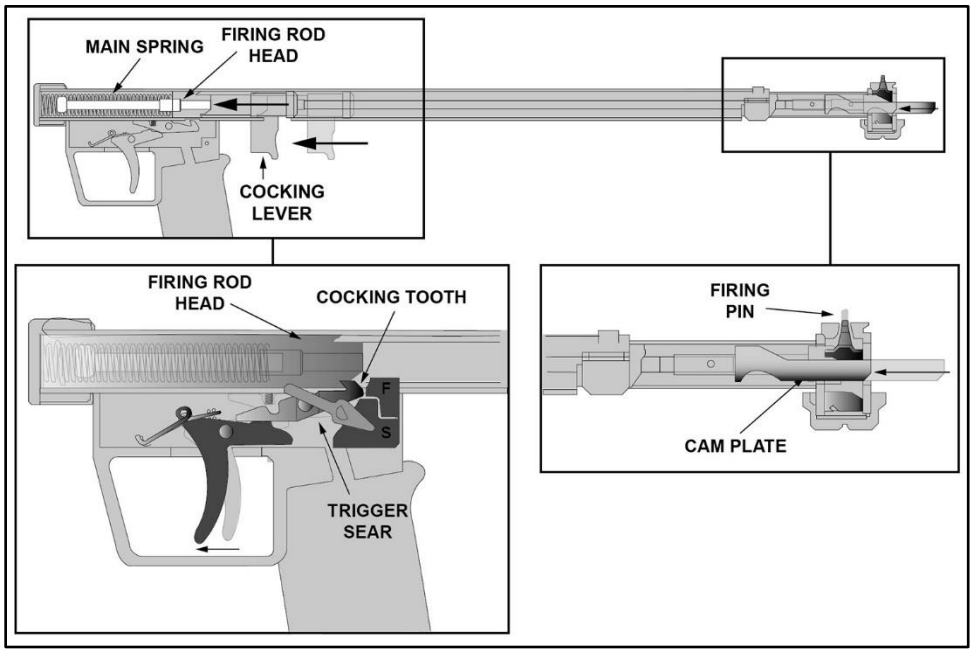


Figure 2–17. Cycle of function, cocking

UNLOCKING

2-31. To unlock the recoilless rifle, ensure the weapon is cocked. Open the venturi by pushing the knob on the venturi locking lever forward. Pushing the lever forward compresses the lever spring, which clears the locking projection from the guide and guideway. Rotate the venturi counterclockwise to the fully open position, causing the stop lug of the venturi to engage the stop projection of the locking lever, which keeps it in the forward position (see figure 2–18).

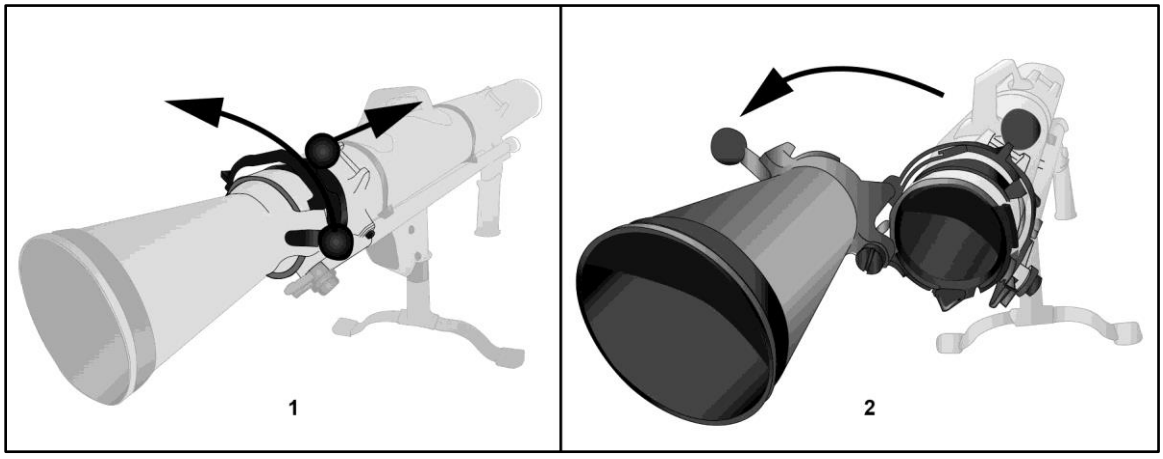


Figure 2–18. Cycle of function, unlocking

FEEDING

2-32. Insert the cartridge into the chamber by aligning the recess in the cartridge case with the cartridge guide (see figure 2–19).

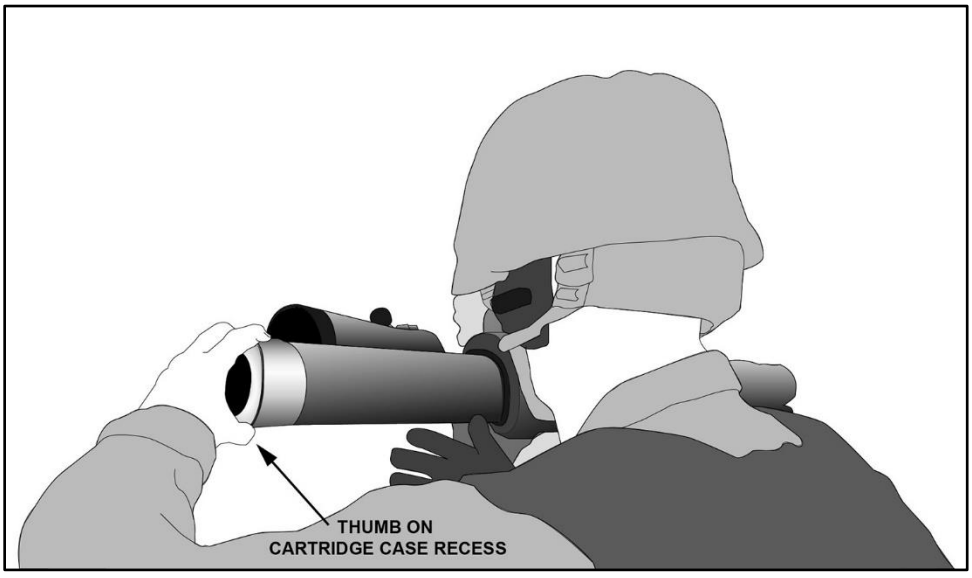


Figure 2-19. Feeding

CHAMBERING

2-33. As the cartridge is fed, chambering occurs when the rim of the cartridge case is seated on the recess in the chamber of the barrel, which aligns the percussion cap of the cartridge case with the firing pin (see figure 2–20).

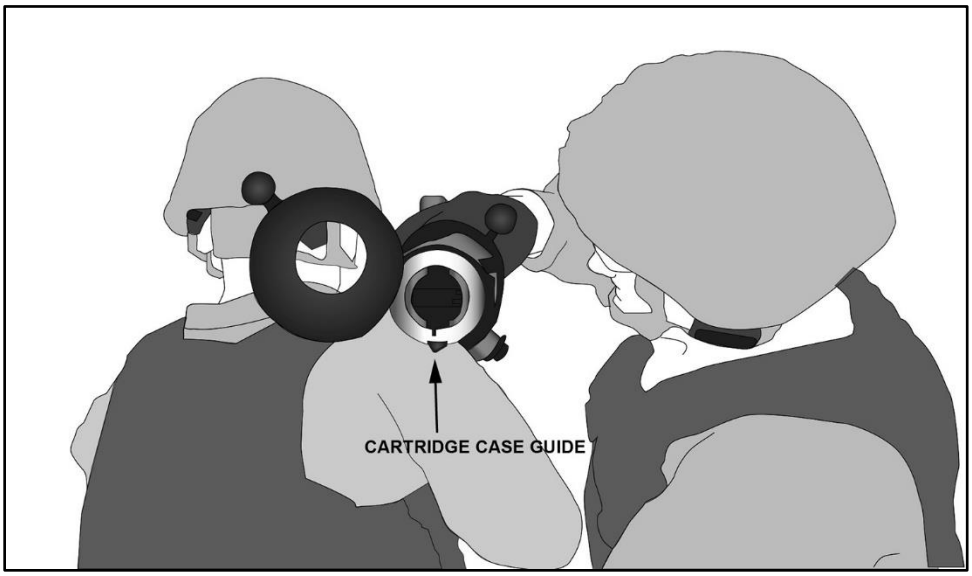


Figure 2-20. Cycle of function, feeding, and chambering

LOCKING

2-34. Rotate the venturi clockwise in the closed position. When the guide on the barrel is completely engaged with the guideway on the venturi, the compressed energy from the venturi locking lever spring is released, thus moving the locking lever rearward. Flick the knob to the rear to ensure that the locking projection is in its fully locked position (see figure 2–21).

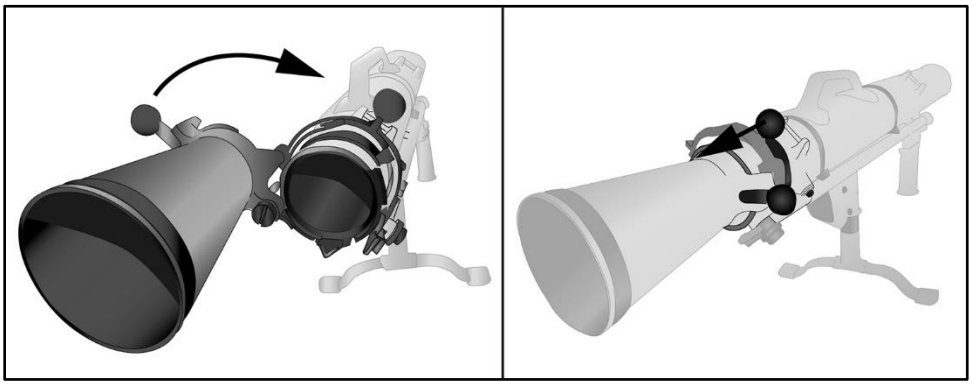


Figure 2–21. Cycle of function, locking

FIRING

2-35. Rotate the safety catch to the F (fire) position (see figure 2–22). Pull the trigger to the rear, which disengages the trigger sear from the firing rod head. The mainspring causes the firing rod to move rapidly to the rear. The inclined surface of the cam plate strikes the appropriate inclined surface in the firing pin, causing it to strike the percussion cap.

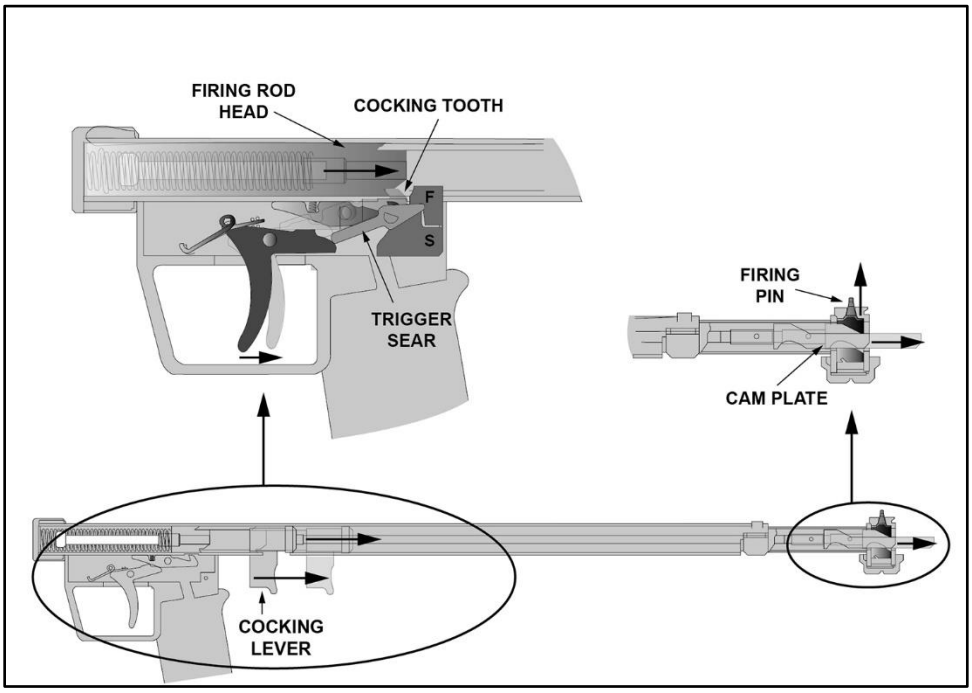


Figure 2-22. Cycle of function, firing

EXTRACTING

2-36. Pressing the cocking lever forward moves the firing rod in the same direction (see figure 2-23, page 2-18). As the firing rod moves forward, the firing rod head compresses the main spring. Cocking is complete when the cocking notch of the firing rod head has engaged with the cocking tooth of the trigger sear and the weapon's safety catch is placed in the S position.

2-37. Open the venturi by pushing the knob on the venturi locking lever forward. Pushing the lever forward compresses the lever spring, which clears the locking projection from the guide and guide-way. Rotate the venturi counterclockwise to the fully open position, thus engaging the stop projection of the locking lever, which keeps it in the forward position.

2-38. Driving the venturi locking lever knob forward causes extraction. This forces the extractor rearward and exerts pressure against the cartridge rim and unseats the round (empty cartridge case).

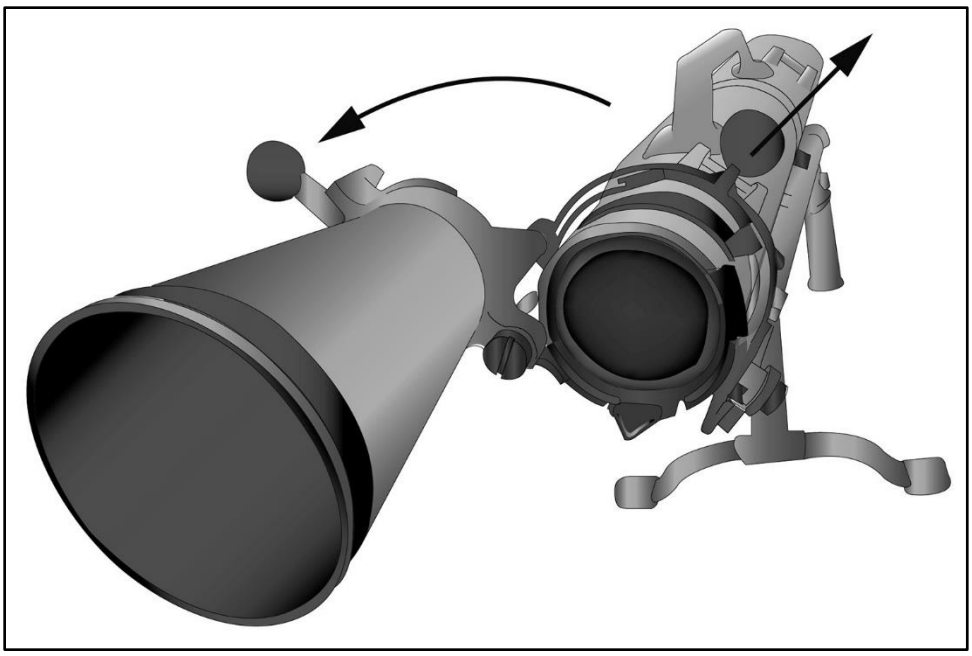


Figure 2-23. Cycle of function, extracting

EJECTING

2-39. Ejecting occurs after the round is unseated by the extractor and the round is moved in a rearward motion either by the force of the extractor or manually (see figure 2-24).

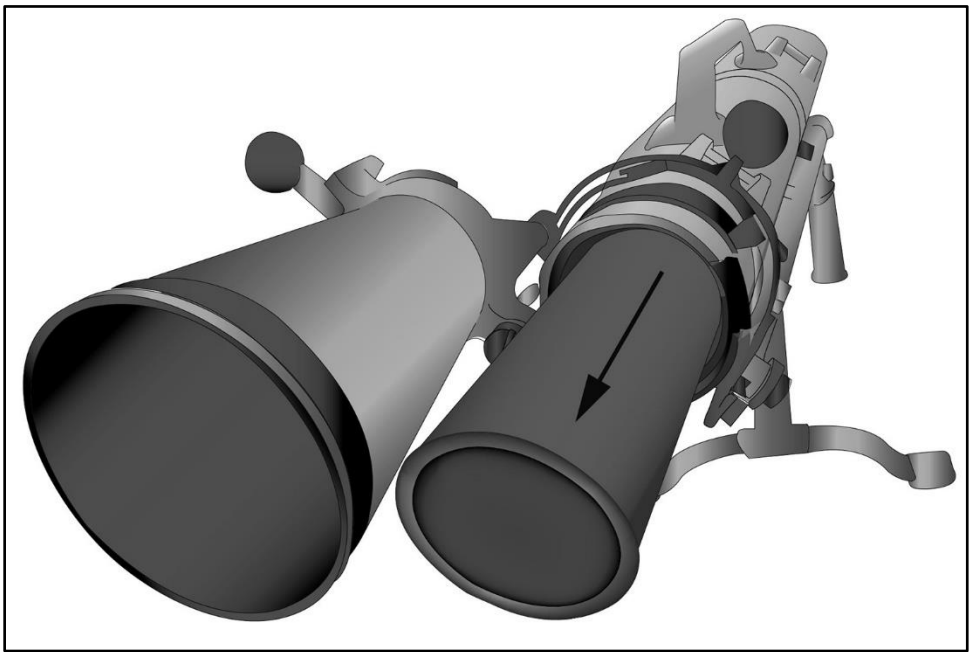


Figure 2-24. Cycle of function, ejecting

WEAPON OPERATION

2-40. The procedures listed below are necessary to operate the M3 MAAWS:

- Clearing.
- Installation and removal of telescopic sight.
- Function check.
- Loading.
- Unloading.

WARNING

Weapon MUST be cleared before inspecting, cleaning, disassembling, transporting, or storing to be considered SAFE. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

CLEARING

2-41. The procedures for clearing are as follows:

Step 1. Push cocking lever forward fully.

Step 2. Set safety catch to S (safe) position (see figure 2-25).

Step 3. Move venturi locking lever forward and open venturi (see figure 2-25).

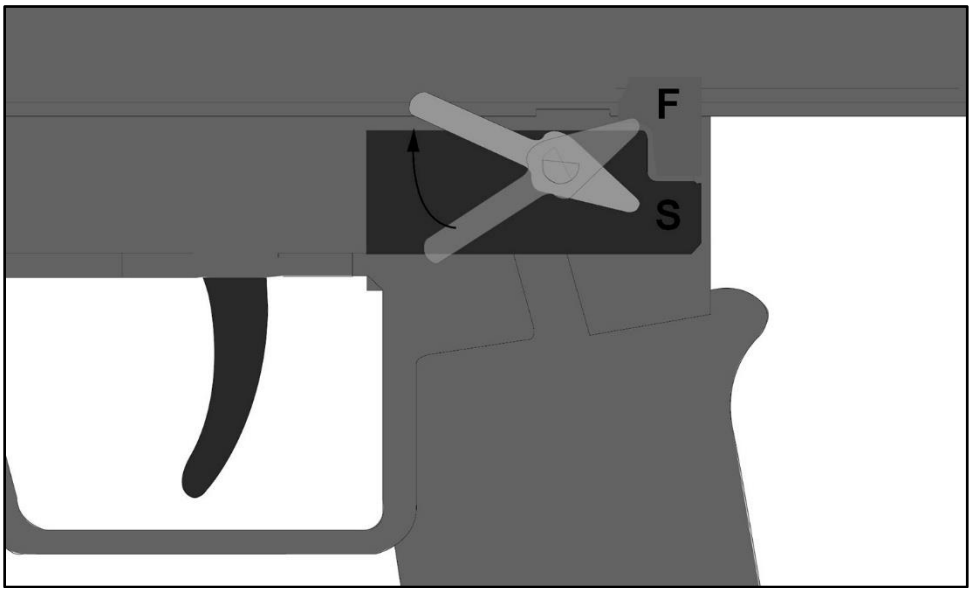


Figure 2-25. Clearing

Step 4. Inspect chamber for live round or empty projectile casing to ensure weapon is clear (see figure 2-26).

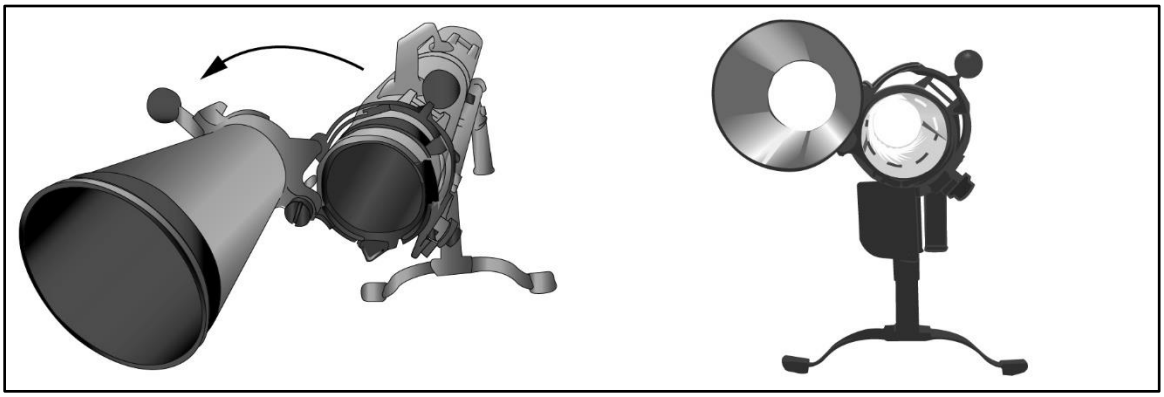


Figure 2-26. Clearing chamber

Step 5. Close venturi ensuring locking lever is engaged fully.

Step 6. Place safety catch to F (fire) position and pull trigger to relieve spring tension (see figure 2-27).

INSTALLATION AND REMOVAL OF TELESCOPIC SIGHT ASSEMBLY

2-42. The telescopic sight and the PFCD are stored inside bag no. 1 within the MAAWS carrying box during initial issue. Soldiers must inspect and ensure the equipment is in proper working order according to TM 9-1015-262-10.

Installation

2-43. Follow the steps below to install the telescopic sight (see figure 2-27):

Step 1. Loosen spreader bar nut fully.

Step 2. Insert the PFCD's V-slide block into the V-slide mounting bracket. Ensure lever arms (on V-slide mounting bracket) engage indentation ns on the PFCD V-slide block.

Step 3. Finger tighten spreader bar nut.

Removal

2-44. Follow the steps below to remove the telescopic sight (see figure 2-27):

Step 1. Loosen spreader bar nut fully.

Step 2. Squeeze lever arms on V-slide mounting bracket and lift telescopic sight assembly from mounting bracket.

Step 3. Finger tighten spreader bar nut.

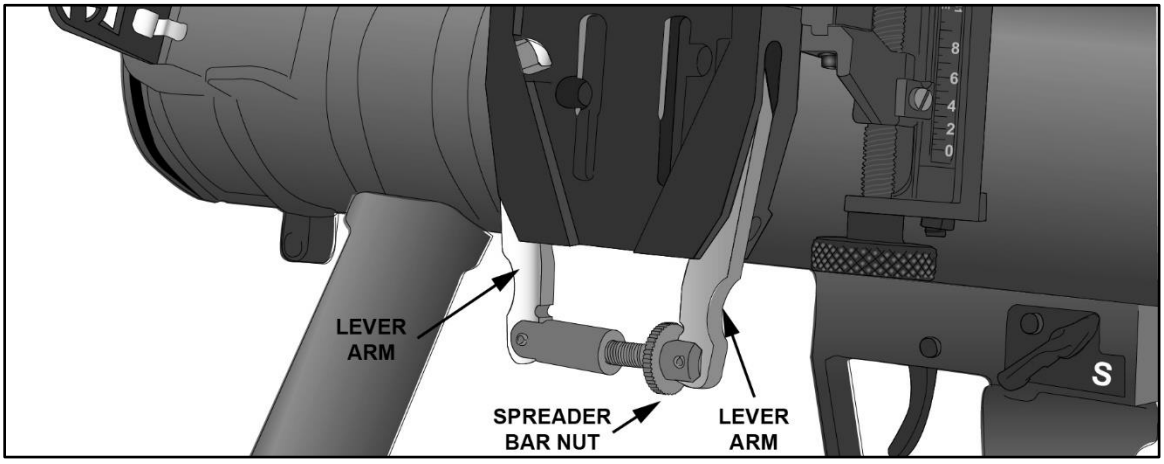


Figure 2-27. Installation of telescopic sights

Function Check

2-45. The function check must be performed in the order of the steps listed below:

WARNING

Ensure the weapon is clear before performing function check. Weapon is not clear unless chamber is free of all cartridges, cases, or ammunition. DO NOT pull the trigger until the weapon has been cleared. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

Step 1. The gunner and assistant gunner check for proper operation of the safety catch, trigger assembly, and firing rod. They perform the following procedures to perform a function check.

(a) Gunner pushes cocking lever forward to cock weapon.

(b) Gunner rotates safety catch to S (safe) position and pulls trigger; weapon must not fire (see figure 2-28):

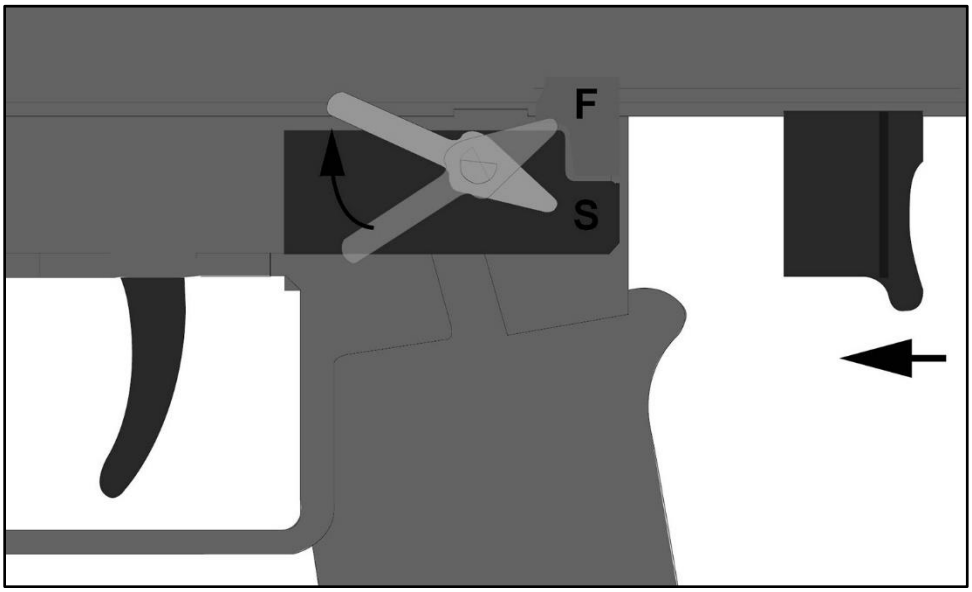


Figure 2-28. Function check

(c) Gunner rotates safety catch to F (fire) position and pulls trigger; weapon must fire.

(d) Assistant gunner reaches through venturi and physically ensures firing pin is protruding (see figure 2-29, page 2-22).

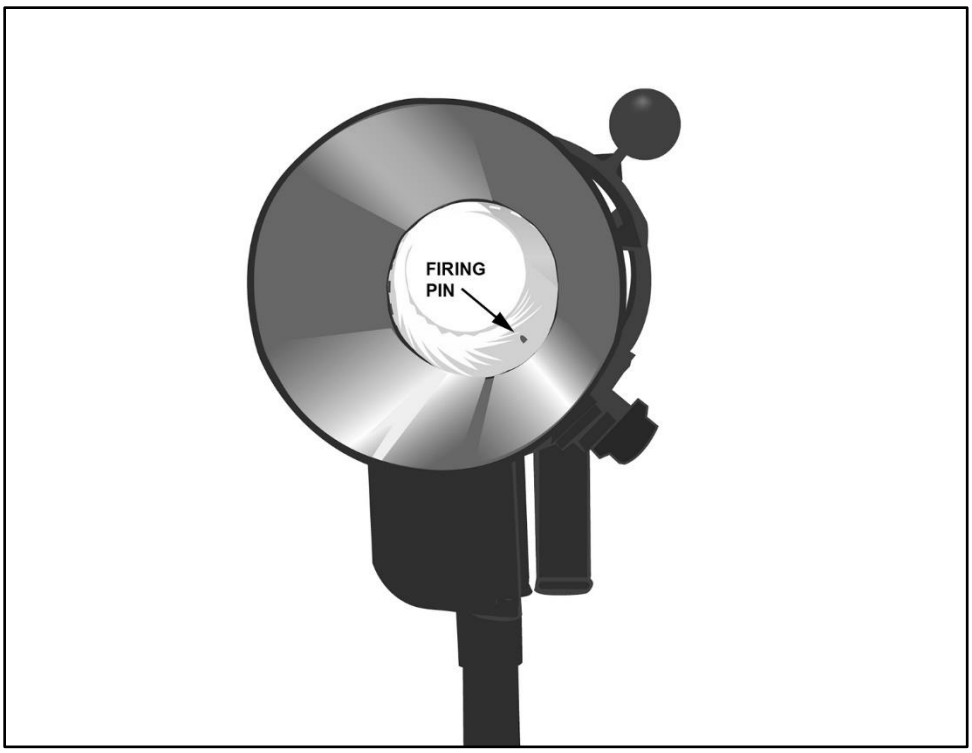


Figure 2-29. Function check, firing pin protruding

Step 2. Check proper operation of venturi safety mechanism as follows:

(a) Gunner pushes cocking lever forward to cock weapon.

(b) Gunner rotates safety catch to S (safe) position.

(c) Assistant gunner pulls venturi locking lever towards muzzle and opens the venturi.

(d) Gunner rotates safety catch to F (fire) position and pulls trigger; weapon must fire.

(e) Assistant gunner reaches into breech of barrel and physically ensures firing pin does not protrude.

(f) Gunner pushes cocking lever forward to cock weapon and rotates safety catch to the S (safe) position.

(g) Assistant gunner closes venturi and ensures venturi locking lever completely rotates to the rear and locks the venturi in the closed position.

(h) Gunner rotates safety catch to F (fire) position and pulls trigger; weapon must fire.

(i) Assistant gunner reaches into breech of barrel and physically ensures firing pin protrudes.

Note. Weapon is safe for storage and transport. If weapon fails function check, refer to troubleshooting procedures according to TM 9-1015-262-10.

LOADING PROCEDURES

2-46. Table 2-3 lists the loading responsibilities of the gunner and assistant gunner.

Table 2-3. Loading

Loading		
Gunner		***Assistant Gunner***
1	If applicable, remove the muzzle cover and the venturi cover.	
2	Assume a firing position.	Assume a position to the right of the gun.
3	Hold weapon horizontally on right shoulder and support bipod against upper body (if attached).	Take out a round from the container and hold it with the nose of projectile to the right and with recess of the cartridge case turned down.
4	Gasp firing grip with right hand and front grip with left hand.	
5	Push cocking lever fully forward with right hand.	
6	Set safety catch to S (safe) position.	
7	Order, “Load.”	
8		Pull venturi locking lever towards muzzle and open venturi.
9		Look into the barrel and check that venturi, chamber, and bore are free from foreign objects.
10		Insert round into chamber, using right hand as a guide and left hand to align recess in cartridge case with cartridge case guide.
11		Using right hand, close venturi and ensure venturi locking lever rotates completely to the rear and locks venturi in closed position. Place hand on venturi locking lever and maintain hold.
12		Announce, “Ready.”

FIRING PROCEDURES

2-47. Table 2-4 lists the firing responsibilities of the gunner and assistant gunner.

Table 2-4. Firing responsibilities

Firing		
Gunner		***Assistant Gunner***
1	Set safety catch to F (fire) position. Announce, “Ready to fire.”	
2		Check backblast area. State, “Backblast area clear”. Maintain hold of venturi locking lever until M3 is fired.
3	Pull trigger.	Take out a round from the container and hold it with the nose of projectile to the right and with recess of the cartridge case turned down.

UNLOADING PROCEDURES

2-48. Table 2-5 lists the unloading responsibilities of the gunner and assistant gunner.

Table 2-5. Unloading

Unloading		
Gunner		*Assistant Gunner*
1	Maintain weapon in firing direction.	
2	Push cocking lever fully forward with right hand.	
3	Set safety catch to S (safe) position.	
4	Order, “Unload” or “Reload.”	
5		Move venturi locking lever forward and open venturi.
6		Pull venturi locking lever towards muzzle, forcing round rearwards.
7		Remove round or cartridge case from weapon and put it down. Load with a new round (reload).
8		Close venturi.
9		Announce, “Ready” (reload).

Chapter 3

Aiming Devices

Every weapon has a fixed or attached device for aiming. Soldiers must be familiar with the various aiming devices, how they operate, and how to employ them correctly for the best effect. Chapter 3 provides the principles of operation of the most widely available aiming devices, and provides general information concerning their capabilities, function, and use.

An aiming device aligns the Soldier, the weapon, and the target to make an accurate and precise shot. Each aiming device functions differently. Different types of aiming devices are useful in different settings. The devices' main categories include the weapon's open sights, telescopic sights, thermal weapon sight, and the available pointing device.

FUNCTION

3-1. 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 represents the various types of mechanical sighting systems available on the weapon. The mechanical sighting system for the M3 consists of the front and rear sights.
- Optics. The optics aiming devices are predominantly for day firing, with limited night capability. This chapter covers the only optics available for the M3 MAAWS, which are the telescopic sights.
- Thermal. Thermals are electronic sighting systems that provide a wide and narrow FOV based on temperature variations. There are numerous variations of the thermal sights that are classified by type.
- Pointer, illuminator, laser. These aiming devices use either a laser beam, flood light, or other light to aim the weapon at the target.

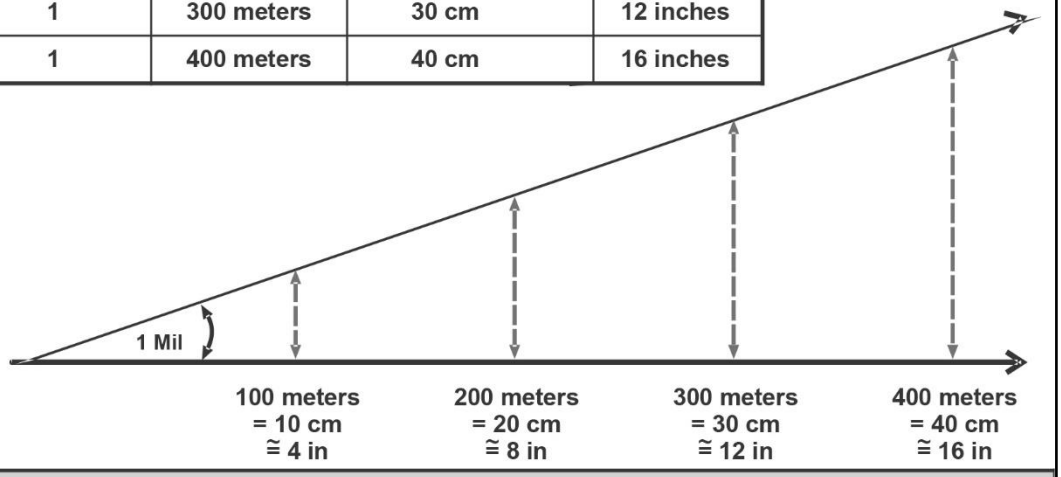
UNITS OF ANGULAR MEASUREMENT

3-3. The primary unit of angular measurement that the M3 MAAWS uses are milliradians (mils). Mils describe a measurement of accuracy when firing a weapon, system, or munition. Typically, Mils include the accuracy of a specific weapon, the performance of ammunition, and the firers ability to employ the weapon.

MILS

3-4. The mil is a common unit of angular measurement that is used in direct fire and indirect fire applications (see figure 3-1). Soldiers use the mil to degree relationship to describe military reticles, ballistic relationships, aiming devices, and on a larger-scale, map reading, and indirect fire.

Mils	At Distance	Equals	
1	100 meters	10 centimeters (cm)	4 inches (in)
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.

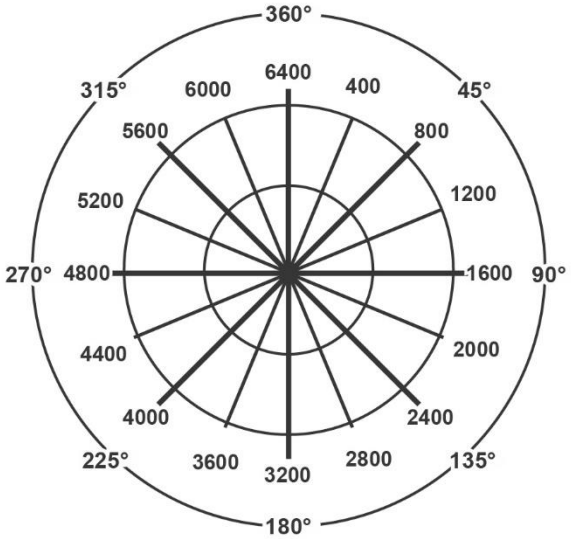


Figure 3-1. Mils unit of measurement

ELECTROMAGNETIC SPECTRUM

3-5. Soldiers must understand how thermal and other optics aid in the detection process—and more appropriately—what each device can see. Each device develops a digital representation of the scene based on frequencies or wavelengths it can detect within the electromagnetic spectrum. Thermal devices see differences in heat.

3-6. Thermal optics equipment operates in the mid and far wavelength of the infrared (IR) band, which is the farthest of the IR wavelengths from visible light. Thermal optics cannot translate visible light. Thermal optics cannot see IR equipment such as IR strobe lights, IR chemical lights, illuminators, or laser pointers. They can identify only emitted radiation in the form of heat (figure 3-3).

3-7. Image intensifiers equipment, such as night vision devices, use visible light and the near area of the IR spectrum closest to the frequencies of visible light to create a digital picture of the scene. These systems cannot see or detect heat or heat sources.

3-8. Generally, these sights operate on the principles of convection, conduction, and radiation (mentioned in chapter 2). The sight picks up or translates the IR wavelength (or light) that the target scene emits through one of those three principles.

3-9. Limitations of these optics include the following:

- Rain absorbs the IR that the target emits making 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.

3-10. Situations where IR can see better than thermal sights are smoke and dust. Smoke does 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 signature.

3-11. Figure 3-2, page 3-4, depicts the areas of the electromagnetic spectrum. The figure details the various wavelengths within the spectrum where the aiming devices, night vision devices, and equipment operates. Figure 3-2, page 3-4, also illustrates where these items can and cannot see the others within their operating range.

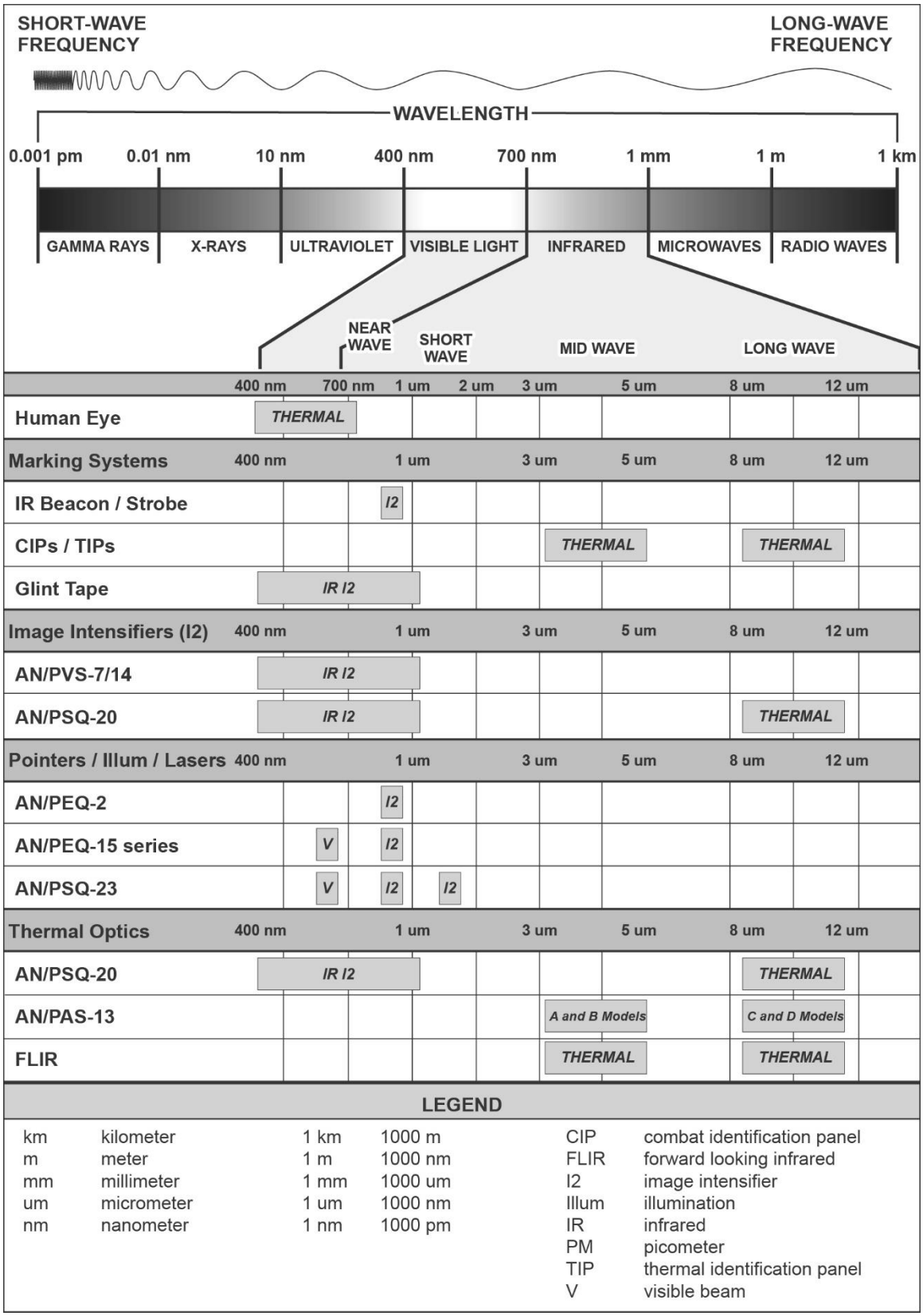


Figure 3-2. Electromagnetic spectrum

AIMING SIGHTS

3-12. The gunner uses aiming sights to align the weapon system to a designated target. The M3 MAAWS has systems to assist the gunner to engage targets accurately. The M3 MAAWS has different types of reticles and sight systems.

BALLISTIC RETICLE

3-13. A ballistic reticle is a series of fine lines in the eyepiece of an optic, such as the telescopic sight or the thermal weapon sight, used as a measuring scale with included aiming or alignment points. The MAAWS reticles use mils for their unit of measurement (see figures 3-3 and 3-4). The telescopic sight reticle includes lead lines for engaging moving targets in 10 kilometers per hour increments.

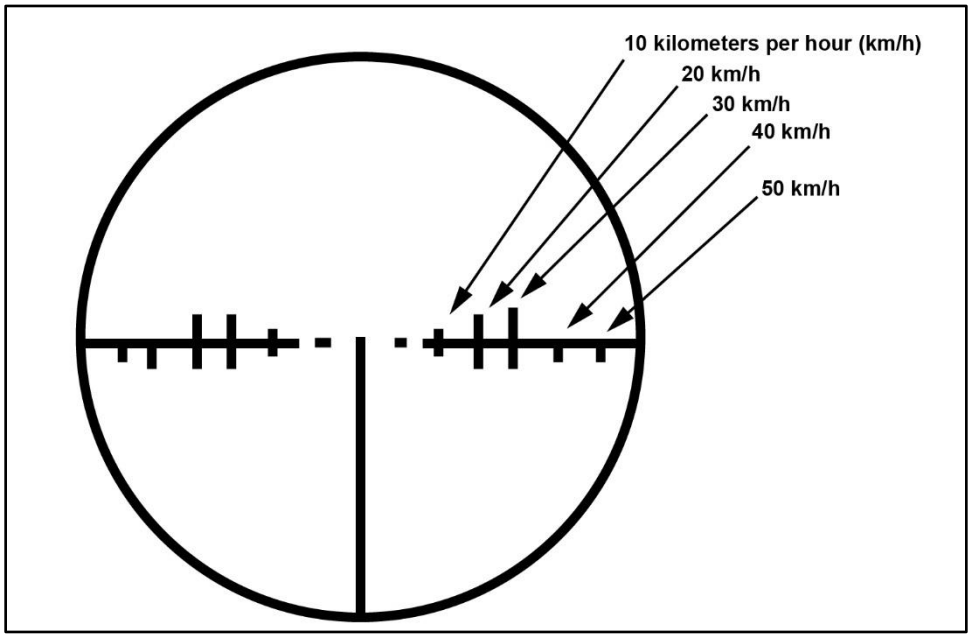


Figure 3-3. Telescopic reticle

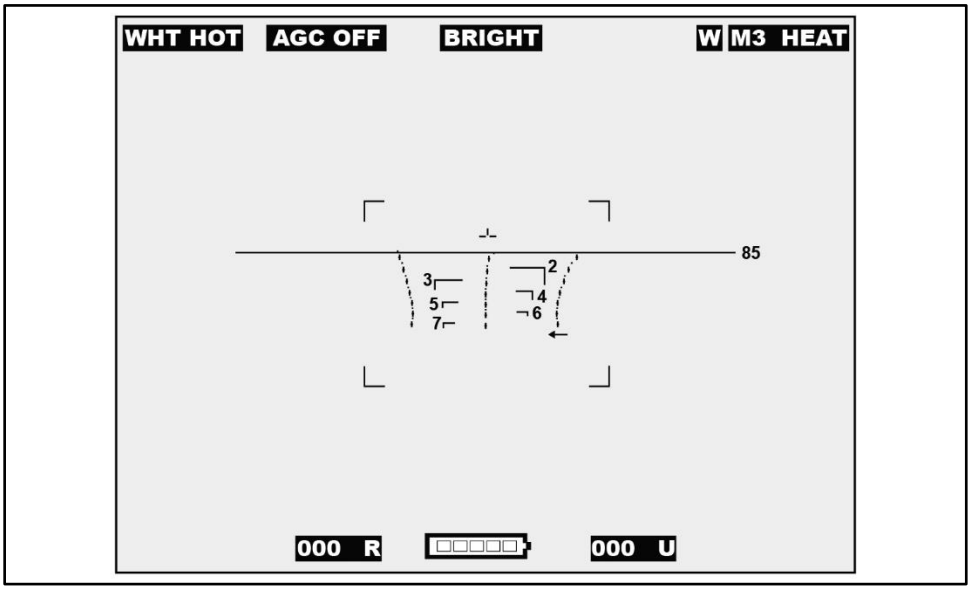


Figure 3-4. Thermal weapon sight reticle

STADIA RETICLE (STADIAMETRIC RETICLE)

3-14. A stadia reticle, or stadiametric reticle, is commonly used in the thermal weapon sight. A stadia reticle enables the gunner to quickly determine 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 standard threat dimensions and the width or height of a viewed dismounted target (see figure 3-5).

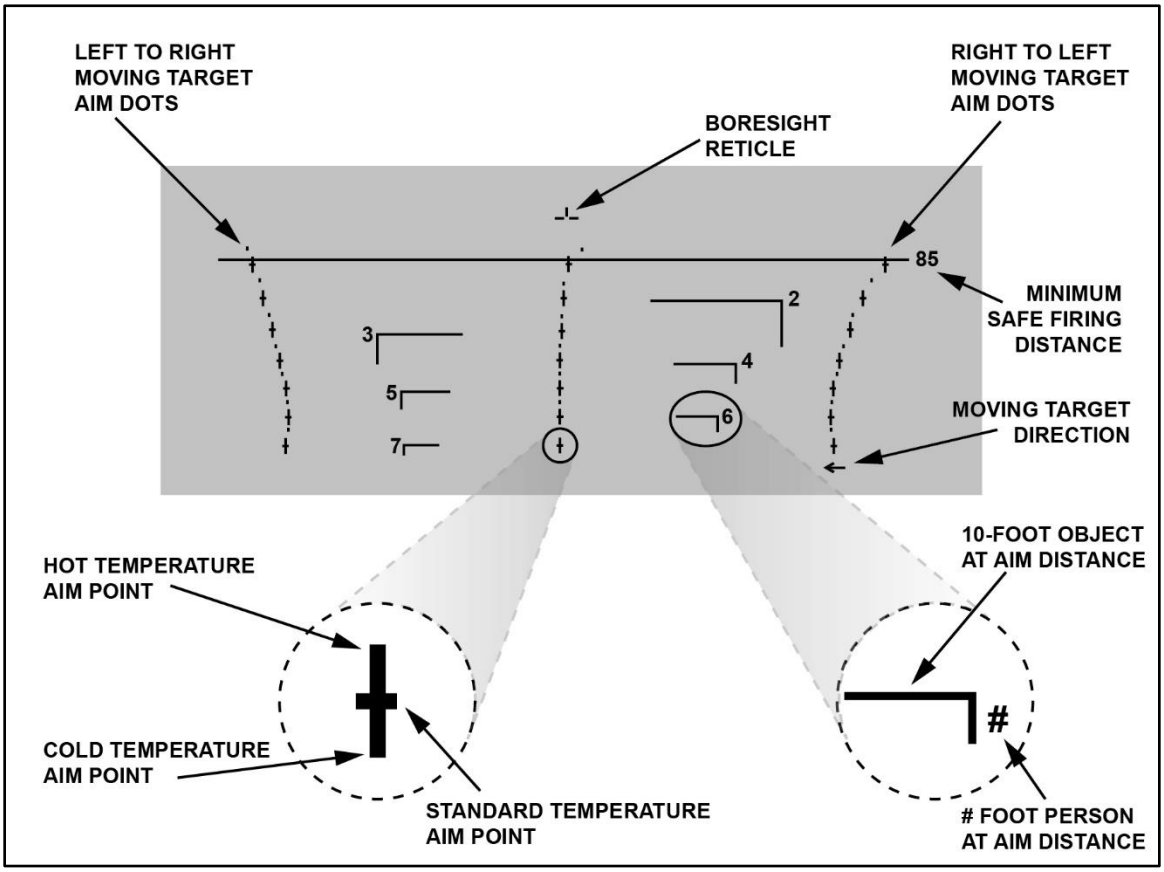
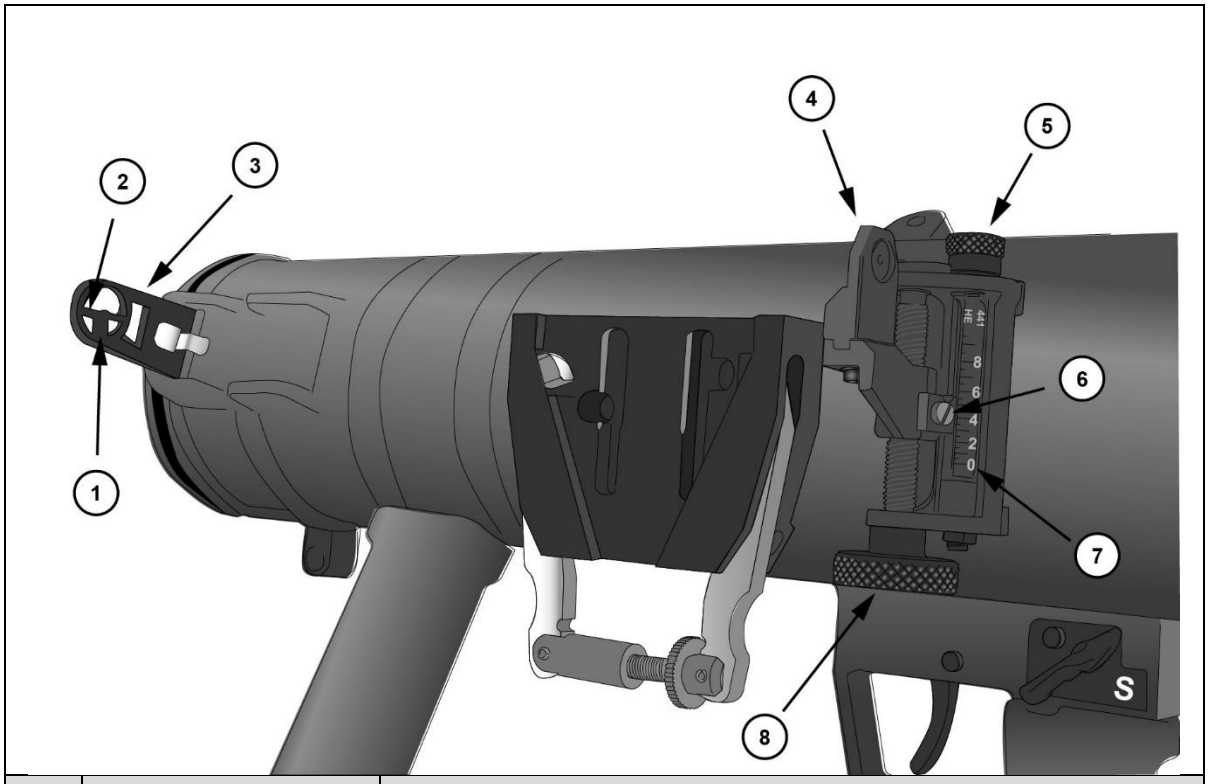


Figure 3-5. Thermal weapon sight aim point for M3 fixed reticle

OPEN SIGHTS

3-15. The open sights consist of the folding front and rear sights (see figure 3-6). The front sight is equipped with a center post and two lead marks. The gunner uses lead marks when firing at moving targets. Refer to appendix C for more information on the application of the lead marks on various ammunition for the MAAWS. The rear sight has a pillar with range scales for different types of ammunition, a range indicator, and a range setting knob.



Item	*Name*	*Description/Function*
1	Center Post	Align with center mass when engaging stationary targets or vehicle travelling towards or away from firer.
2	Lead Marks	Align with center mass for vehicles traveling at 10km/h (6MPH). Align with lead edge of target when vehicle is traveling at 20 km/h (12 mph).
3	Front Sight Aperture Ring	Align edge of front sight aperture ring with center mass if vehicle is travelling at 30 km/h (19 mph).
4	Rear Sight Aperture	Rear sight aperture is used for aiming with open sights. It adjusts left and right for azimuth adjustments when boresighting.
5	Pillar Knob	Pillar assembly is used for ammunition selection.
6	Range Elevation Indicator	Range indicator is used in conjunction with the range scale to select desired target engagement range and adjust round temperature setting.
7	Ammunition Range Scales	Ammunition type is indicated at the top of each range scale. The range scale compensates for ballistics associated with selected ammunition type.
8	Elevation Knob	Elevation knob facilitates elevation adjustment of the rear sight assembly.

Figure 3-6. Open sights

3-16. The range indicator is equipped with a white line and a blue and red index for cold and hot ammunition, respectively (see figure 3-7).

3-17. The gunner achieves range setting in normal temperatures, 32-86 degrees Fahrenheit (0-30 degrees Celsius) by turning the range setting knob until the selected range and the middle white line on the range indicator coincide. The gunner uses the bottom of the white line when the ammunition is colder than 32 degrees Fahrenheit (0 degrees Celsius) and the top of the line if the ammunition is hotter than 86 degrees Fahrenheit (30 degrees Celsius).

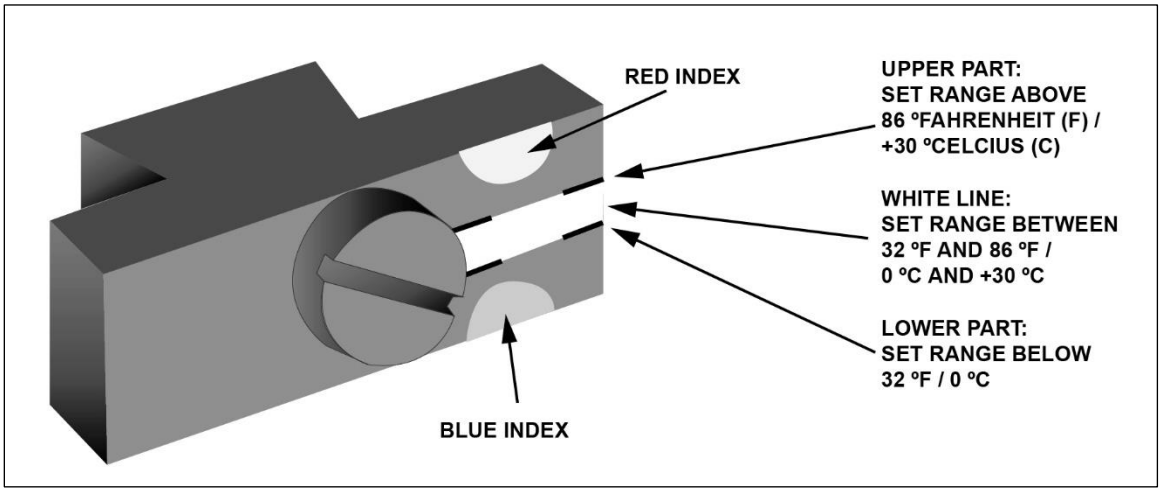
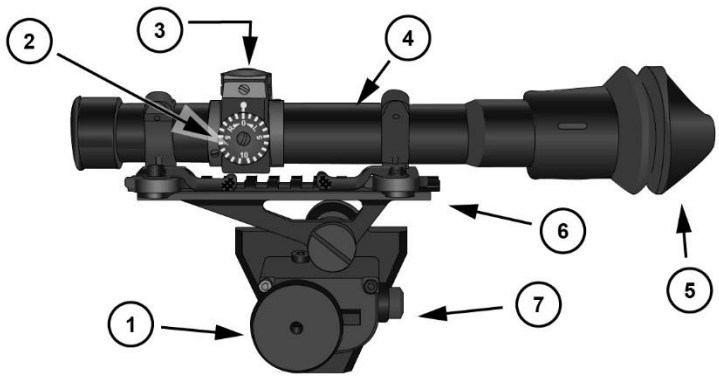


Figure 3-7. Ammunition temperature index, open sights

TELESCOPIC SIGHTS

3-18. The telescopic sight consists principally of a telescope and the PFCD telescope bracket. The gunner uses the V-slide assembly (see figure 3-8 and table 3-1) to mount the PFCD to the weapon. Then, the gunner uses the Picatinny rail of the PFCD to mount the telescope.



Item	*Name*	*Description/Function*
1	Range Setting Knob	Slides in and out to select proper ammunition indicator ring for various rounds and rotates to adjust for range.
2	Azimuth Drum	Used for azimuth adjustments during boresighting.
3	Elevation Drum	Used for elevation adjustments during boresighting and temperature adjustments during firing.
4	Telescope	Provides 3x magnification and a 12 degree field of view.
5	Eye Cup	Used for blocking ambient light during aiming.
6	Picatinny Rail	MIL-STD-1913 rail used for mounting telescopic sight.

Figure 3-8. Telescopic sight

Table 3-1. Telescopic sights data

Telescopic Sights Data	
Description	***Measurement***
Magnification	3 x ± 5%
Field of view	12° (213 mils) ± 5%
Diopter setting	-0.50 –1.0 diopter
Exit pupil	6 mm ± 5%
Eye relief	38 mm ± 5%
Elevation range	0–1000 meters
Length of telescope	9.84 inches (250 mm)
Total weight	2.0 lb (0.90 kg)
Legend: kg – kilograms; lb – pounds; mm – millimeters	

3-19. The telescope is fitted with two adjusting drums that are used for boresighting (see figure 3-9). The azimuth and elevation drums are for adjusting the point of aim in the vertical and lateral direction. The scale on the face of each drum is graduated in mils. The telescope has a magnification of 3x and an FOV of 12 degrees. The reticle is designed for target-center aiming. The reticle is intended for use when firing high-explosive anti-tank (known as HEAT) 551/551C reduced sensitivity (known as RS), high explosive (HE) 441B/441D RS, high-explosive, dual-purpose (known as HEDP) 502 RS, area deterrent munition (known as ADM) 401/401B, SMOKE 469B/C, target practice (known as TP) 552, antistructure munition (known as ASM) 509, and target practice tracer (known as TPT) 141. When firing SMOKE, ADM, and HE rounds, the gunner uses the reticle center post for aiming at different ranges indicated by the range drum. Gunners use lead marks when firing rounds at moving targets.

3-20. The range indicator is equipped with a white line and a blue and red index for cold and hot ammunition respectively (see figure 3-9). To place the correct temperature setting on the telescopic sight, loosen the locking screw and turn the elevation drum so the 0 mark points to the appropriate temperature index. (The 0 mark points to the white index, which equals the boresighted weapon.) Tighten the locking screw.

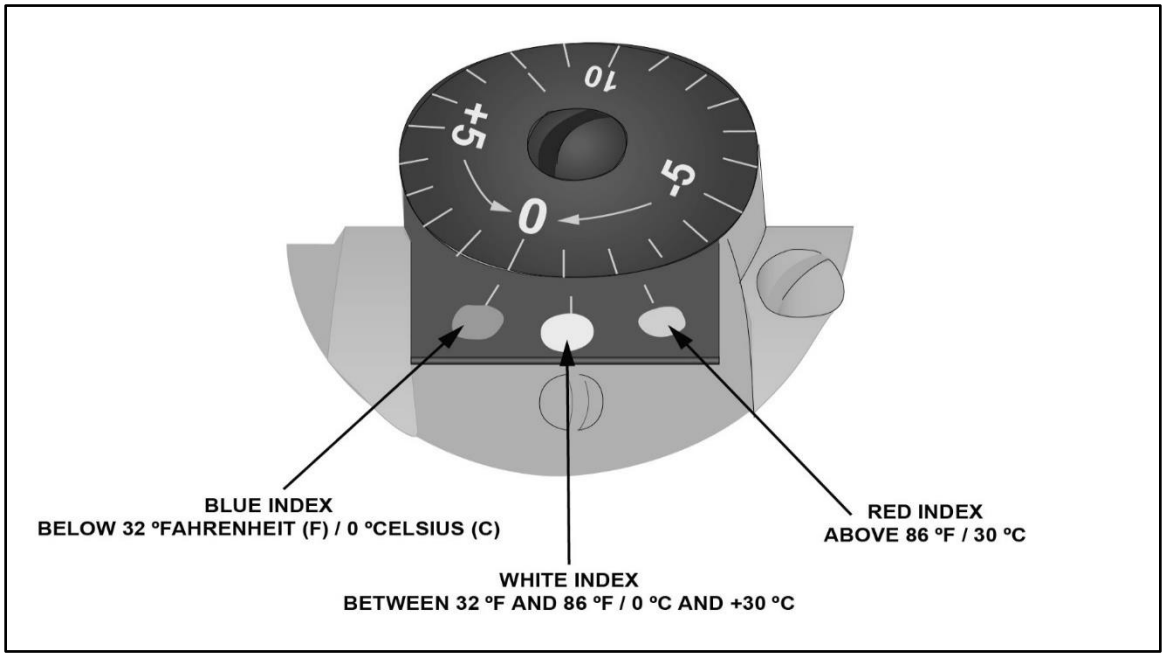


Figure 3-9. Ammunition temperature index, telescopic sights

PICATINNY FIRE CONTROL DEVICE

3-21. The PFCD consists of a MIL-STD-1913 rail for mounting optics, V-slide mounting block, range drum with four preset ammunition settings, and a range setting knob (see figure 3-10 and 3-11). Two luminous grooves form a V on the bottom left-hand side of the PFCD to determine the weapon's proper elevation when firing illumination rounds.

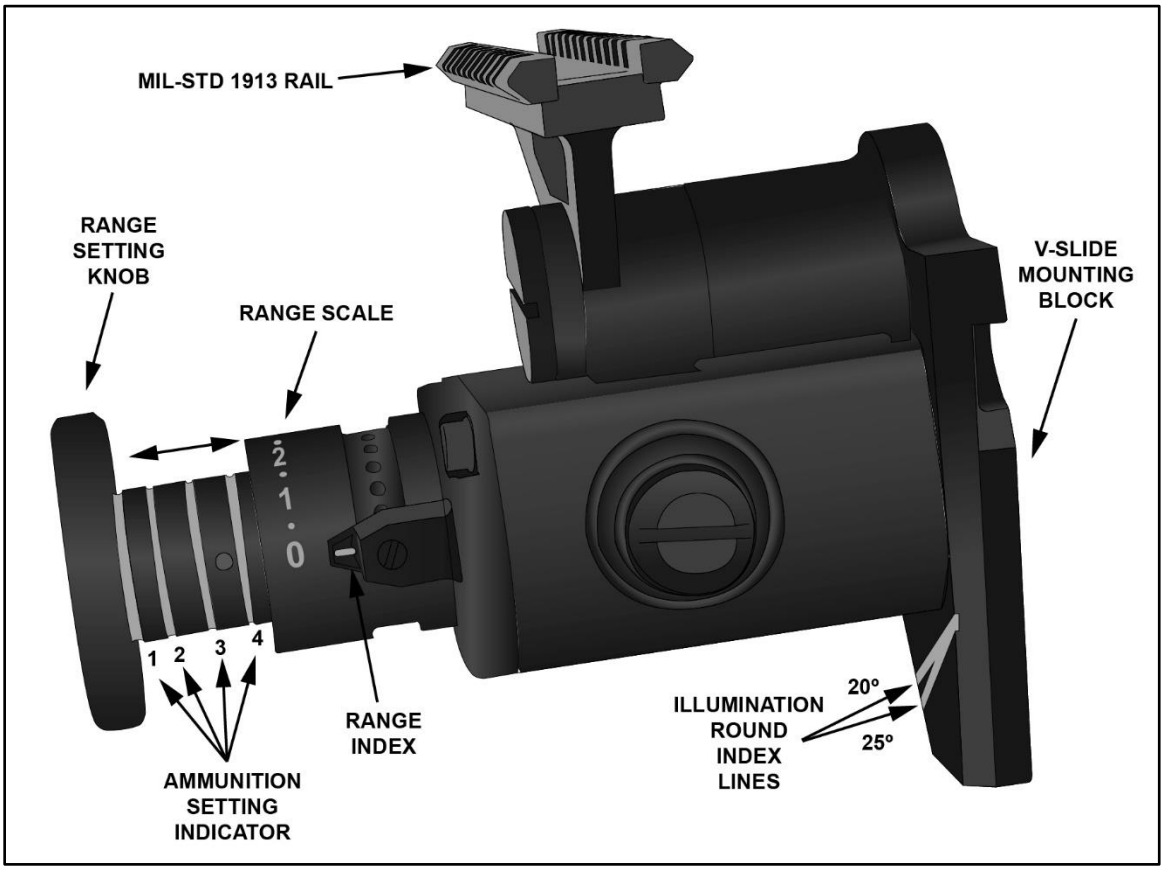


Figure 3-10. Picatinny fire control device

> **CAUTION**
>
> Set range to 0 before adjusting ammunition type on the PFCD. Failure to observe this caution will result in damage to equipment.

3-22. In accordance with TM 9-1015-262-10, to set the range properly for the desired ammunition, the range must be conducted in the following order:

- Set the range drum to 0.
- Pull out the setting knob to align the appropriate ammunition indicator ring with the edge of the range drum for the desired round.

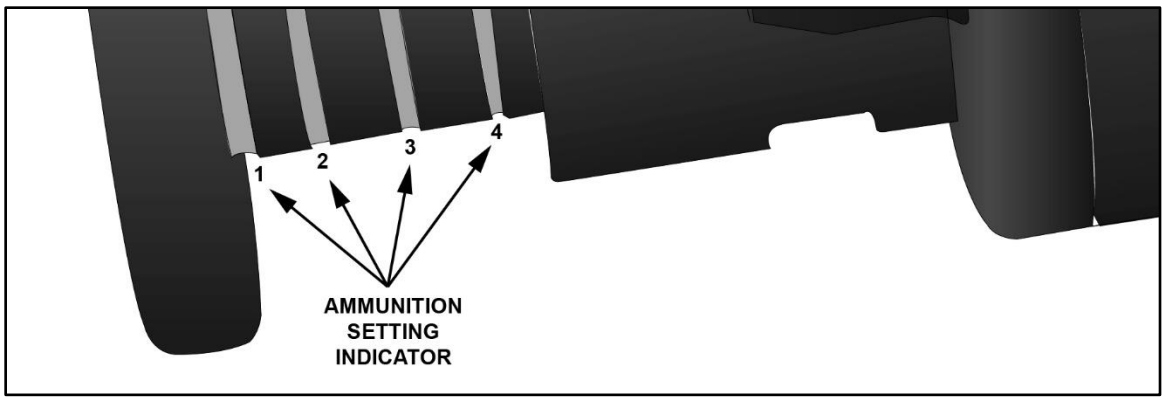


Figure 3-11. PFCD ammunition setting rings

THERMAL SIGHTS

3-23. Thermal sights are target acquisition and aiming sensors that digitally replicate the FOV based on an estimation of the temperature. Thermal sights use advanced forward-looking infrared technology that identifies the IR emitted radiation (heat) of an FOV and translate those temperatures into a gray- or color-scaled image. The thermal weapon sight is capable of target acquisition under conditions of limited visibility, such as darkness, smoke, fog, dust, and haze. The thermal weapon sight operates during the day and night.

3-24. The thermal weapon sight is composed of five functional groups (see figure 3-12, page 3-14):

- Objective lens. The objective lens receives IR light emitting from an object and its surroundings. The objective lens magnifies and projects the IR light.
- Detector assembly. The detector assembly senses the IR light and converts it to a video signal.
- Sensor assembly. The sensor assembly processes the video for display on the liquid crystal display (LCD) array in the FOV.
- LCD array and eyepiece. The LCD array and eyepiece provides the IR image along with the reticle selected. The light from the LCD array is at the eyepiece.
- User controls. The user controls allow the user to interface with the device to adjust contrast, thermal gain, sensitivity, reticle display, and magnification.

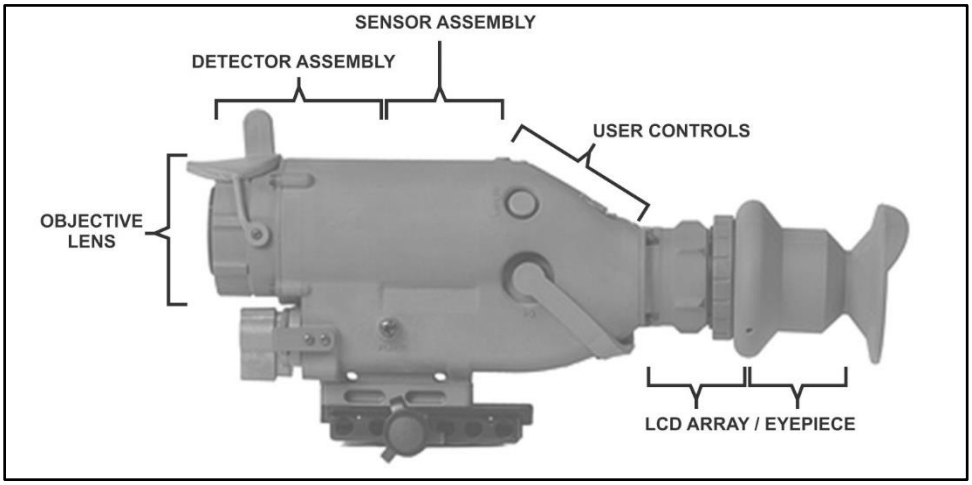


Figure 3-12. Thermal sight weapon

3-25. Thermal sensors or optics use a small detector to identify IR radiation with wavelengths between 3 and 30 um (micrometer). The thermal optic calculates and processes the thermal scene into a correlating video image signal based on the temperature identified. The optics can differentiate thermal variations of one degree Celsius of the viewable scene. The 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

3-26. There are several versions of weapon thermal sights available. Soldiers must be familiar with the specific model and version of their assigned weapons' thermal sight and be knowledgeable on the specific procedures for alignment and operation. The various models and versions, listed below, are identified in their official model nomenclature:

- Version 1 (v1) – Light Weapons Thermal Sight.
- Version 2 (v2) – Medium Weapons Thermal Sight.
- Version 3 (v3) – Heavy Weapons Thermal Sight.

3-27. Weapons thermal sights are silent, lightweight, and compact. They have durable, battery powered IR imaging sensors that operate with low battery consumption (see figure 3-13).

VERSION		
Light Weapon Thermal Sight (LWTS)	***Medium Weapon Thermal Sight (MWTS)***	***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)
AN/PAS-13F (v1)	AN/PAS-13F (v2)	AN/PAS-13F (v3)
AN/PAS-13G (v1)	AN/PAS-13G (v2)	AN/PAS-13G (v3)

Figure 3-13. Weapon thermal sights by version

Advantages

3-28. Military grade, weapon thermal 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 meantime between failures.
- Quiet. The lack of a cooling element allows for a low operating noise level.
- One optic fits on multiple weapons. The use of the adaptive rail system, rail-mounting bracket allows Soldiers to use the same optic on other weapons.
- The F and G models attach in front of other aiming devices to improve their capabilities and to eliminate the devices' zeroing procedures.

Disadvantages

3-29. Military grade weapon thermal sights have limitations that Soldiers should take into consideration, particularly during combat operations. The primary disadvantages are:

- Cannot interpret (see multispectral IR). 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 using common nonrechargeable (alkaline) batteries, typically, a separate battery adapter is required.
- Cannot interpret thermal signatures behind glass or water effectively.
- Cannot always detect friendly marking systems worn by dismounts.
- Thermal sight has a wide field of view (known as WFOV) and a narrow field of view (known as NFOV) (see figures 3-14 and 3-15, page 3-14).

Thermal Weapon Sight Reticles

3-30. The thermal weapon sight provides various reticles corresponding to the weapon it is used on. The thermal weapon sight provides reticles for both the WFOV and the NFOV.

Reticle Selection

3-31. Reticle selection is based on the weapon being used, and in the case of the M3, the ammunition used. The FOV setting determines whether the NFOV or the WFOV reticle is displayed.

Reticle Position

3-32. To zero the thermal weapon sight, the Soldier repositions the aiming features of the reticle on the display. The position of the reticle is adjustable in windage and elevation and is shown on the display. The most recent position is stored in the memory and is retained when the power is removed.

Reticle Indicators

3-33. The NFOV area indicator (see figure 3-14, page 3-14) is used on all thermal weapon sight's WFOV reticles. Four corners of the NFOV area indicator (see figure 3-15, page 3-14) outline the area of the thermal scene that is magnified when the FOV is set to the NFOV.

Zeroing Aim Line, Aim Point, and Angular Measurements

3-34. The two longest horizontal lines to the left and right of the zeroing aim point are known as zeroing aim lines. Zeroing aim lines serve the two purposes below:

- For reticles with multiple aim points, zeroing indicates which aim point to use when zeroing the thermal weapon sight.
- For angular measurements that can be determined from the zeroing aim line and aim point (see figures 3-14 and 3-15, page 3-14). Zeroing serves as a means of measuring angles for combat preparations, directing fire, or range estimation.

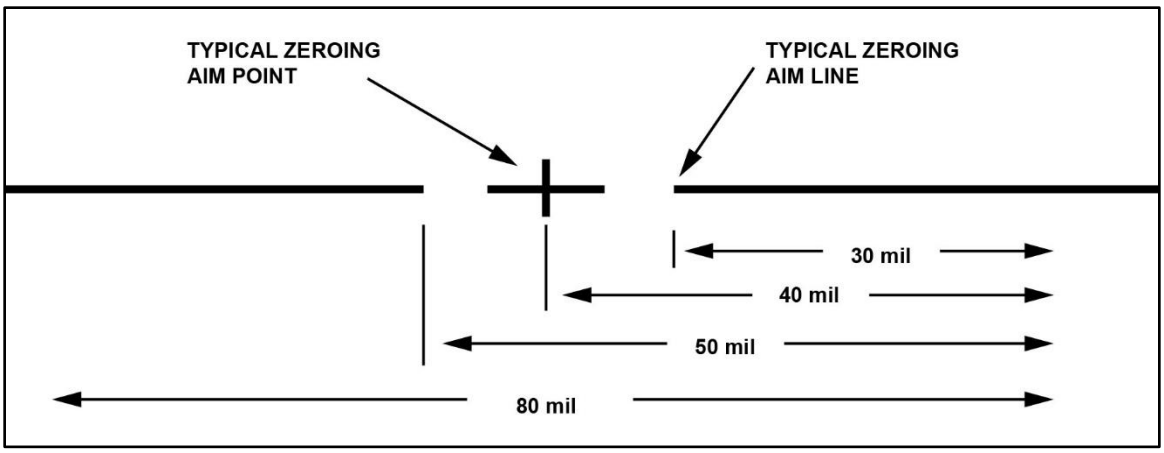


Figure 3-14. Angular measurements using zeroing aim line and aim point, WFOV reticle

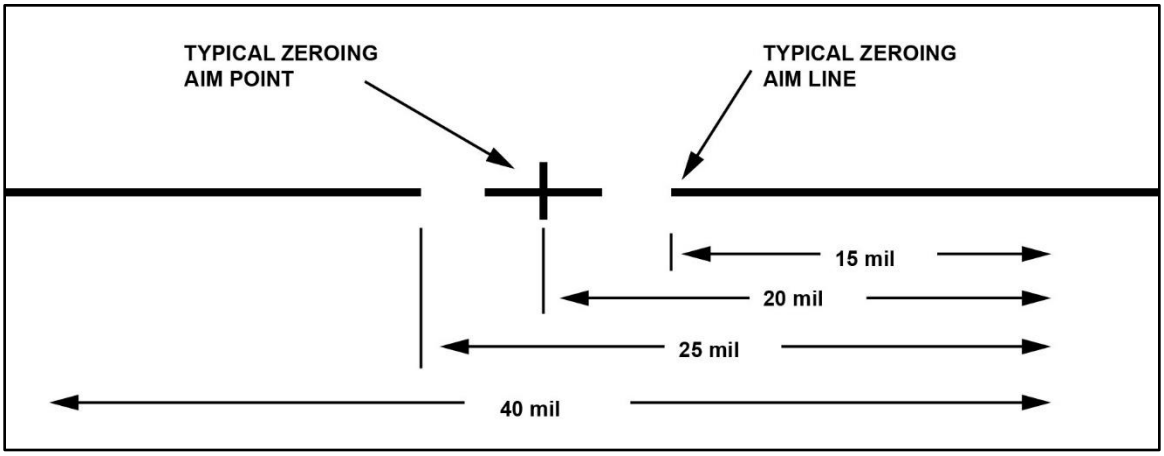


Figure 3-15. Angular measurements using zeroing aim line and aim point, NFOV reticle

Modular Ballistic Solution Reticle

3-35. The modular ballistic solution allows the thermal weapon sight to be used with the AN/PSQ 23, small, tactical, optical rifle—mounted (known as STORM) on the M3 MAAWS for quicker, accurate target engagements. Only the STORM laser point is visible until the target has been lased, then the integrated thermal weapon sight reticle appears and moves to a compensated aiming point based on the distance lased by the STORM and round choice. For further information on the thermal weapon sight and the STORM as a system, refer to TM 9-1015-262-10.

3-36. The STORM ranging reticle (see figure 3-16) is in a fixed location near the display center. The M3 target reticle appears once the target is lased. There is a chance that the reticle may not be usable in the NFOV. The ranging reticle is identified in the WFOV (see figure 3-16) by the reticle being outside the NFOV indicator brackets. In the NFOV (see figure 3-17), the ranging reticle can be identified by the reticle blinking at the edge of the display. If either occurs, the target has to be engaged in the WFOV.

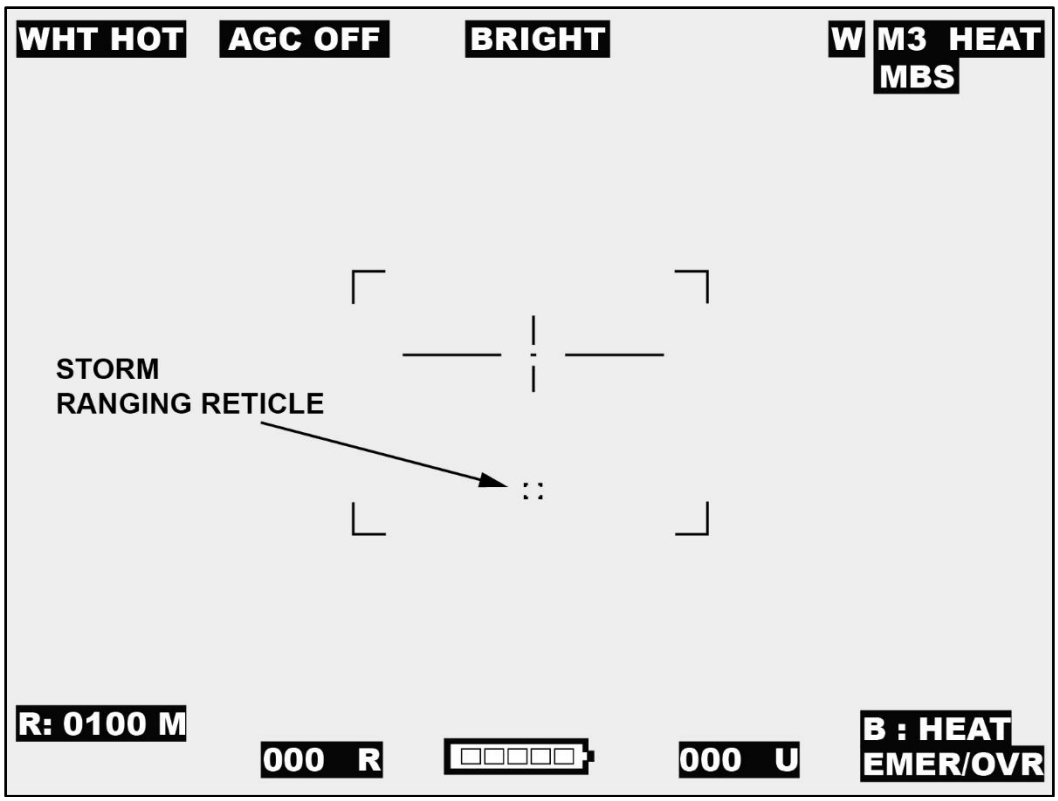


Figure 3-16. Modular ballistic solution reticle, WFOV

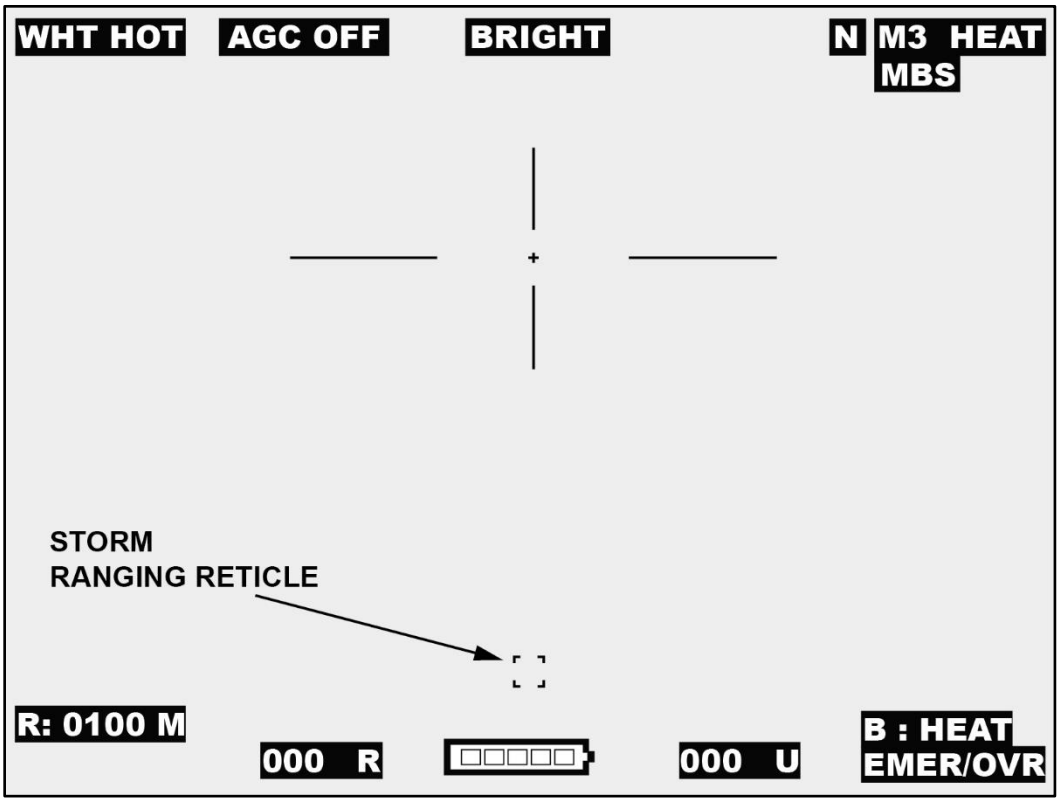


Figure 3-17. Modular ballistic solution reticle, NFOV

M3 Fixed Reticles

3-37. Five reticles are available for use with select M3 rounds. The M3 reticles provide multiple aim points used for target firing (see figure 3-18). Each aim point is used at different ranges. Range, in meters, used for specific aim points is indicated beside each range estimation line (example: 6 = 600 meters). Aim points are provided at 50-meter intervals. The vertical range estimation line reflects the height of a 5-foot man at a specified range. The horizontal range estimation line reflects the width of a 10-foot tank at a specified range.

Note. M3 fixed reticles are for use without STORM integration.

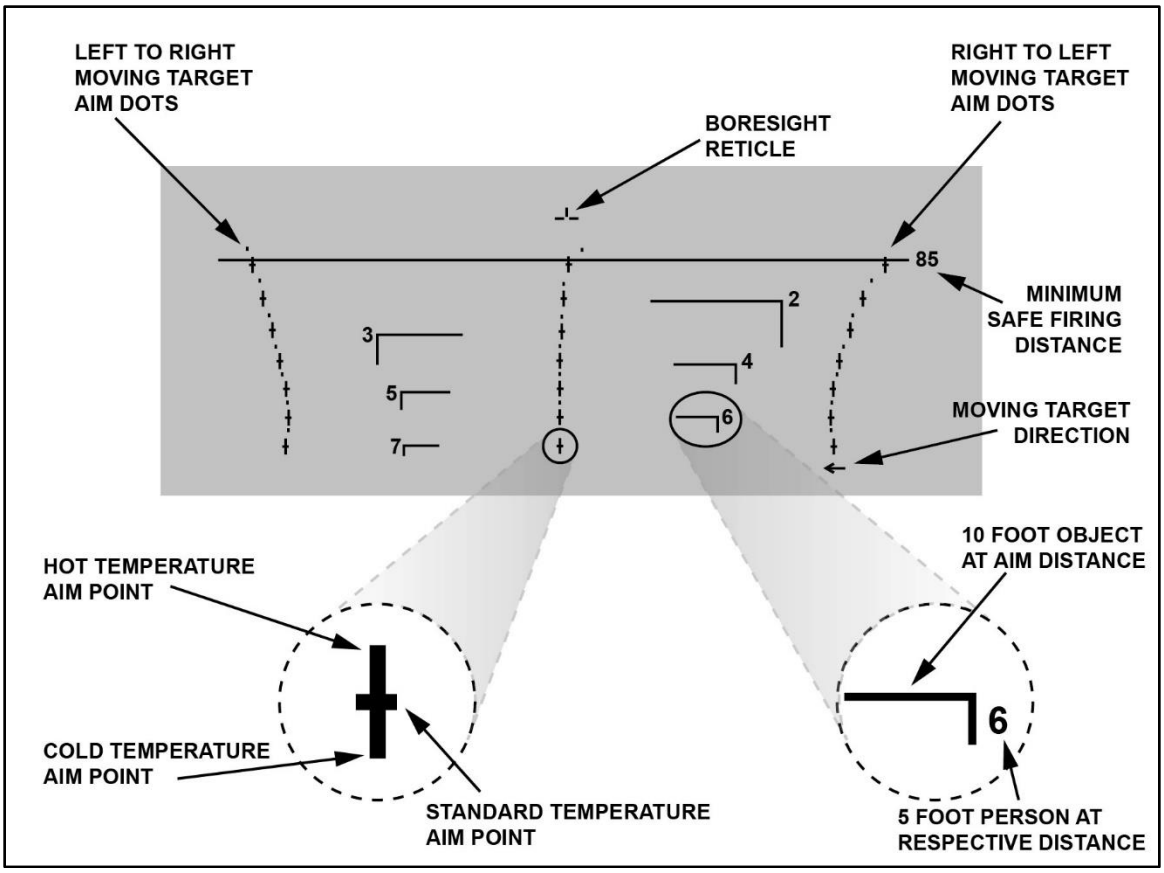


Figure 3-18. Thermal weapon sight aim point for M3 fixed reticle

Note. Reticles shown for HEAT ammunition (see figures 3-19 and 3-20). Reticles for the HE, HEDP, and ASM ammunition choices are similar with the exception of aim point spacing due to differences in bullet drop.

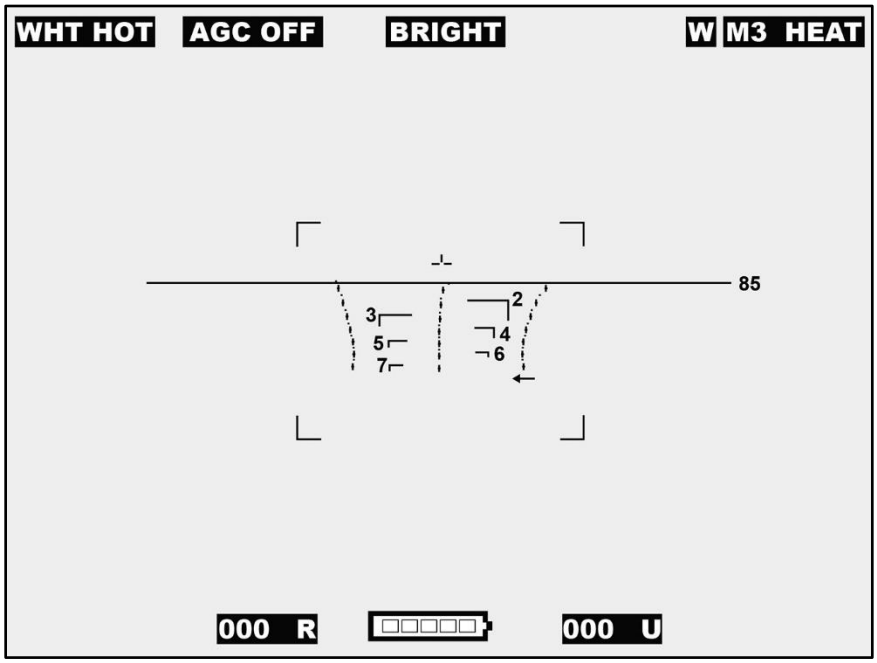


Figure 3-19. M3 HEAT reticle, WFOV

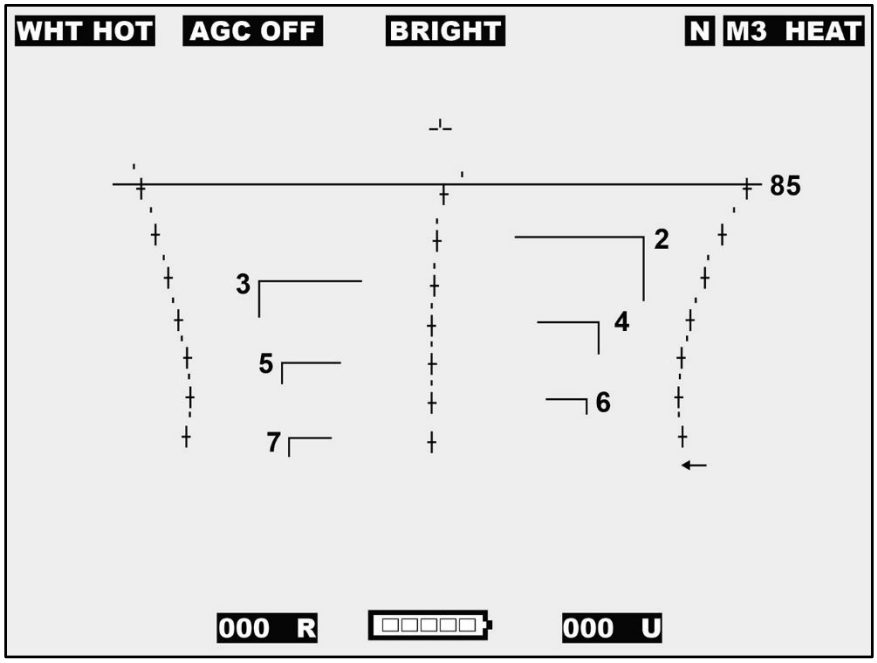


Figure 3-20. M3 HEAT reticle, NFOV

POINTERS, ILLUMINATORS, AND LASERS

3-38. 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 user activates the laser by a selector switch on the device or by a remote mechanism installed on the weapon. The basic two modes or functions are the pointer and illuminator.

Pointer

3-39. When used as a pointer or aiming device, a small, pin-point beam emits from the device. The IR beam provides an IR visible point when it strikes an object or target. The IR beam operates in the 400- to 800-nanometer wavelength and can be seen only by image intensifier optics, such as the AN PVS-7 or -14 night vision devices.

Illuminator

3-40. Typically, the illuminator is used to illuminate a close quarters area as an IR flood light. The illuminator provides a flood-light effect for the Soldier when used in conjunction with image intensifier night vision devices.

Note. Laser is an acronym for light, amplified, stimulated, emitted radiation, but is predominantly used as a proper noun.

3-41. The AN/PSQ-23 and AN/PSQ-23A is the authorized illuminator for the M3 MAAWS. For further information, refer to TM 9-5855-1913-13&P and TM 9-5855-1920-13&P (see figure 3-21).

3-42. The following are the STORM's characteristics, capabilities, and features:

- Characteristics. STORM is a battery operated, laser range finder and digital magnetic compass with integrated multifunction lasers.
- Capabilities. The STORM's laser range finder and digital magnetic compass may be used in combination to obtain accurate positioning information for targeting purposes and other tactical applications.
- Features. When weapon mounted, the visible aim laser enables the STORM to coalign with existing optics; and the IR illuminator and IR aim laser facilitate target acquisition and aiming in low ambient light conditions.

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	1 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 and ILLUM operates on high power		
DH	DUAL HIGH	IR and ILLUM both operate on high power		
BUTTON	**MODE**	**REMARKS**		
L	Laser Activate	Activates aiming laser		
R	Range/Compass	Press and hold 3 seconds to enter menu mode		
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; g – grams; in – inches; ILLUM – illuminator; IR – infrared; mRad – milliradians; nm – nanometers; oz – ounces				

Figure 3-21. Technical data, AN/PEQ23

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Chapter 4
Employment

The primary role of the M3 MAAWS gunner is to engage a target with a well-aimed shot. Consistently hitting a target with precision is a complex interaction of factors immediately before, during, and after firing the round. The 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.

FIRING EVENTS

4-1. Every Soldier must adapt to their environment, integrate the rules of firearms safety, manipulate the fire control, and instinctively know when, how, and where to shoot. The Soldier's ability to hit the target under conditions of extreme stress rely upon the following:

- Interpreting and acting upon perceptual cues related to the target, front and rear sights, weapon movement, and body movement.
- Executing minute movements of the hands, elbows, legs, feet, and cheeks.
- Coordinating gross motor control of their body positioning with fine motor control of their trigger finger.

4-2. The Soldier's goal when shooting is to fire well-aimed shots, regardless of the weapon system. The Soldier must properly point the weapon (sight alignment and sight picture), and fire the weapon without disturbing the aim. Soldiers must master sight alignment, sight picture, and trigger control as follows:

- 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. Trigger control is the skillful manipulation of the trigger that causes the weapon to fire without disturbing the aim.

SHOT PROCESS

4-3. 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. Soldiers may interrupt the shot process at any point before the sear disengages and fires the weapon should the situation change. The shot process has three distinct phases:

- Pre-shot.
- Shot.
- Post-shot.

4-4. Soldiers must understand and correctly apply the shot process to achieve consistent, accurate, well-aimed shots. The sequence of the shot process does not change; however, the application of each element varies based on the conditions of the engagement. Every shot that the Soldier fires has a complete shot process.

4-5. 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.

4-6. The level of attention allocated to each element during the shot process is proportional to the conditions of each individual shot. Table 4-1 provides an example of a shot process.

Table 4-1. Shot process, example

Pre-shot	Position
	Natural point of aim
	Sight alignment and 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

4-7. Functional elements of the shot process are the linkage between the Soldier, the weapon system, the environment, and the target that directly affects the shot process and ultimately the consistency, accuracy, and precision of the shot. When used appropriately, they build a greater understanding of any engagement. The functional elements are interdependent. An accurate shot, regardless of the weapon system, requires the Soldier to establish, maintain, and sustain all of the four functional elements defined below:

STABILITY

4-8. The Soldier stabilizes the weapon to provide a consistent base to fire from and maintain through the shot process until the recoil pulse ceases. The 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

4-9. Aim is 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

4-10. Control entails all the conscious actions of the Soldier before, during, and after the shot process that the Soldier can control. The first of which is trigger control. This includes whether, when, and how to engage. Control incorporates the Soldier as a safety function, as well as the ultimate responsibility of firing the weapon.

MOVEMENT

4-11. Movement is the process of the Soldier moving during the engagement process. Movement 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.

Note. For the M3 MAAWS, the gunner's primary focus is on the first three functional elements of the shot process. The gunner fires the MAAWS from a stabilized firing position described in chapter 5.

4-12. The functional elements define the tactical engagements that require the Soldier to make adjustments to determine appropriate actions, and compensate for external influences on their shot process. Soldiers can rapidly engage targets when all the functional elements are applied. The shooter must consider the functional elements of time, target size, target distance, and their own skills and capabilities to minimize induced errors of the shot.

4-13. Each weapon, tactical situation, and sight system has preferred techniques for each step in the shot process and within the functional elements to produce precision and accuracy in a timely manner. Target size, target distance, and the firer's capability determine how fast or slow the firer progresses through the process.

4-14. The most complex form of shooting is under combat conditions when the Soldier and the enemy is moving under limited visibility conditions. Soldiers and leaders must refine their skills continuously and move training from the simplest engagement 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. Each of the functional elements and the Soldier's actions to consider during the shot process are described later in this manual.

TARGET ACQUISITION

4-15. Target acquisition is a critical Soldier function before any shot process begins. The Soldier must 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, which are—

- Detect potential threats (target detection).
- Identify the threat as friend, foe, or noncombatant (target identification).
- Prioritize the threat based on the level of danger they present (target prioritization).

TARGET DETECTION

4-16. Soldiers must master a series of skills to perform effective target detection. Detection is an active process during combat operations with or without a clear or known threat presence. The Soldier's detection skills enable all engagements and are built upon the following three skill sets:

- Scan and search, which is a rapid sequence of various techniques to identify potential threats. A Soldier uses their scanning skills to determine potential areas where threats are most likely to appear.
- Acquire, which is a refinement of the initial scan and search based on irregularities in the environment.
- Locate is the Soldier's ability to determine the general location of a threat and to engage with accuracy or to inform the small-unit leader of contact with a potential threat.

Scan and Search

4-17. 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. Environment irregularities include irregular shapes, colors, heat sources, movement, or actions the Soldier perceives as being out of place as compared to the surrounding area.

4-18. Soldiers use the following five basic search and scan techniques to detect potential threats in combat situations:

Rapid Scan

4-19. Soldiers use rapid scan to detect obvious signs of threat activity quickly. Rapid scan is usually the first method used, whether on the offense or fighting in the defense.

Slow Scan

4-20. Soldiers conduct the more deliberate scan using various optics, aiming devices, or sensors if they do not detect any threats during the rapid scan. The slow scan is best conducted in the defense or during slow movement or tactical halts.

Horizontal Scan

4-21. Soldiers use horizontal scan when operating in restricted or urban terrain. A horizontal scan is a horizontal sweeping scan that focuses on key areas where potential threats may be overwatching their movement or position.

Vertical Scan

4-22. The vertical scan is 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

4-23. Soldiers use a detailed search 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

4-24. 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.

4-25. During the scan and search, Soldiers are looking for target signatures, which are signs or evidence of a threat. Tactically, Soldiers look for threat personnel and obstacles (including explosive hazards such as mines, unexploded ordnance, and improvised explosive devices), vehicles, or antitank missile systems. Soldiers can identify these target signatures by sight, sound, or smell.

Locate

4-26. Target location is the determination of where a target is in the operational environment in relation to the firer, 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.

4-27. Once a target is located, the Soldier can rapidly and efficiently communicate the threat location 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.

Detection Best Practice

4-28. 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 image intensifiers and thermal optics in tandem during limited visibility.
- Understand the difference between image intensifiers and thermal optics, what they can see and what they cannot.
- Thermal optics are the preferred sight for target acquisition and engagement, day or night.
- Do not 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, and nuclear environment. Practice detection skills with personal protective equipment and individual protective equipment, and understand the constraints and limitations, day and night.

TARGET IDENTIFICATION

4-29. Identifying (or discriminating) a target as friend, foe, or noncombatant (neutral) is the second step in the target acquisition process. The identification process is complicated by the increasing likelihood of having to discriminate between friend or foe and combatant or 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.

Classifications

4-30. The Soldier must be able to positively identify the threat as one of the following three classifications:

Friend

4-31. Any force, United States or allied, that is jointly engaged in combat operations against an enemy of the United States in a theater of operation.

Foe (Enemy Combatant)

4-32. Any individual who has engaged in acts against the United States or its coalition partners in violation of the laws and customs of war during an armed conflict.

Noncombatants

4-33. Personnel, organizations, or agencies that are not taking a direct part in hostilities. Noncombatants include individuals such as medical personnel, chaplains, United Nations observers, media representatives, or those out of combat such as the wounded or sick. The Red Cross and Red Crescent are examples of organizations classified as noncombatants.

Fratricide Prevention

4-34. Units have other means of designating friendly vehicles from enemy vehicles. Typically, Soldiers derive these marking systems from the unit tactical SOP or other standardization publications and apply them to the personnel, small units, or vehicles as required.

Markings

4-35. The unit SOP defines unit markings. They distinctly identify a vehicle as friendly in a standardized manner.

Panels

4-36. Visual signal 17 (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

4-37. Soldiers use chemical or light emitting diode lights to mark 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

4-38. Beacons and strobes are unit-procured, small-scale, compact, battery-operated, flashing devices that operate in the near IR wavelength. They are clearly visible through night vision optics but Soldiers cannot view them through thermal optics.

Note. Beacons and strobes generate illumination signals that Soldiers can only view with image intensifier optics. Soldiers cannot view the signal with 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.

Enemy elements with night vision capabilities have the potential to view beacons and strobes. . Units should tailor use of the beacon based on mission, enemy, terrain and weather, troops and support available, time available, and civil considerations.

Symbols

4-39. Soldiers may use unit symbols to mark friendly vehicles. An inverted V, for example, painted on the flanks, rear, and front of a vehicle aid in identifying a target as friendly. Soldiers typically apply symbols 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

4-40. The Soldier must prioritize each target and carefully plan their burst to ensure successful target engagement when faced with multiple targets. The keys to a successful engagement of multiple targets are the Soldier's mental preparedness and the ability to make split-second decisions. The proper mindset allows the Soldier to react instinctively and control the pace of the battle rather than reacting to the adversary threat.

Threat Levels

4-41. 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 cannot defeat the friendly force, but can coordinate with other threats that are more prepared. Least dangerous targets are defeated after all threats of a higher threat level are defeated.

Multiple Targets

4-42. When Soldiers encounter multiple targets of the same threat level, they prioritize the targets according to the threat they represent. The standard prioritization of targets establishes the order of engagement. Firers engage similar threats using the following guide:

- Near before far.
- Frontal before flank.
- Stationary before moving.

4-43. The prioritization of targets provides a control mechanism for the firer, and facilitates maintaining overmatch over the presented threats. Firers should prepare to deviate from the prioritization guide based on the situation, collective fire command, or changes to the target's activities.

Chapter 5
Stability

Stability is the ability of the Soldier to create a stable firing platform for the engagement. The gunner 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 gunner holds the weapon and their posture during an engagement. A stable firing platform is essential during the shot process.

Chapter 5 provides the principles of developing a stable firing platform, describes the interaction between the gunner, weapon, the surroundings, and the methods to achieve the greatest amount of stability in various positions. Chapter 5 explains how the stability functional element supports the shot process and interacts and integrates with the other three elements. Stability provides a window of opportunity to maintain sight alignment and sight picture for the most accurate shot.

SUPPORT

5-1. Four functions provide stability: Support, muscle relaxation, natural point of aim, and recoil management. These functions provide the Soldier with the best means to stabilize their weapon system during the engagement process.

5-2. The majority of the support comes from a combination of the weapon bi-pod if used, the firer's worn equipment and muscles. The more support a particular position provides, the more stable the weapon. The following paragraphs describe the principles of firing positions.

LEG POSITION

5-3. 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 in the standing position, the body is upright with the legs staggered and knees slightly bent. In the prone position, the gunner's legs must be at a 30-degree angle (minimum) away from the venturi of the weapon with the right foot on top of the left ankle. In the sitting position, the legs serve as an intricate part of the firing position.

STANCE AND CENTER OF GRAVITY

5-4. Stance and center of gravity is the physical position of the gunner before, during, and after the shot that relates to the gunner's balance and posture. The position and center of gravity does not apply when the gunner is firing from the prone position. The position and center of gravity specifically relates to the Soldier's ability to maintain the stable firing platform during firing, absorbing some of the recoil impulses during the shot process.

FIRING ELBOW

5-5. The Soldier must place their firing elbow properly during the shot process. Proper elbow placement provides consistent support stability while standing, sitting, kneeling, and in the prone position during the shot process.

NONFIRING ELBOW

5-6. The Soldier's placement of the nonfiring elbow during the shot process supports the M3 MAAWS in all positions. Soldiers must use their nonfiring elbow and firing elbow to stabilize the weapon when firing.

FIRING HAND

5-7. Proper placement of the firing hand aids in trigger control. The Soldier places the pistol grip in the 'V' formed between their thumb and index finger. The pressure applied is similar to a firm handshake grip. Different Soldiers have different size hands and length of fingers, so there is no set position of the finger on the trigger. To grip the weapon, the Soldier places the back of the weapon's pistol grip high in the web of their firing side hand between the thumb and index (trigger) finger. The Soldier indexes their trigger finger on the trigger assembly leaving the trigger finger outside of the trigger guard until ready to fire. The Soldier grasps the pistol grip with their remaining fingers ensuring there is no gap between their middle finger and the trigger guard.

NONFIRING HAND

5-8. The firer places their nonfiring hand firmly on the front grip. The gunner's ability to maintain a firm hold on the front grip and with the support of the nonfiring elbow maximizes the gunner's stability during the shot process.

NATURAL POINT OF AIM

5-9. The natural point of aim is the point where the barrel naturally orients when the firer's muscles are relaxed and support of the weapon system 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 firer's body on the ground equals a more stable position with less mobility.

5-10. 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 their 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.

5-11. To check a firer's natural point of aim, the Soldier should assume a good, steady position and get to the natural pause. Soldier's should 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 the 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 repeats this process until the natural point of aim is on the point of aim on the target.

SHOOTER-GUN ANGLE

5-12. The shooter-gun angle is the relationship between the shooters upper body and the direction of the weapon. Typically, this angle is different from firing position to firing position and directly relates to the Soldier's ability to control recoil. Significant changes in the firer-gun angle can result in eye relief.

FIELD OF VIEW

5-13. The FOV is the extent that the human eye can see at any given moment. The FOV is the Soldier's view without using magnification, optics, or thermal devices. The FOV is what the Soldier sees and includes the areas where the Soldier can detect potential threats.

CARRY POSITIONS

5-14. There are four primary carry positions. The leader may direct these positions or the Soldier may assume the positions based on the tactical situation. The primary positions are—

- Stowed carry.
- Sling carry.
- Low ready.
- Ready. Standing, kneeling, sitting, and prone (discussed in paragraphs 5-29 through 5-32).

STOWED CARRY

5-15. Soldiers use the stowed carry position when an immediate threat is unlikely (see figure 5-1). In the stowed carry, the weapon is mounted and secured on the Soldier's rucksack or weapon carrying case according to the unit SOP. The weapon status is GREEN.

5-16. In the stowed carry position, the Soldier's mobility and flexibility is limited to their capability and the constraints of the weapon system they are carrying. The Soldier maintains positive control of the M3 MAAWS and their primary weapon.

Carry position	***Stowed carry***
When used	No immediate threat is likely or present. Used to maintain positive control of the weapon system.
Command	"Assume stowed carry."
Advantages	Provides Soldier with some mobility while maintaining positive control of Soldier's primary weapon.
Disadvantages	Mobility limited to Soldier's abilities and constraints of mounted weapon.

Figure 5-1. Stowed carry

SLING CARRY

5-17. The sling carry is used when an immediate threat is likely or suspected (see figure 5-2). In the sling carry, the weapon is unstowed from the ruck or weapon carrying case. The Soldier slings and secures their weapon in a manner that does not hinder their use of their primary weapon or tactical movement. The weapon status is GREEN.

5-18. In the sling carry position, the Soldier's mobility and flexibility is limited to their capability and the constraints of the weapon system they are carrying. The Soldier maintains positive control of the M3 MAAWS and their primary weapon.

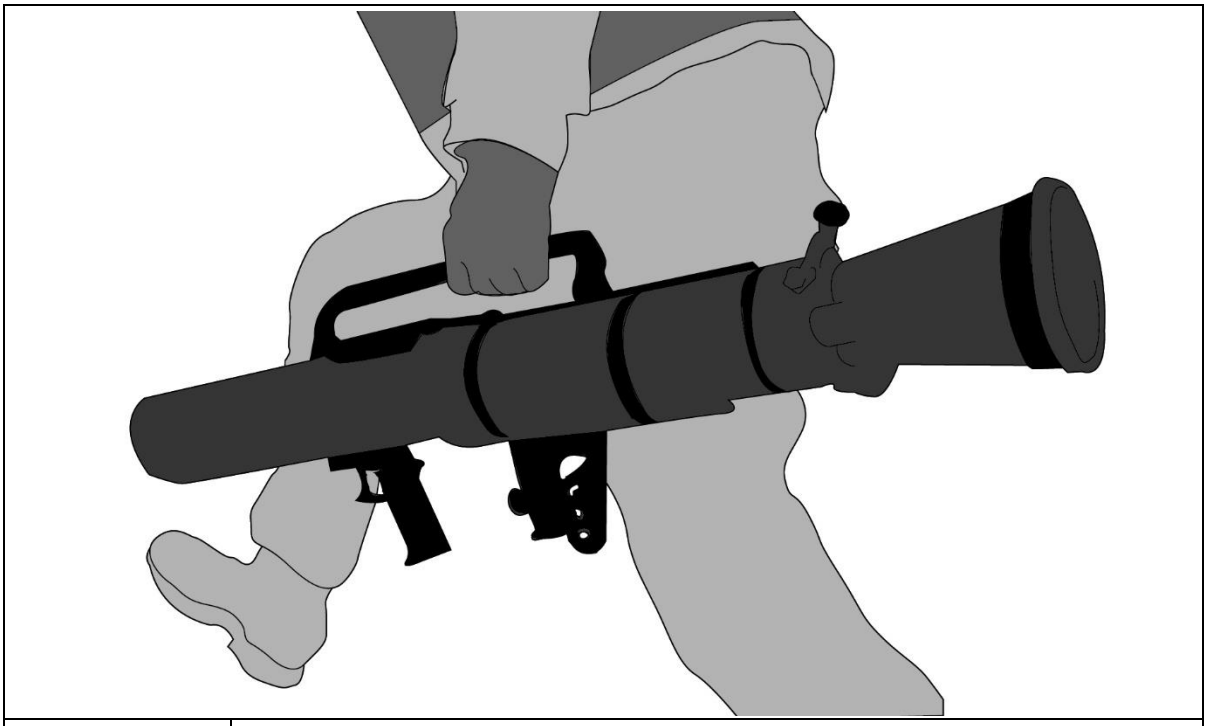
Carry position	Sling carry.
When used	Immediate threat is likely or suspected. Used to maintain positive control of the weapon system.
Command	"Assume sling carry."
Advantages	Provides Soldier with some mobility while maintaining positive control of Soldier's primary weapon.
Disadvantages	Mobility limited to Soldier's abilities and constraints of the slung weapon.

Figure 5-2. Sling carry

LOW READY

5-19. Soldiers use the low ready (see figure 5-3) when a greater degree of readiness to respond to threats or when weapon retention is necessary. In the low ready, the weapon is un-slung, and the Soldier uses the carrying handle to maintain positive control of the weapon system. The weapon status is GREEN.

5-20. The low ready allows a Soldier to navigate restrictive environments while simultaneously maintaining positive control of the muzzle orientation.



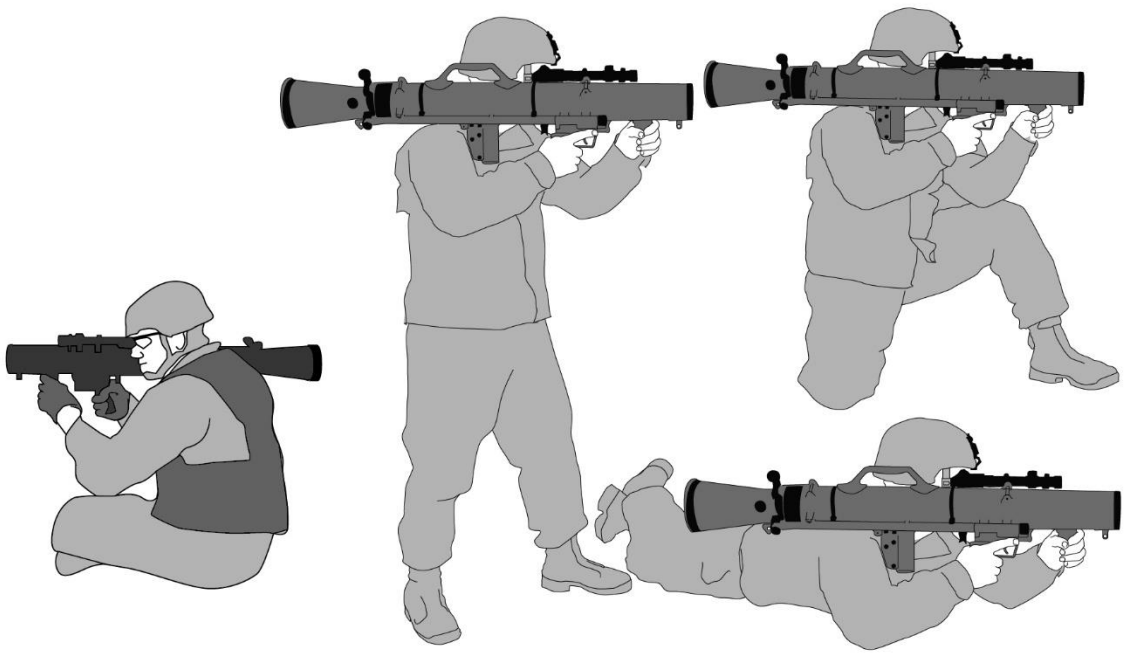
Carry position	Low ready.
When used	Threat is imminent. Used tomaintain positive control of the weapon.
Command	“Assume low ready.”
Advantages	Provides Soldier with some mobility while maintaining positive control of Soldier’s primary weapon.
Disadvantages	Mobility limited to Soldier’s abilities and constraints of mounted weapon.

Figure 5-3. Low ready

READY

5-21. Soldiers use the ready carry position when the threat is present and identified (see figure 5-4). The Soldier uses the ready carry when they are preparing or are prepared to engage a threat.

5-22. In the ready carry position, the Soldier has established a supported fighting position and is prepared to engage the threat. The weapon status is RED. The Soldier sustains firearms safety rule 3 and rule 4 keeping the finger off the trigger until ready to engage.



Carry position	Ready.
When used	Threat is present and identified. The orientation of the muzzle is the most probable target location, and the Soldier is prepared to engage. Used to maintain positive control of the weapon system..
Command	“Make ready.”
Advantages	The highest level of readiness to engage a threat or threats. Rapid transition from the 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 5-4. Ready position

STABILIZATION

5-23. The Soldier must stabilize the weapon when firing from all positions (see figure 5-5). To create a stabilized platform, a Soldier must understand the physical relationship between the weapon system, the gunner’s body, the ground, and any other objects touching the weapon or gunner’s body. The more contact the firer has to the ground determines how stable and effective the position is. The situation and tactics determine the actual position used.

5-24. When the gunner assumes a stable firing position, movement from muscle tension, breathing, and other natural activities within the body transfer to the weapon and the gunner must compensate for them.

5-25. 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.

5-26. A stabilization failure compounds the firing occasion's errors, which directly correlate to the accuracy of the shot taken. To maximize the gunner's stability during the shot process, they correctly assume various firing positions when stationary.

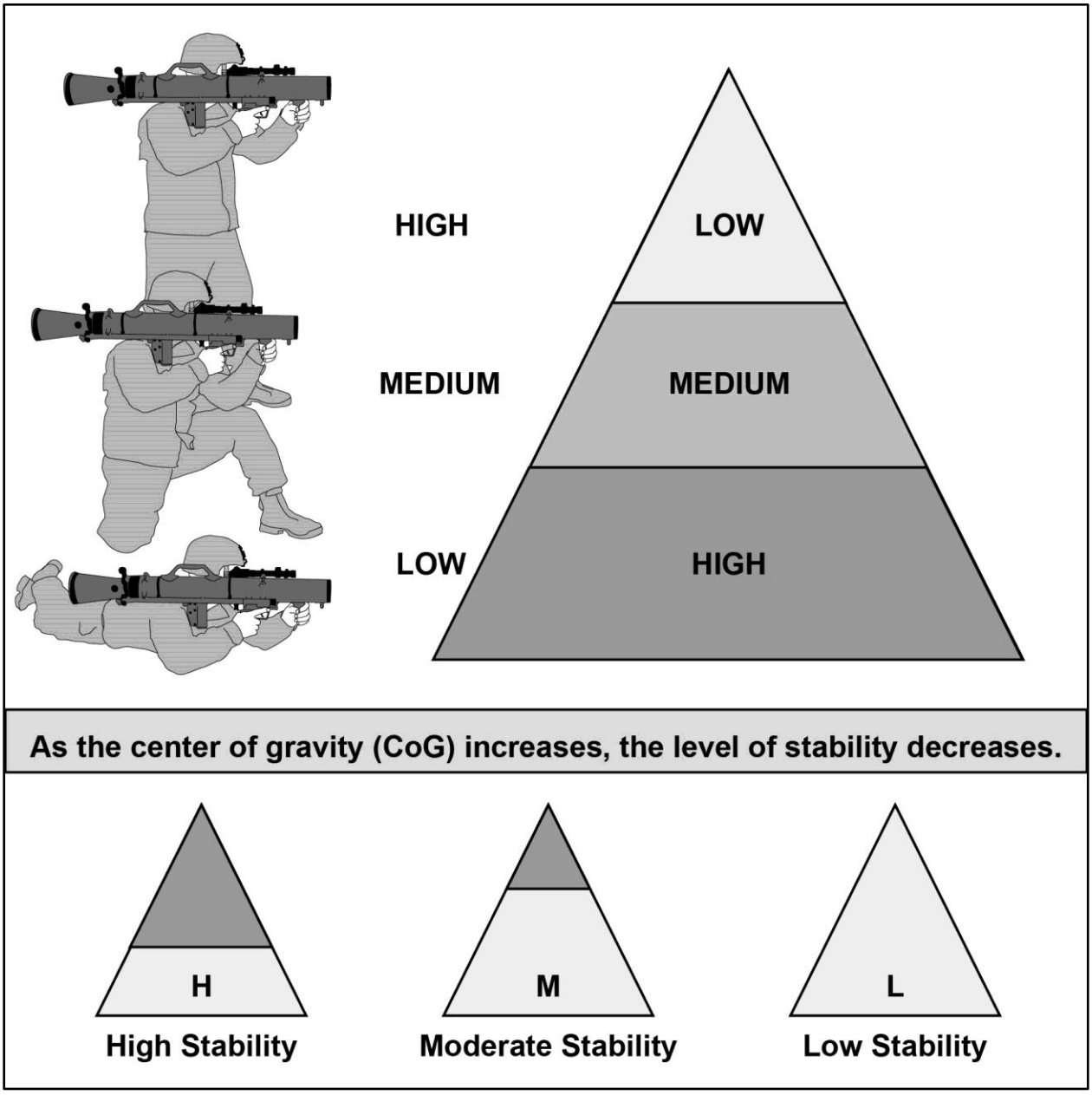


Figure 5-5. Firing position stability

FIRING POSITIONS

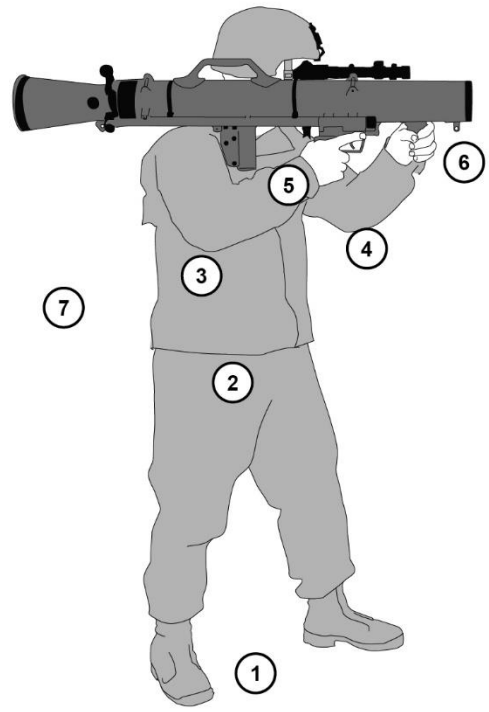
5-27. The nature of combat does not always allow time for a Soldier to get into a particular position. Soldiers need to practice firing in a variety of positions including appropriate variations. The primary positions described below are highest to lowest:

- Standing.
- Kneeling.
- Sitting.
- Prone.

5-28. Soldiers must frequently practice the positions dry 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 develops their ability to change positions rapidly and correctly, translating into efficient movement and consistent stable firing positions.

STANDING POSITION

5-29. Figure 5-6 lists the key focus areas for the standing position.

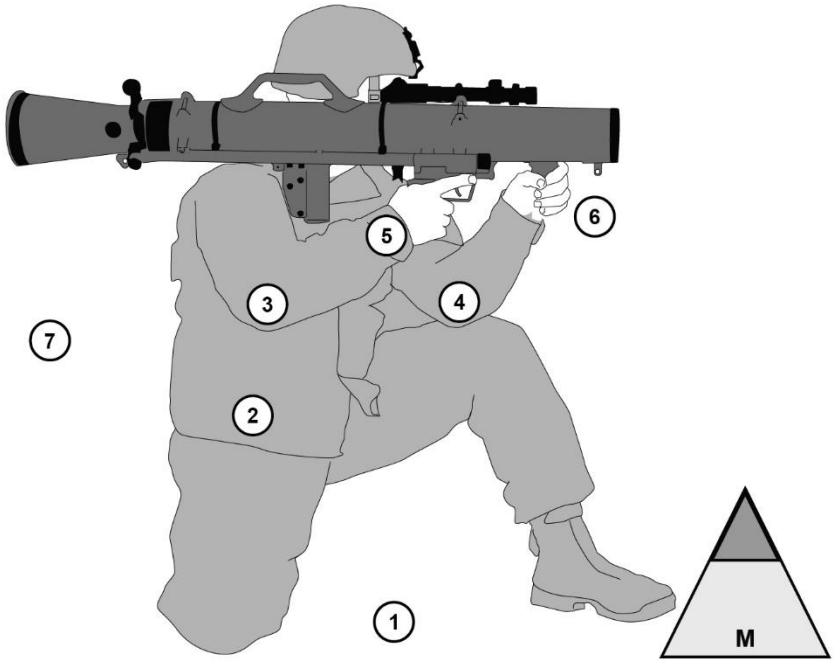


1	Leg position	Standing firm, feet should-width apart.
2	Stance/center of gravity	Slight lean forward toward the target.
3	Firing elbow	Tucked toward the gunner's body or with equipment worn to support the elbow.
4	Nonfiring elbow	Tucked toward the gunner's body or with equipment worn to support the elbow.
5	Firing hand	Grasping the pistol grip with finer off the trigger until ready to fire.
6	Nonfiring hand	Firm hold on the front grip, support nonfiring hand if possible.
7	Assistant gunner position	Head in line with gunner's, right hand over the venturi lock lever, left hand and arm wrapped around gunner's back.

Figure 5-6. Standing position

KNEELING POSITION

5-30. Figure 5-7 lists the key focus areas for the kneeling position.

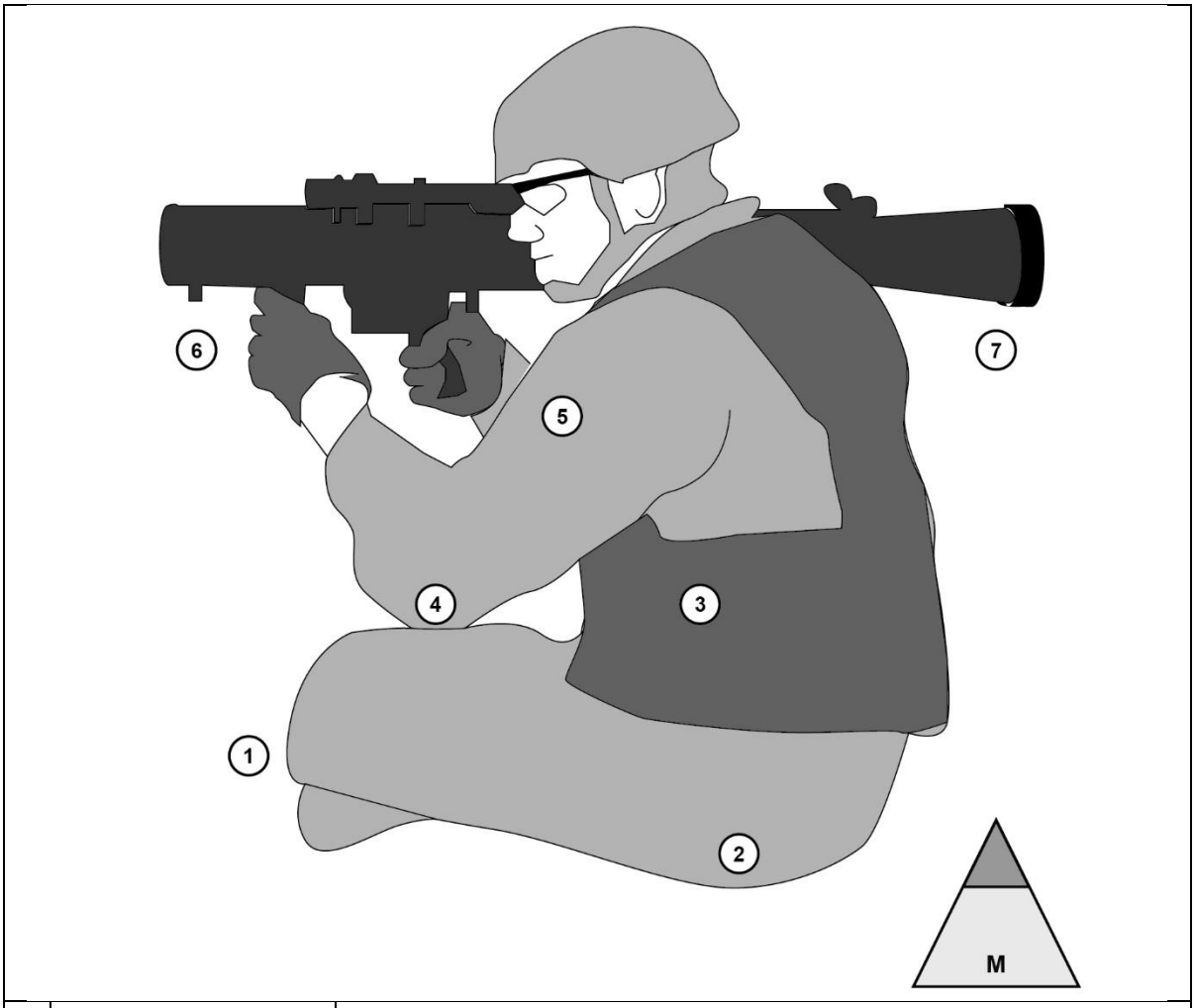


1	Leg position	Right knee on the ground, foot under seat, left leg bent approximately 90 degrees (adjust accordingly) and under weapon.
2	Stance/center of gravity	Slight lean forward toward the target. All weight, thigh to calf, on right foot.
3	Firing elbow	Tucked toward the gunner's body or with equipment worn to support the elbow.
4	Nonfiring elbow	Tricep on the left lower thigh above the knee, or tricep on kneecap, for self-support to avoid bone-to-bone contact.
5	Firing hand	Grasping the pistol grip with finger off the trigger until ready to fire.
6	Nonfiring hand	Firm hold on the front grip, applying pressure to press the weapon into shoulder.
7	Assistant gunner position	In the kneeling position with right hand over the venturi lock lever in a suitable position to perform their role.

Figure 5-7. Kneeling position

SITTING POSITION

5-31. Figure 5-8 lists the key focus areas for the sitting position.

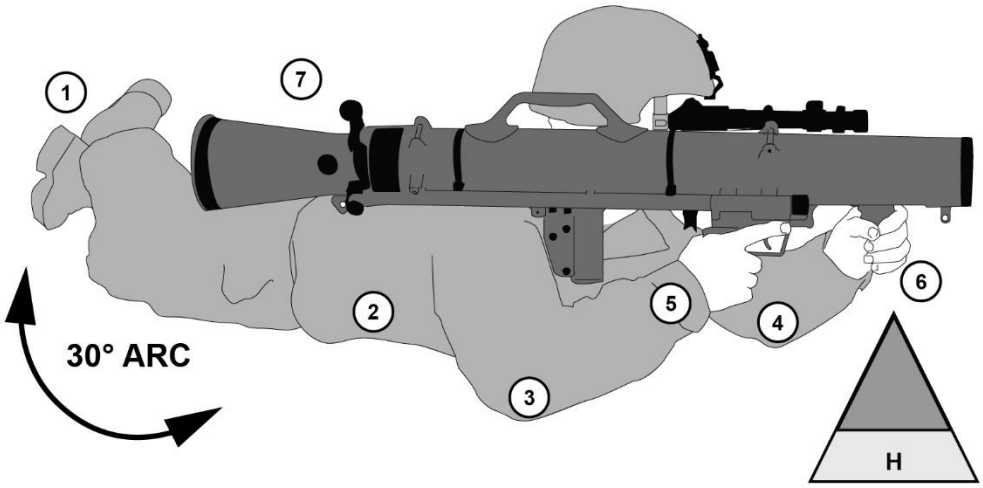


1	Leg position	Nonfiring leg crossed over firing leg in a crossed sitting position.
2	Stance/center of gravity	Soldier's frame sitting against the ground for maximum stability, shot recovery, and recoil absorption.
3	Firing elbow	Tucked toward the gunner's body with elbow placed on thigh (avoid bone-to-bone contact elbow to knee).
4	Nonfiring elbow	Tucked toward the gunner's body with elbow placed on thigh (avoid bone-to-bone contact elbow to knee).
5	Firing hand	Grasping the pistol grip with finder off the trigger until ready to fire.
6	Nonfiring hand	Firm hold on the front grip, support nonfiring hand if possible.
7	Assistant gunner position	In the kneeling position with right hand over the venturi locking lever in a suitable position to perform their role.

Figure 5-8. Sitting position

PRONE POSITION

5-32. Figure 5-9 lists the key focus areas for the prone position.



1	Leg position	Next to each other with right foot over left foot, legs angled between the body and weapon more than 30 degrees.
2	Stance/center of gravity	Prone position maximizes the gunner's frame against the ground for maximum stability.
3	Firing elbow	In contact with the ground, utilizing environment for additional support.
4	Nonfiring elbow	In contact with the ground, tucked toward gunner's body, utilizing environment for additional support.
5	Firing hand	Grasping the pistol grip with finger off the trigger until ready to fire.
6	Nonfiring hand	Firm hold on the front grip applying rearward pressure into firing shoulder.
7	Assistant gunner position	Head in line with the gunner, body perpendicular to the tube, right hand over venturi locking lever, watching to the rear.
	Bipod	Adjust body position if utilizing the bipod. Ensure position is stable, comfortable, and most suitable for target engagement.

Figure 5-9. Prone position

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Chapter 6
Aiming

Aim is the functional element of the shot process. Aim is the continuous process of orienting the weapon correctly, aligning the weapon's sights, on the target, and applying the appropriate lead and elevation during a target engagement. Soldiers conduct aiming through pre-shot, shot, and post-shot to 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

6-1. 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 when holding in a stabilized manner.
- Sight alignment. The physical alignment of the aiming device.
- Front and rear sight assembly.
- Optic reticle.
- Ballistic reticle (day or thermal).
- Sight picture. The target as viewed through the line of sight.
- Point of aim. The specific location where the line of sight intersects the target.
- Desired point of impact. The desired location of the strike of the round to achieve the desired outcome (incapacitation or lethal strike).

6-2. Typically, Soldiers apply the aim to the largest, most lethal area of any static target presented. Soldiers use the center of visible mass. The center of visible mass is the initial point of aim on a target of what the Soldier can see.

WEAPON ORIENTATION

6-3. 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 FOV.

HORIZONTAL WEAPONS ORIENTATION

6-4. Horizontal weapons orientation covers the frontal arc of the gunner, spanning the area from the left shoulder, across the Soldier's front, to the area across the right shoulder (see figure 6-1).

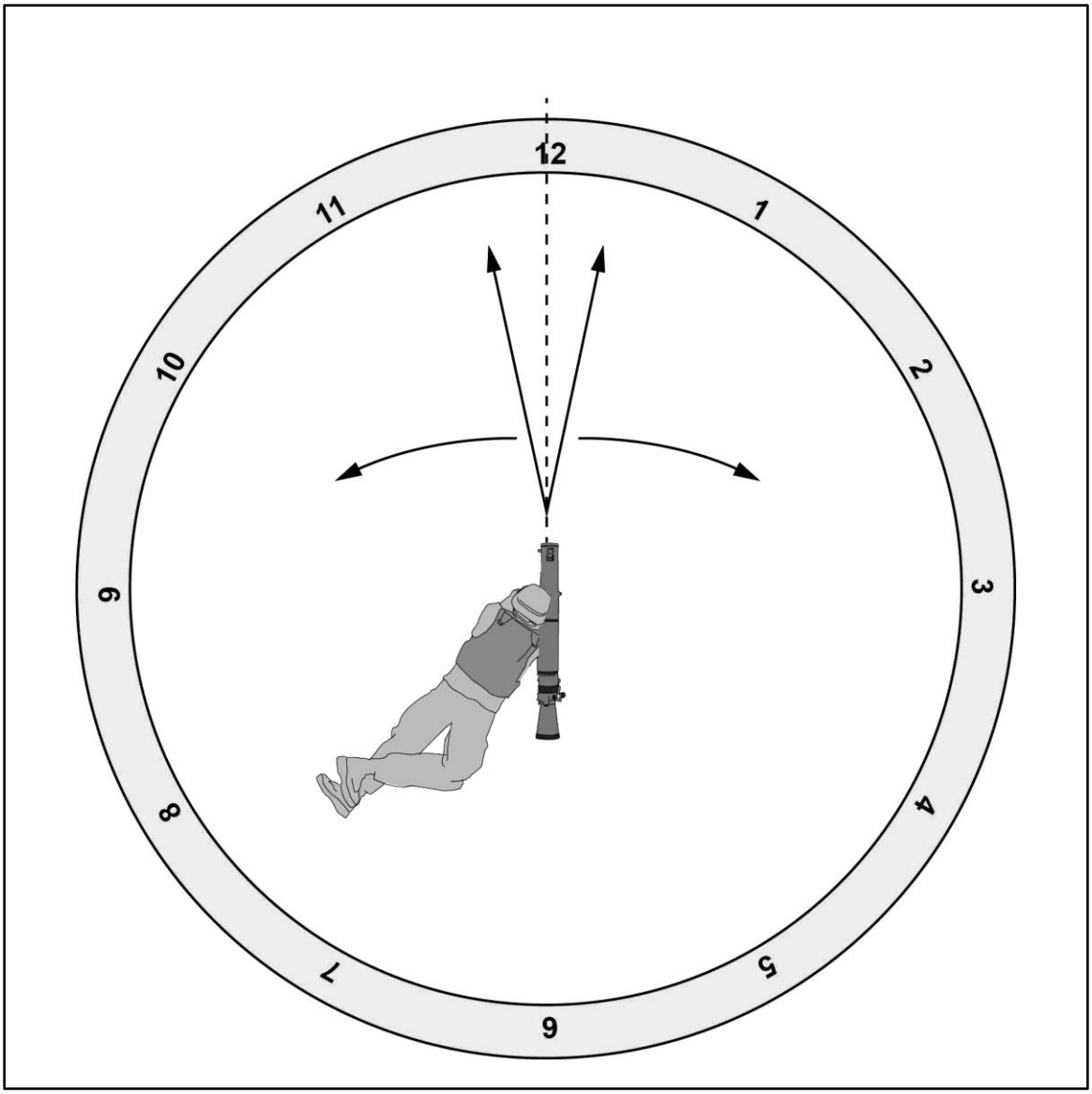

Figure 6-1. Horizontal weapons orientation

VERTICAL WEAPONS ORIENTATION

6-5. Vertical weapons orientation includes all the aspects of orienting the weapon at a potential or confirmed threat in elevation. Usually, the Soldier applies vertical weapons orientation in restricted, mountainous, or urban terrain where threats present themselves in elevated or depressed firing positions (see figure 6-2).

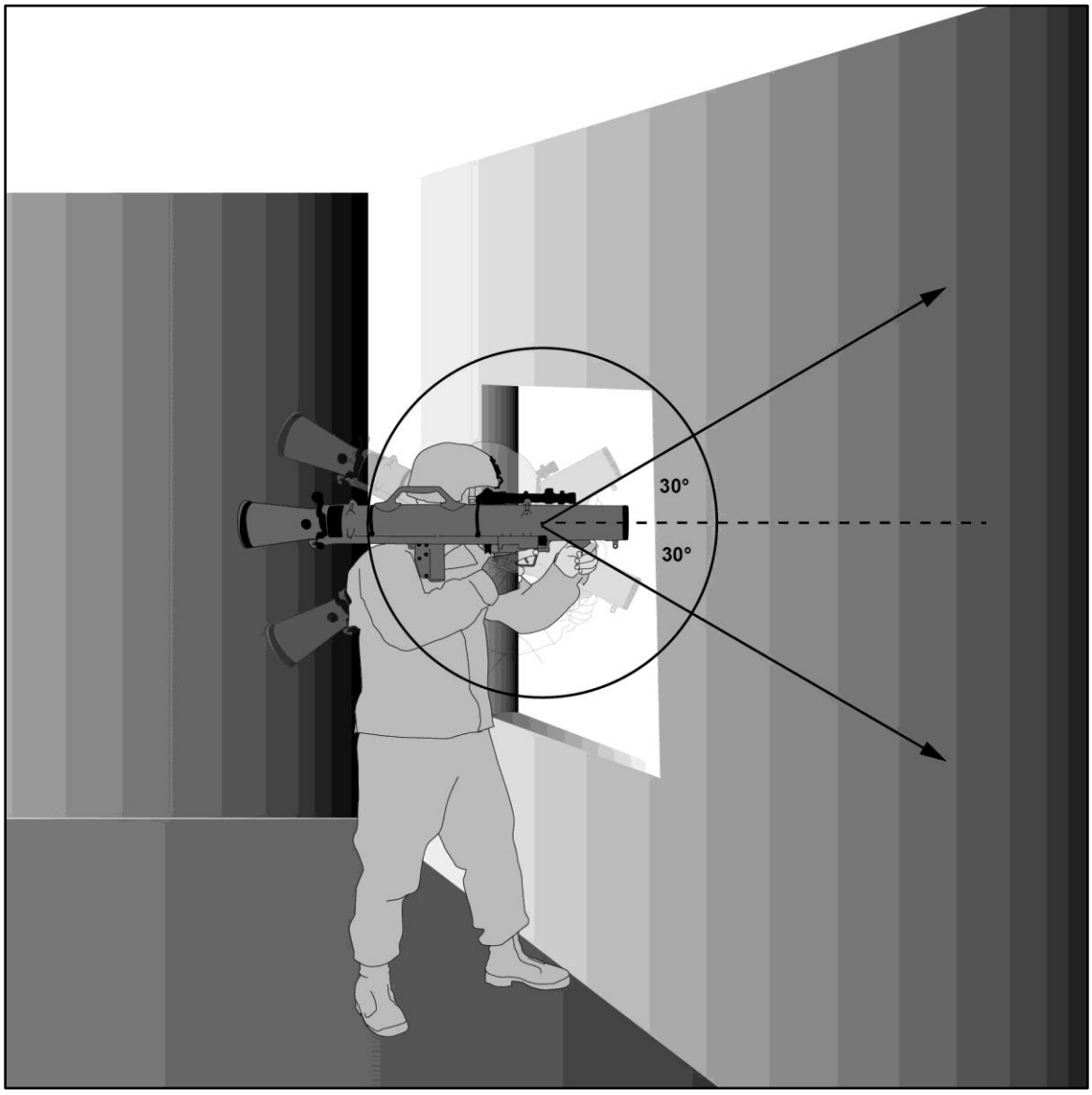

Figure 6-2. Vertical weapons orientation

WARNING

Due to a risk for physical injury, only HEAT 655 CS is allowed to be fired from confined spaces. Refer to appendix A for further information on the characteristics and capabilities of the various other ammunitions.

SIGHT ALIGNMENT

6-6. Sight alignment is the relationship between the aiming device and the firer's eye. The process the Soldier uses depends on the aiming device employed with the weapon as listed below:

- Open sights. The relationship between the front sight assembly, rear sight assembly, and the firer's eye. The firer aligns the tip of the front sight post in the center of the rear aperture and their eye. The firer maintains focus on the front sight post simultaneously centering it in the rear aperture.
- Telescopic. 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. Soldiers ensure they achieve a full centered FOV with no shadow on magnified optics.
- Thermal. The relationship between the firer's eye, the eyepiece, and the reticle.
- Pointers, illuminators, and 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.

6-7. The human eye can focus clearly only 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. The most accurate sight alignment for the shot process is with the firer's eye on the front sight post or reticle.

6-8. The firers allow their right eye only to look through the center of the aiming or sighting device. If the firer's head placement is subject to change during the firing process or between each shot, the Soldier experiences difficultly achieving an accurate, aimed shot.

SIGHT PICTURE

6-9. 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. Sight picture is not the same as sight alignment.

6-10. There are two sight pictures used during the shot process: Pre-shot and post-shot, which are listed below. 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. What the Soldier must use as the point of reference for any sight adjustments for any subsequent shot.

POINT OF AIM

6-11. The point of aim is 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. The point of aim should be the target's center of visible mass. The point of aim does not include any hold off or lead changes.

DESIRED POINT OF IMPACT

6-12. 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 than the weapon's zero distance, the Soldier's desired point of impact and their point of aim will not align without adjusting the range drum on the Picatinny fire control device. Therefore, the Soldier must apply the appropriate ballistic reticle at the determined range to achieve the desired point of impact.

COMMON AIMING ERRORS

6-13. 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.

6-14. The most common aiming errors include—

- Incorrect boresight. Regardless of how well a Soldier aims, if the boresight is incorrect, the round cannot travel to the desired point of impact without adjustment with subsequent rounds. (Refer to appendix E.)
- 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 optics, use of thermal optics, or the use of laser pointing devices with image intensifier optics.
- Battlefield obscurants. Smoke, debris, and haze are common conditions on the battlefield that 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 incorrect sight alignment when failing to focus on the front sight post or reticle.
- Incorrect sight picture. Typically, an incorrect sight picture occurs when the threat is in a concealed location, is moving, or sufficient winds between the firer and target exist that are not accounted for during the hold determination process. The failure directly impacts the Soldier's ability to create and sustain the proper sight picture during the shot process.
- Improper range determination. Improper range determination results in an improper placement of ballistic reticle on the desired target.

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Chapter 7
Control

The control element of the shot process considers all the conscious actions of the Soldier before, during, and after the shot process. Control incorporates the Soldier as a function of safety, as well as giving them 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 and target alignment. Chapter 7 discusses the engagement techniques to which Soldiers must adapt to the continuously changing combat environment.

ARC OF MOVEMENT

7-1. When firing, the Soldier is the weapon’s fire control system, ballistic computer stabilization system, and mobilization system. Control refers to the Soldier’s ability to regulate these functions and maintain the discipline to execute the shot at the appropriate time.

7-2. Regardless of how well-trained or physically strong a Soldier is, a wobble area (or arc of movement) is present, even when the Soldier provides sufficient physical support of the weapon. Soldiers can observe the arc of movement as the sights move in a W shape, a circular shape, vertical (up and down) pulses, 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 lateral, horizontal, and front-to-back variance in the movement that occurs in the sight picture (see figure 7-1).

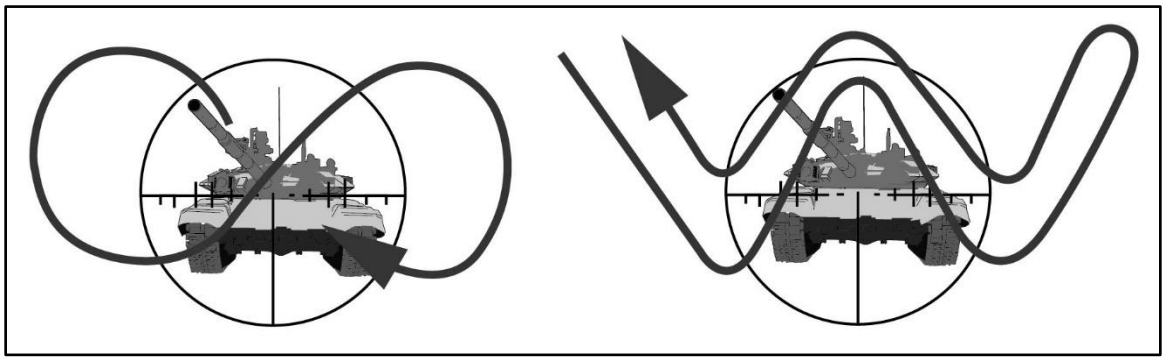


Figure 7-1. Arc of movement

7-3. The control element consists of several supporting Soldier functions and includes 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

7-4. Trigger control is firing the weapon while maintaining proper aim and adequate stabilization until the round leaves the muzzle. Trigger control and the firer's position work together to allow the sights to stay on the target long enough for the firer to fire the weapon and for the round to exit the muzzle.

7-5. 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 round to fire at the gunner's moment of choosing. When the firer achieves both a solid position and a good trigger squeeze, any induced shooting errors can be attributed to the aiming process for refinement.

7-6. Placing the finger where it naturally lays facilitates smooth trigger control. Natural placement of the finger on the trigger allows for the best mechanical advantage when applying rearward pressure to the trigger as follows (see figure 7-2):

- Trigger finger placement. The trigger finger lays naturally across the trigger after achieving a proper grip. Firers do not have to use a specified point on their trigger finger. Trigger finger placement is not the same for all Soldiers due to different size hands.
- 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 is always smooth.

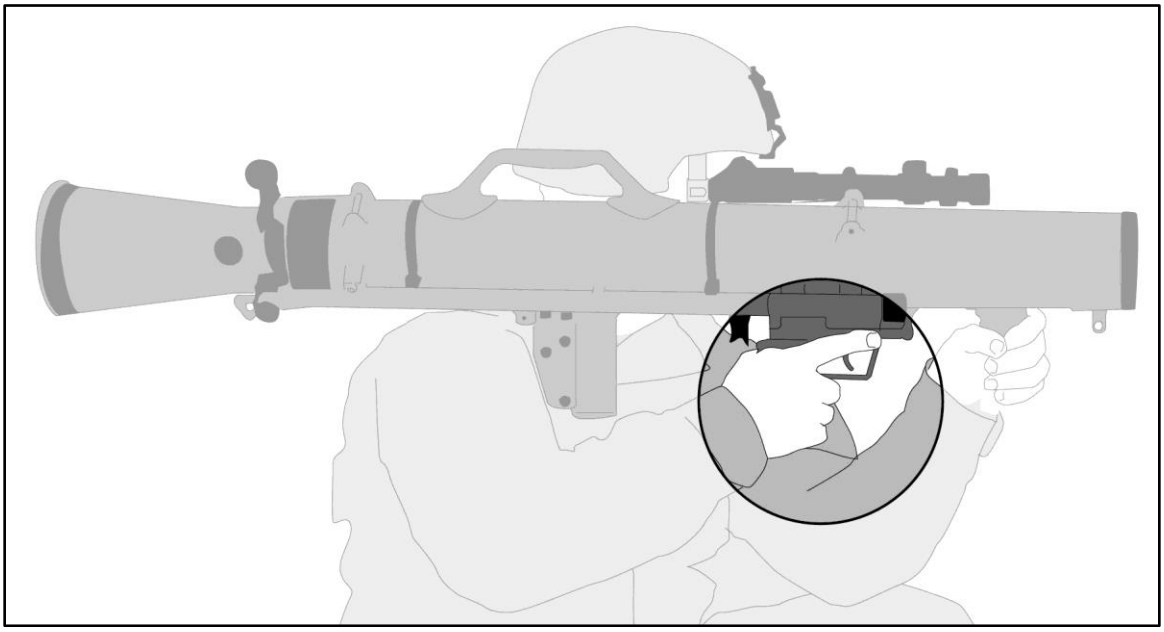


Figure 7-2. Natural trigger finger placement

BREATHING CONTROL

7-7. During the shot process, the gunner controls their breathing to reduce the amount of movement of the weapon. During training, the gunner learns 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.

7-8. Breathing induces unavoidable body movement that contributes to wobble or the arc of movement 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. The most common technique is to fire on the natural pause during breathing. Failure to maintain proper aiming and trigger control, rather than breathing, is the likely cause of vertical dispersion.

WORKSPACE MANAGEMENT

7-9. The workspace is a spherical area, 12 to 18 inches in diameter centered on the Soldier's face and approximately 12 inches in front of their face. The workspace is where the majority of weapons manipulations take place (see figure 7-3, page 7-4).

7-10. Conducting manipulations in the workspace allows the Soldier to keep their eyes oriented towards a threat or their 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.

7-11. Workspace management includes the gunner's ability to perform the functions below on the following components:

- Selector switch. To change the weapon's status from safe to fire from any position.
- Trigger housing assembly. To control the firing of the weapon.
- Cocking lever. To smoothly use the cocking lever during operation, including any corrective actions to overcome malfunctions, loading, unloading, or clearing procedures.
- Picatinny fire control device. Apply correct ammunition selection and appropriate ballistic reticle.
- Front grip. Adjust the position to suite the gunner.
- Shoulder pad. Adjust the position to suite the gunner.

Workspace Manipulations	Telescopic sight/open sight
	Firing mechanism
	Barrel, seated at shoulder
	Front grip
	Selector switch
	Weapon oriented downrange

Figure 7-3. Workspace

CALLING THE SHOT

7-12. Knowing precisely where the sights are when the weapon discharges is critical for shot analysis. Firers can see errors such as flinching, anticipation of recoil or jerking of the trigger in the sights before discharge. Calling a shot refers to the gunner stating exactly where they think the initial projectile strike should be by recalling the sights' relationship to the target when the weapon fired.

7-13. The gunner is responsible for the point of impact of every round fired from their weapon. Therefore, the gunner must ensure the target area is clear of friendly and neutral actors, in front of and behind the target. Also, the gunner must 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.

FOLLOW-THROUGH

7-14. Follow-through is the continued mental and physical application of the shot process' functional elements after the round has been fired. The firer's head stays oriented towards the target, their firing eye remains open, then the firer lets off the trigger and the Soldier's body position and breathing remain steady.

7-15. Follow-through consists of all actions the gunner controls after the round leaves the muzzle. The gunner must complete the shot process with follow-through. The follow-through actions are executed in a general sequence as follows:

- Recoil recovery. Returning to the same pre-shot position and reacquiring the sight picture. The gunner should have a good sight picture before and after the shot.
- 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 rounds, assesses the target's state, and immediately selects one of the following courses of action:
  - Subsequent engagement. The target requires additional (subsequent) shots to achieve the desired target effect. The firer starts the pre-shot process.
  - Supplemental engagement. The weapons team determines the desired target effect is achieved and another target may require servicing. The gunner starts the pre-shot process.
  - Sector check. All threats have been adequately serviced to the desired effect. The gunner checks their sector of responsibility for additional threats as the tactical situation dictates. The unit's SOP dictates any vocal announcements required during the post-shot sequence.
  - Correct malfunction. If the gunner 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.

MISFIRE

7-16. A misfire is the failure of a weapon to complete the cycle of operation. The MAAWS team can apply immediate or remedial action to clear a misfire. Some misfires that immediate or remedial actions cannot clear could require weapon repair to correct the problem.

7-17. The procedural or mechanical failure of the weapon or the ammunition causes a malfunction. Function checks, preventive maintenance checks and services identify potential problems before they become malfunctions. Repeated malfunctions can indicate whether the weapon requires cleaning and lubrication or inspection by field maintenance or organizational level maintenance. Immediate action is known as the first action to get a weapon back into service after a stoppage or malfunction.

IMMEDIATE ACTION

7-18. Immediate action involves quickly applying possible corrections to overcome a misfire based on initial observation or indicators but without determining actual cause. To apply immediate action, perform the steps in table 7-1.

Note. Apply immediate action only one time for a given malfunction. If the weapon still fails to fire, inspect M3 to determine cause of misfire or malfunction and take appropriate remedial action.

Table 7-1. Immediate action procedures

	Immediate Action
1	Keep sights on target. Wait five seconds and recock firing mechanism.
2	Aim and pull trigger. If M3 still misfires, keep aim on target.
3	Recock firing mechanism.
4	Aim and pull trigger. If M3 still misfires, keep aim on target.
5	Wait two minutes, remove round, and reload with new round.

REMEDIAL ACTION

7-19. Remedial action is a continuing effort to determine the cause for misfire or malfunction and the attempt to clear the misfire once the misfire has been identified. To apply remedial action, perform the steps in table 7-2 below:

Table 7-2. Remedial action procedures

	Remedial Action
1	Clear weapon.
2	Perform function check.
3	Change ammunition and attempt to fire.
4	If weapon does not fire, return weapon to field maintenance or organizational level maintenance for maintenance and troubleshooting.

7-20. No single corrective action solution can resolve all or every malfunction. Soldiers need to understand what failed to occur as well as any specific sounds or actions of the weapon to apply the appropriate correction measures.

TROUBLESHOOTING

7-21. For troubleshooting procedures for the subcaliber adapter, refer to TM 9-1015-262-10. A list of tests or inspections follows each malfunction of part, assembly, or subassembly, which helps to determine the corrective actions to perform. Soldiers must perform tests or inspections and corrective actions in the order listed in table 7-3, page 7-6.

Note. This manual cannot list all possible malfunctions that may occur, nor all tests, inspections, and corrective actions. If a malfunction is not listed, the Soldier must forward the weapon to a qualified armorer.

Table 7-3. Troubleshooting procedures

Symptom	*Malfunction*	*Corrective Action*
Unfired round jammed in chamber.	Inspect for swollen case, burred case guide, and defective primer.	Keep gun pointed in safe direction. Ensure extractor and spring is not damaged.
		Remove jammed round, and return weapon to unit armorer.
WARNING Never use a metal object against any projectile head when performing any unloading action. If injury occurs, immediately seek medical attention. Failure to observe this warning could result in personnel injury or death.		
Fired casing jammed in chamber.	Inspect for split casing, sand and grit, and burred case guide.	Cock weapon, place on (S) position, and open venturi.
		Using cleaning tool assembly mounted on cleaning rod to push projectile or casing rearward out of chamber.
		Catch casing with hands when unseated from chamber area.
		Remove jammed round and return weapon to unit armorer.
No primer indentation.	Inspect for broken firing pin.	Replace firing pin.
	Inspect for bent or broken firing rod and cam.	Return weapon to unit armorer.
	Inspect for weak mainspring.	Replace mainspring.
	Inspect for foreign material in firing pin hole.	Remove, inspect, clean, and service firing pin and firing pin hole.
Venturi clearance exceeds gauge tolerance.	Inspect for worn venturi.	Return weapon to unit armorer.
	Inspect for worn venturi pivot pin.	Return weapon to unit armorer.
Round will not chamber or is jammed within chamber area.	Inspect for sand and grit in chamber, burred case guide, and burred casing rim.	Remove jammed round and return weapon to unit armorer.
Round will not chamber.	Inspect for obstruction in bore.	Remove round. Clear bore using bore cleaning brush.

Table 7-3. Troubleshooting procedures (continued)

Symptom	*Malfunction*	*Corrective Action*
Failure to cock.	Firing mechanism is damaged or missing.	Return weapon to field maintenance or organizational level maintenance.
	Mainspring is weak, damaged, or missing.	Step 1. Remove, inspect, and clean mainspring. If mainspring is missing return weapon to field maintenance or organizational level maintenance. Step 2. If failure to cock is still present, check for proper installation of mainspring. Step 3. If failure to cock is still present return weapon to field maintenance or organizational level maintenance.
	Firing rod is damaged or missing.	Step 1. Remove, inspect, and clean firing rod (WP 0017). If firing rod is missing, return weapon to field maintenance or organizational-level maintenance. Step 2. If failure to cock is still present, check alignment of firing rod. Step 3. If failure to cock is still present, return weapon to field maintenance or organizational-level maintenance.
	Front cap is damaged or missing.	Step 1. Remove, inspect, and clean front cap. Step 2. If failure to cock is still present, return weapon to field maintenance or organizational-level maintenance.
	Cocking lever is damaged or missing.	Step 1. Remove, inspect, and clean cocking lever. Step 2. If cocking lever is missing or damaged, return weapon to field maintenance or organizational-level maintenance.
Round will not chamber.	Chamber and casing rim and recess is dirty.	Step 1. Clean chamber and cartridge case recess. Step 2. If round still will not chamber, return weapon to field maintenance or organizational-level maintenance.
	Case guide has burrs.	Return weapon to field maintenance or organizational level maintenance.
	Bore is obstructed.	Step 1. Clean bore using bore cleaning brush. Step 2. If round still will not chamber, return weapon to field maintenance or organizational-level maintenance.
Failure to lock.	Firing road and cam bent or broken.	Step 1. Remove, inspect, clean, and check alignment of firing rod. Step 2. If failure to lock still occurs, return weapon to field maintenance or organizational-level maintenance.
	Firing mechanism is damaged or missing.	Return weapon to field maintenance or organizational-level maintenance.
Unfired round jammed in chamber.	Case swollen, burred case guide, and defective primer.	Step 1. Keep gun pointed in safe direction. Step 2. Ensure extractor and springs are not damaged. Step 3. Using cleaning tool assembly mounted on cleaning rod, push round rearward out of chamber. Step 4. Catch round with hands when unseated from chamber area. Step 5. Return weapon to field maintenance or organizational-level maintenance.

Table 7-3. Troubleshooting procedures, continued

Symptom	*Malfunction*	*Corrective Action*
Fired casing jammed in chamber.	Casing is split, contains sand and grit, and case guide is burred.	Step 1. Cock weapon, place on S position, and open venturi. Step 2. Using cleaning tool assembly mounted on cleaning rod, push casing rearward out of chamber. Step 3. Catch casing with hands when unseated from chamber area. Step 4. Return weapon to field maintenance or organizational level maintenance.
No primer indentation or firing pin does not protrude.	Foreign material in firing pin.	Step 1. Remove, inspect, clean, and service firing pin and firing pin hole. Step 2. If still no primer indention or firing pin does not protrude, return weapon to field maintenance or organizational-level maintenance.
	Firing pin broken.	Step 1. Replace firing pin. Step 2. If still no primer indention or firing pin does not protrude, return weapon to field maintenance or organizational-level maintenance.
	Firing rod and cam bent or broken.	Step 1. Remove, inspect, clean, and check alignment of firing rod. Step 2. If still no primer indention or firing pin does not protrude, return weapon to field maintenance or organizational-level maintenance.
Failure to fire.	Venturi locking lever not fully seated and closed.	Step 1. Fully seat and lock venturi locking lever. Step 2. If failure to fire is still present, return weapon to field maintenance or organizational-level maintenance.
	Firing pin protrusion.	Step 1. Remove, inspect, clean, and service firing pin and firing pin hole. Step 2. Check for proper installation and alignment. Step 3. If failure to fire is still present, return weapon to field maintenance or organizational-level maintenance.
	Mainspring is weak.	Step 1. Remove, inspect, and clean mainspring. Step 2. Check for proper installation and alignment.
	Safety lever actuates or is loose.	Return weapon to field maintenance or organizational-level maintenance.
Round will not extract.	Extractor is damaged or missing.	Step 1. Inspect extractor for damage or if missing. Step 2. If extractor is damaged or is missing, return weapon to field maintenance or organizational-level maintenance.
	Extractor spring is weak.	Step 1. Remove, inspect, clean, and service extractor spring. Step 2. Check for proper installation and alignment. Step 3. If round still does not extract, return weapon to field maintenance or organizational-level maintenance.

Appendix A

Ammunition

Appendix A discusses the characteristics and capabilities of the different ammunition that is available for the M3 MAAWS. Appendix A includes general ammunition information such as safety, standard and North Atlantic Treaty Organization marking conventions, the components of ammunition, characteristics, description, and general principles of operation. The information within this appendix is specific to the M3 MAAWS weapon only.

GENERAL SAFETY

A-1. Soldiers must be familiar with the safety precautions for the M3 MAAWS to gain knowledge for future training tasks and understanding and respect for the system.

POTENTIAL HAZARDS

A-2. There are two important basic safety rules to keep in mind when operating the M3 MAAWS:

- Always wear double hearing protection.
- Always ensure the backblast area is clear.

AMMUNITION SAFE SEPARATION AND FUZE ARMING DISTANCES

A-3. Table A-1, page A-2, details the ammunition safe separation and fuze arming distances.

WARNING

Crews will be observant of all safe separation and surface safety distances. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

The following restrictions apply during training and combat because of fragmentation hazards. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

Table A-1. Ammunition safe separation and fuze arming distances

	HEAT 551C RS	*HE 441D RS*	*HEDP 502 RS*	*ASM 509*
Minimum fuze arming distance	72 feet 22 meters	151 feet 46 meters	56-66 feet 17-20 meters	39 feet 12 meters
*Safe distance of gunner and assistant gunner	279 feet 85 meters	820 feet 250 meters	600 feet 183 meters	No frag hazard at 39 feet or 12 meters
**Safe distance of all other personnel	279 feet 85 meters	984 feet 300 meters	1083 feet 330 meters	591 feet 180 meters
Remarks *Leaders must train crews not to engage targets closer than safe separation distance because fragmentation may cause injury or death. **Crews shall use extreme caution when firing within these distances of adjacent personnel and friendly troops. Measure distances from intended target or point of detonation.				
Legend: ASM – antistructure munition; HE – high explosive; HEAT – high-explosive anti-tank; HEDP – high-explosive dual-purpose; RS – reduced sensitivity				

AMMUNITION FIRING RESTRICTION

A-4. Due to excessive noise and blast over pressurization that occurs when firing the M3, the gunner and assistant gunner may only fire a limited number of rounds during training and combat. Table A-2 details the ammunition firing restrictions (rounds) by ammunition type and firing positon. The table provides the maximum amount of rounds the gunner and assistant gunner can fire in a 24-hour period. Each type of ammunition and firing position has a point value assigned. The gunner and assistant gunner cannot exceed a total of 6 points within a 24-hour period regardless of the firing position or ammunition type. Leaders must use the ammunition type and firing position information to determine the maximum amount of rounds that can be fired. For example, if the Soldier fired 3 rounds of HEDP 502 RS from the standing, kneeling, and prone positions (1 round from each position), the total point value would be 5. The Soldier may now only fire an additional round from the standing or kneeling position to ensure the 6-point rule is not exceeded.

WARNING

Ammunition firing restrictions for ammunition type and firing position apply to both gunner and assistant gunner over a 24-hour period. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

Double hearing protection is required. Failure to wear double hearing protection when firing the M3 will cause permanent hearing loss. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

The ammunition firing restrictions apply during training and combat because of excessive noise and blast overpressure levels. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

Table A-2. Ammunition firing restrictions (rounds)

***Round* Type**	***Firing Position (Firing from Foxhole or Enclosure is Prohibited)***							
	Standing		Kneeling		Sitting		Prone	
	Rounds	Points	Rounds	Points	Rounds	Points	Rounds	Points
TP 552	1	1	1	1	1	3	1	1
HEAT 551C RS	1	1	1	1.5	1	1	1	1
HE 441D RS	1	1.5	1	1	1	3	1	3
HEDP 502 RS	1	1	1	1	1	2	1	3
ADM 401 (all variants)	1	1	1	1	1	2	1	1.5
SMOKE 469B	1	1.5	1	1	1	1.5	1	3
ILLUM 545C	1	1	1	1	1	1	0	N/A
TPT 141	1	1	1	1	1	1	1	1
ASM 509	1	1	1	1	1	1	1	1
SCA 553B	44	1	27	1	27	1	10	1
Legend: ADM – area deterrent munition; ASM – antistructure munition; HE – high explosive; HEAT – high-explosive anti-tank; HEDP – high-explosive dual-purpose; ILLUM – illuminator; N/A – not applicable; RS – reduced sensitivity; SCA – subcaliber adapter; TP – target practice; TPT – target practice tracer								

DANGER AREA

A-5. The danger area is the area within which damage may occur. The limits of the danger area are called danger area limits.

A-6. The danger areas are given without considering major aiming errors or abnormal ammunition. If built-up areas are present, Soldiers must consider the risks for major aiming errors when selecting the firing area.

A-7. The size of the danger area is influenced by the basic factors below:

- Risk near the weapon, noise level, fragments, and backblast.
- Weapon dispersion.
- Errors made when determining the firing data.
- Risk of ricochets or risk of fragments when firing at hard targets and reactive armor.
- Size of the area within which fragments or stones may be thrown on burst or impact.

BACKBLAST DANGER AREA

A-8. The danger area for personnel behind the weapon is limited to a sector with a radius of 100 meters and an angle of 45° to either side of the bore axis extension (area A and B) (see figure A-1, page A-4). When selecting a firing position, always check that there are no vertical objects (house walls, bank of earth, stones) within a distance of 40 meters from the venturi (area A). When firing from a trench or foxhole, the firing position must permit the backblast gases to pass over the edge of the trench or foxhole.

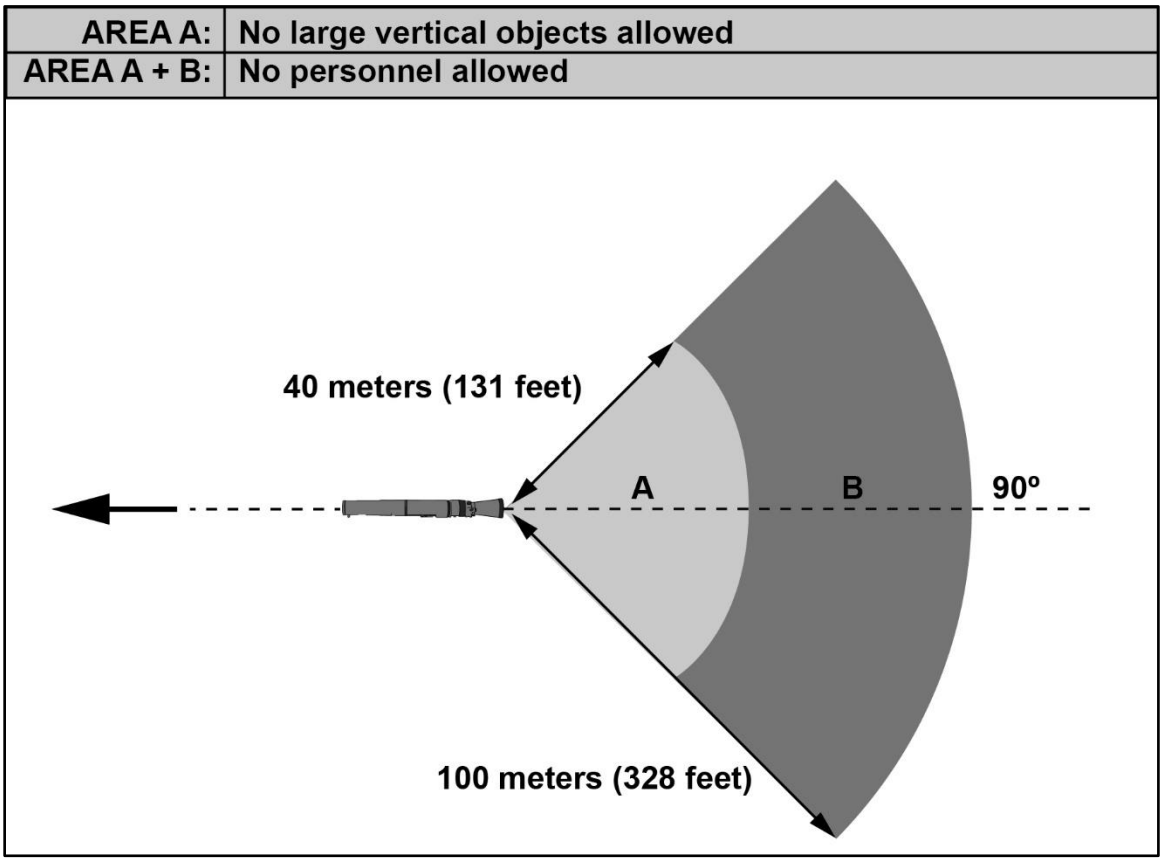


Figure A-1. Backblast danger area

COLORS, MARKINGS, AND SYMBOLS

A-9. Ammunition is identifiable by color coding specification per type and intended use. Table A-3 describes the general color codes used for ammunition of a caliber 20 mm and above. The M3 MAAWS, 84-mm ammunition has applicable Department of Defense Identification Codes (DODICs); those identification codes provide clarity and ease for the unit's ammunition resource manager. Refer to MIL-STD-709D for more information.

A-10. Ammunition is painted primarily to protect it from rust or corrosion. However, the color of the protective coating and markings also makes ammunition easy to identify by the user. Ammunition 20 mm and larger is color-coded according to MIL-STD 709D to facilitate user identification as shown in table A-3.

A-11. Markings stenciled or stamped on munitions or their containers include all information needed for complete identification. Refer to TM 9-1300-251-20&P, TM 9-1300-251-34&P, and TM 43-0001-28 for further information.

Table A-3. Ammunition color coding, 20 mm and larger

Color	*Note*	*Interpretation*
Yellow		Identifies high-explosive ammunition or indicates the presence of a high explosive.
Brown		Identified low explosive items or components or indicates the presence of a low explosive.
Gray	1/4	Identifies chemical ammunition containing a toxic chemical, incapacitating or not, control agent.
Dark Red		Identifies a riot control agent filler.
Dark Green	1	Identifies a toxic chemical agent filler.
Violet		Identifies an incapacitating agent filler.
Black	1/3	Identifies an armor defeating ammunition or indicates an armor defeating capability.
Silver, Aluminum		Identifies countermeasure ammunition (such as radar, echo, or leaflets).
Light Green	1	Identifies screening or marking smoke ammunition.
Light Red		Identifies incendiary ammunition or the presence of highly flammable materials (liquids, jellies, solids) designed to produce damage by fire.
White	1/2/3	Identifies illuminating ammunition or ammunition designed to produce a colored light.
Light Blue		Identifies practice ammunition.
Orange		May be used to identify ammunition used for tracking and recovery in tests or in training operations (such as underwater mines and torpedoes).
Bronze, Gold, Brass		Identifies inert ammunition designed to use in activities such as assembly, testing, handling, drills, and so forth, and not designed to be delivered in a delivery system.

Notes

1. The following colors have no color coding significance when applied as stated: Gray, black, green, or white on underwater ammunition.
2. The following colors have no color coding significance when applied as stated: White on guided missiles, dispensers, and rocket launchers.
3. The following colors have no color coding significance when applied as stated: Black or white when used for lettering or special markings.
4. The following colors have no color coding significance when applied as stated: Gray on air-launched missiles.

MAJOR COMPONENTS

A-12. Ammunition for use in the M3 MAAWS is described as a cartridge. A cartridge (figure A-2, page A-6) is an assembly consisting of a cartridge case, a percussion cap, a quantity of propellant, a projectile, and a base plate. The following terminology describes the general components of an M3 MAAWS round:

- Cartridge case. The cartridge case is made of light alloy that holds 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.
- Percussion cap. The percussion cap is a small explosive charge that provides an ignition source for the propellant.
- Projectile. The projectile is the component that travels to the target.
- Base plate. The rear portion of the cartridge. Upon firing, the case base and seal assembly provide rear obturation.

PROPELLANT

A-13. Cartridges are loaded with various propellant weights that impart sufficient velocity within safe pressure to obtain the required ballistic projectile performance. The propellants contained within the cartridge are identical with those used in the other ammunition types for the 84-mm M1, M2, and M3 MAAWS. Refer to table A-1, page A-2, for more information. The projectile contains various propellants that perform specific functions for specific parts within the projectile. Tables A-5 to A-28 (pages A-8 through A-31) list the various propellants associated with other projectile types.

CARTRIDGE CASE ASSEMBLY

A-14. The cartridge case is made of light alloy. It is filled with a double-base propellant in strips form. The propellant charge is ignited by a side-located percussion cap and an igniter. The rear end of the case is closed by a base plate (see figure A-2).

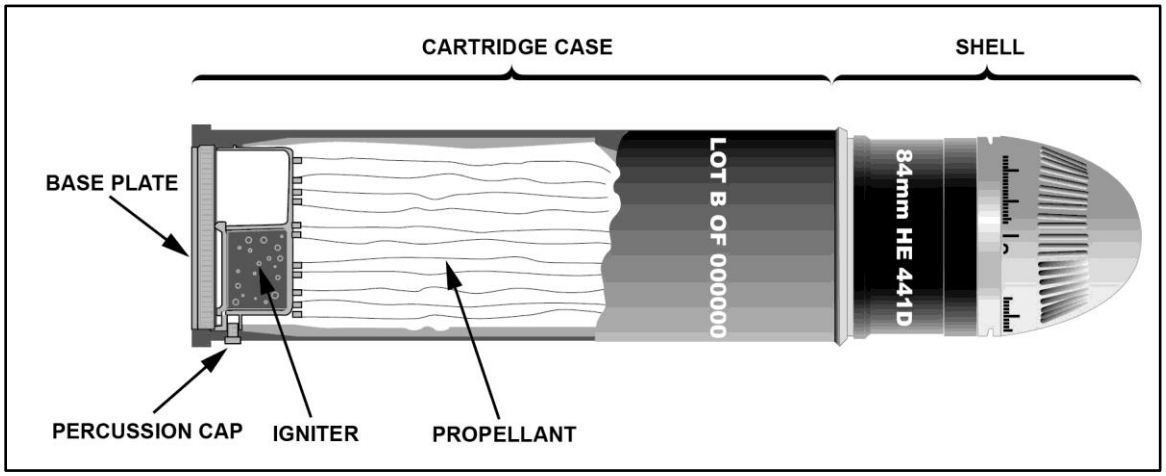
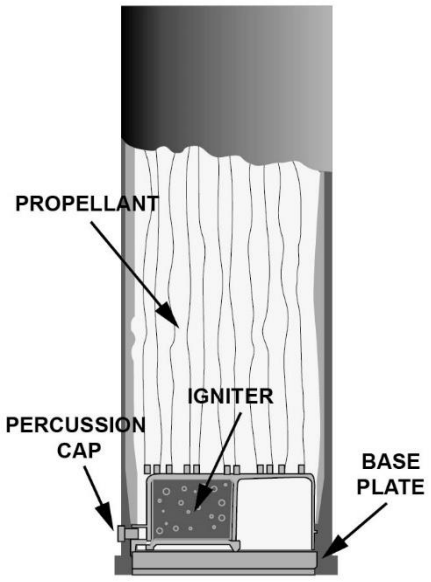


Figure A-2. Major component of a complete cartridge

A-15. The main components of the cartridge case are identical with those used in the other ammunition types for the 84-mm M1, M2, and M3 MAAWS. Table A-4 lists the types of explosives and their compositions that are associated with the cartridge case assembly.

Table A-4. Cartridge case assembly with propellant

Parts of	*Explosive*	*Weight (g)*	*Composition*
Cartridge case assembly with propellant			
Igniter	Z47B	5	Boron powder Potassium nitrate Acrylic binder
	Powder JK6B	10	Nitrocellulose Diphenylamine Centralite 1 Surface coating agent
Propellant	NK1287	~370	Nitrocellulose Nitroglycerine Centralite 1
Percussion cap	C107E	0.08	Lead dioxide Zirkonium powder Zinc stearate Acrylic binder
	Z2A	0.05	Barium nitrate Calcium silicide Lead dioxide Antimony trisulfide Tetrazene Lead tricinate



Characteristics

- The cartridge case is made of light alloy. It is filled with a double-base propellant in strips form. The propellant charge is ignited by a side-located percussion cap and an igniter.
- The rear end of the case is closed by a base plate.
- The main components of the cartridge case are identical with those used in the other ammunition types for the 84-mm M1, M2, and M3 MAAWS.

Safety Information

The most heat-sensitive component is the propellant, whose ignition temperature is +160 °C.
Packaged round will endure a 12-meter drop without the safety being affected.

Legend: °C – degree Celsius, g – grams; MAAWS – Multi-role, Anti-armor, Anti-personnel Weapon System

AMMUNITION TYPES

A-16. The projectile body is a cylindrically shaped projectile made of steel or aluminum that engages with the rifling of the barrel. The projectile body design varies based on the characteristics and capabilities of each round.

A-17. Tables A-5 through A-28 (pages A-8 through A-31) describe the characteristics of various 84-mm projectiles each cartridge uses for the M3 MAAWS, and the various types of 84-mm ammunition for training and combat. The M3 MAAWS, 84-mm ammunition has applicable DODICs whose identification codes provide clarity and ease for the unit's ammunition resource manager.

Table A-5. HE 441D RS, 84-mm cartridge

DODIC	CA27		Color Code	
Model	HE 441D RS		Cartridge case	Black with white markings
Type	High explosive		Projectile	Forest green with yellow markings
Complete round	7.05 lb	3.2 kg		
Projectile	5.07 lb	2.3 kg		
Length	14.8 in	376 mm		
Diameter	3.3 in	84 mm		

Intended for use Against			
Troops in open or in defilade, machine gun posts, soft-skinned transport vehicles, or similar targets.			
Performance			
Muzzle velocity	240 m/s		
Time of flight out to	350 m		1.6 sec
	700 m		3.4 sec
	1000 m		5.1 sec
Minimum engagement distance		250 m	820 ft
Minimum arming distance		40-70 m	131-229 ft
Max effective range	Air burst	1250 m	4101 ft
	Impact	1300 m	4265 ft
Temperature Limits			
Lower limit	-40 °F (-40 °C)		-60 °F (-51 °C)
Upper limit	+140 °F (+60 °C)		+160 °F (-71 °C)

Description

- The 84-mm HE, 441D RS round is intended for use against troops in the open and in slit trenches, machine gun posts, soft-skinned transport vehicles, and similar types of targets.
- The HE 441D RS projectile is spin-stabilized and fitted with a combined mechanical time and impact fuze.
- The RS stands for reduced sensitivity of the bursting charge; for example, withstands outer heat better than the Octol charge in the standard round.

Limitations

Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Safety Remarks

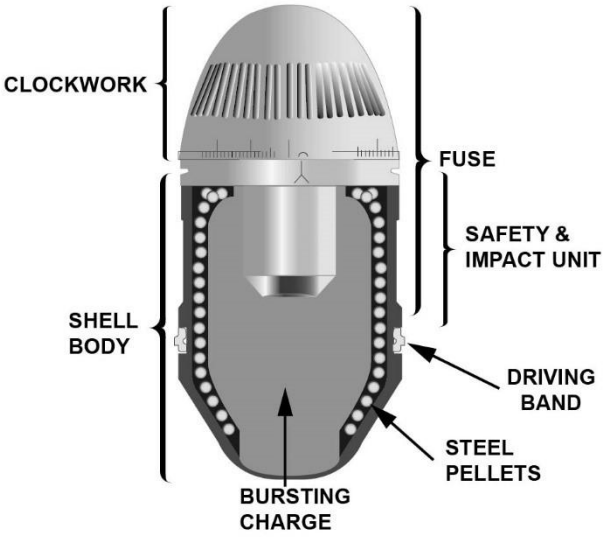
Do not engage targets closer than 250 meters (820 ft).
Use extreme caution when firing within 300 meters (984 ft) of friendly troops.

- Crews shall be trained not to engage targets closer than minimum engagement distance because fragmentation may cause injury or death.
- Crews shall use extreme caution when firing within these distances of adjacent personnel or friendly troops.

Legend: °C – degree Celsius; °F – degree Fahrenheit; ft – feet; HE – high explosive; in – inches; kg – kilogram; lbs –pounds; m – meters; mm – millimeter; m/s – minute per second; N – Newton; Ns – Newton second; RS – reduced sensitivity; sec –seconds

Table A-6. HE 441D RS, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
Warhead			
Explosive (bursting charge)	PBXN-110	590	HMX Adhesive
Booster	NSH 45 NSR 14	4.9 0.48	RDS 96 Desensitizing agent 4% Tetryl
SAI (Safety, Aiming, and Initiation) unit			
Detonator, clockwork	Z28	0.45	Lead dinitroresorcinate Barium nitrate Tetrazene
Detonator SA unit	M55	0.015 0.05 0.02	NOL 130 Lead azide RDX
Relay charge (not shown)	PBXN-5	0.2	HMX Vitone A
Booster	PBXN-5	2.5	HMX Vitone A
Bursting charge	PBXN-110	350	HMX Adhesive



Characteristics

- The projectile consists of the following main parts: projectile body, clockwork, safety and impact unit, and fuze.
- The projectile is fitted with a combined mechanical time and impact fuze, which is set by hand without tools.
  - The setting is made between 40 and 1250 meters and is stepless.
  - The scale is subdivided into 10-meter divisions.
  - The direction in which the fuze is turned is immaterial.
  - The fuze can be reset to the S position and reused.
- The fuze's impact mechanism functions independently of the time mechanism.
- From 0 to 40 meters, the projectile can be fired through obstruction consisting of brush-type vegetation.
- Impact will always cause ignition of the detonator independent of position of fuze setting scale even with the index at the S position.
- The projectile body is made of steel. It encloses two inserts of rubber containing about 800 steel pellets. The pellet's insert surrounds the bursting charge of plastic bonded explosives. The projectile body is designed so that the danger area for rearward fragments from the point of burst is small.

Safety Distance

The fuze is safe at 40 meters from the muzzle and is fully armed at 70 meters. Consequently, air burst may fail to occur when the fuze is set between 40 and 70 meters.

Safety Information

- The ammunition is not sensitive to electromagnetic radiation. The ammunition has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant in the cartridge case.
- Fuze in the safe condition withstands 12 meters in drop tests and is safe for dispersal.
- If the propellant charge is ignited in or outside of the package—
  - The projectile will separate from the cartridge case and project several meters.
  - The burning propellant may cause a fire to start.
  - The base plate of the cartridge case will rupture and parts of the projectile may project as far as 60 meters.
- If the projectile detonates, fragments will project approximately 400 meters.
- Fragment size is approximately the same as the diameter of the balls.

Note

Soldiers are not allowed to disassemble the HE 441D RS round.

Legend: °C – degree Celsius, g – grams

Table A-7. HEDP 502 RS, 84-mm cartridge

DODIC	CA21		Color Code		
Model	HE 502 RS		Cartridge case	Black with white markings	
Type	High explosive dual purpose		Selection model	White I and D	
Complete round	7.27 lb	3.3 kg	Length	17.2 in	437 mm
Projectile	5.07 lb	2.29 kg	Diameter	3.3 in	84 mm

Intended for use Against

The projectile has armor penetration capabilities to achieve maximum lethality against armored vehicles and delay action for bursting inside field fortifications and buildings.

Performance			Dispersion, zone (height x width) with 50% hit probability
Muzzle velocity	225 m/s		
Time of flight out to	150 m	0.71 sec	0.82 x 0.2 m
	300 m	1.49 sec	0.5 x 0.5 m
	600 m	3.36 sec	1.4 x 1.0 m

			Max Effective Range		Target Type
Minimum engagement distance	150 m	492 ft	300 m	984 ft	Moving target
Minimum arming distance	17-20 m	55-65 ft	500 m	1641 ft	Stationary target
			1000 m	3281 ft	Exposed troops

Temperature Limits		
Lower limit	-40 °F (-40 °C)	-60 °F (-51 °C)
Upper limit	+140 °F (+60 °C)	+160 °F (+71 °C)

Description

- The fuze system has two modes, I and D, where I is impact and D is delay.
- The required mode is set by turning the round to one of two positions guided by the cartridge case marking (I or D).
- When the round is inserted into the weapon, the selected mode is indicated by that letter (I or D), which shall face upwards.
- The projectile is fin-stabilized and rotates slowly in flight.
- The RS stands for reduced sensitivity of the bursting charge, for example, withstands outer heat better than the Octol charge in the standard HEDP round.

Limitations

Cartridge is subject to firing limitations. Refer to tables A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Safety Remarks

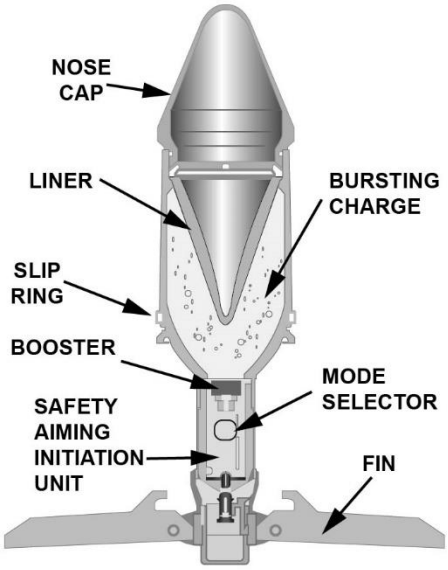
Do not engage targets closer than 150 meters (492 ft).
Use extreme caution when firing with 330 meters (1083 ft) of friendly troops.

- Crews shall be trained not to engage targets closer than safe separation distance because fragmentation may cause injury or death.
- Crews shall use extreme caution when firing within these distances of adjacent personnel and friendly troops.
- Distances are measured from intended target or point of detonation.

Legend: °C – degree Celsius; °F – degree Fahrenheit; ft – feet; HE – high explosive; HEAT – high-explosive anti-tank, HEDP – high-explosive, dual-purpose; in – inches; lbs – pounds; m – meters; MAAWS – Multi-role, Anti-armor, Anti-personnel Weapon System; mm – millimeter; m/s – minute per second; second; sec –seconds

Table A-8. HEDP 502 RS, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
Warhead			
Explosive (bursting charge)	PBXN-110	590	HMX Adhesive
Booster	NSH 45 NSR 14	4.9 0.48	RDS 96 Desensitizing agent 4% Tetryl
SAI (Safety, Aiming, and Initiation) unit			
	Z30	0.07	Silver azide Graphite
	Z210	0.06	Silver azide
	RD1347	0.05	RDX
	RDS NSH 46	0.07	RDX
	(98-1-1)		Desensitizing agent Carbon black
	Z24	0.01	Silver azide Lead trinitrorescorcinate
	Z110	0.1	Zirconium Barium chromate Aerosil 200 Acrylic binder
	Z 22 A	0.09	Boron Potassium perchlorate Red lead oxide Sulforantimony Tetrazene



Characteristics

- The projectile consists of the following main parts: projectile body, safety, aiming, and initiation unit, and fin assembly.
- The projectile body is made of steel and designed for optimum fragmentation. The shaped charge liner is made of a special alloy to achieve enhanced effect behind armor.
- The safety, aiming, and initiation unit has two independent preconditions, gas pressure and acceleration, for achieving arming status.
- The fin assembly is made of light alloy. Before firing, the fins are folded inside the cartridge case. They unfold when the projectile leaves the barrel.
- The slip ring is located on the rear of the projectile body. Although the projectile is fired from a rifled barrel, the slip ring ensures that the spin does not reach a rate influencing the fin stabilization of the projectile or that would reduce the shaped charge performance.

Safety Information

- The ammunition is not sensitive to electromagnetic radiation. The ammunition has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant in the cartridge case.
- If the propellant charge is ignited in or outside of the package—
  - The projectile will separate from the cartridge case and project several meters.
  - The burning propellant may cause a fire to start.
  - The base plate of the cartridge case will rupture and parts of the projectile may project as far as 60 m.
- If the projectile detonates, fragments will project approximately 400 meters.

Note

Soldiers are not allowed to disassemble the HE 502 RS round.

Legend: °C – degree Celsius, g – grams; m – meter

Table A-9. TPT 141, 84-mm cartridge

DODIC	CA10		Color Code		
Model	TPT 141		Cartridge case	Black with white markings	
Type	Target practice with tracer				
Complete round	5.5 lb	2.5 kg	Length	16.26 in	413 mm
Projectile	3.9 lb	1.8 kg	Diameter	3.75 in	95.3 mm
Intended for use Against					
Training only.					
Performance			**Dispersion, zone (height x width) with 50% hit probability**		
Muzzle velocity	305 m/s				
Time of flight out to	200 m	0.77 sec	0.2 x 0.2 m		
	300 m	1.25 sec	0.3 x 0.2 m		
	400 m	1.79 sec	0.5 x 0.4 m		
Temperature Limits					
Lower limit	-40 °F (-40 °C)		-60 °F (-51 °C)		
Upper limit	+140 °F (+60 °C)		+160 °F (+71 °C)		

Description

- The cartridge consists of a projectile body, tracer, slip ring, cartridge case, propellant charge, igniter charge, percussion primer, and base plate.
- The cartridge is used for target practice and simulates the trajectory of tactical M3 MAAWS Recoilless Rifle cartridges (non-rocket assisted only) up to 984 ft (300 m) in flight.

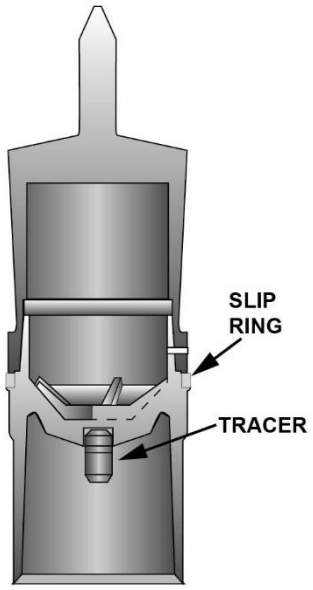
Limitations

Cartridge is subject to firing limitations. Refer to tables A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Legend: °C – degree Celsius; °F – degree Fahrenheit; ft – feet; in – inches; kg – kilogram; lbs – pounds; m – meters; MAAWS – Multi-role, Anti-armor, Anti-personnel Weapon System; mm – millimeter; m/s – minute per second; sec –seconds

Table A-10. TPT 141, 84-mm projectile

Parts of	*Weight (g)*	*Composition*
Igniter composition	0.25	Magnesium Calcium recinat Strontium peroxide Color agent
Illum Composition	0.45	Magnesium Strontium nitrate PVC binder Strontium oxalate



Characteristics

- The projectile is made of aluminum with a slip ring.
- The tracer is clearly visible throughout the trajectory when firing at ranges up to 400 meters.
- The tracer burning time is about 2 seconds.

Safety Information

- The ammunition is not sensitive to electromagnetic radiation. Similar systems have been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against strike of lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant in the cartridge case.
- If the propellant is ignited in or outside the package, the projectile will separate from the cartridge case and project a distance of several meters. The burning propellant may cause a fire.
- The base plate of the cartridge case will rupture and parts of it may project as far as 60 meters.

Note

Soldiers are not allowed to disassemble the TPT 141 round.

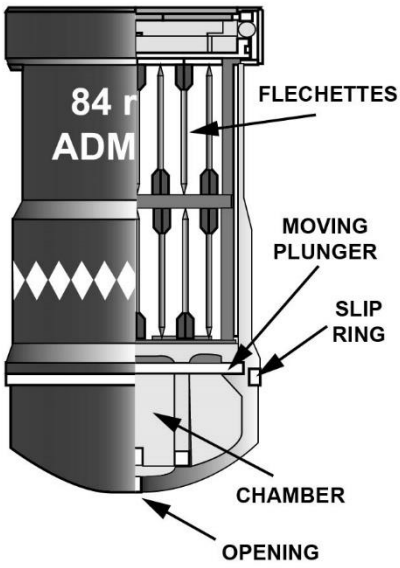
Legend: °C – degree Celsius; g – grams; ILLUM – illuminator; PVC – polyvinyl chloride

Table A-11. ADM 401/B, 84-mm cartridge

DODIC	CA23		Color Code	
Model	ADM 401		Projectile	Olive green body with white markings
Type	Area defense munition		Cartridge case	Black with white markings
Complete round	5.73 lbs	2.6 kg		
Projectile	3.97 lbs	1.8 kg		
Length	15.08 in	383 mm		
Intended for use Against				
Intended for area protection; used as an antipersonnel munition for close-in protection in tight conditions of jungle or urban warfare.				
Performance				
Muzzle velocity	300 m/s			
Effective range	100 m	328 ft		
Temperature Limits				
Lower limit	-40 °F (-40 °C)		-60 °F (-51 °C)	
Upper limit	+140 °F (+60 °C)		+160 °F (+71 °C)	
Description				
• The 84-mm ADM 401 is a round intended for area protection. The round will spread approximately 1100 flechettes against the target area. • At a distance of 100 m and a target of (h x w) 2 x 7 m divided into 14 square meters, at least 10 of the squares will be fully penetrated.				
Note				
The 84-mm, ADM 401B round has ball bearings with an effective range of 200 m.				
Limitations				
Cartridge is subject to firing limitations. Refer to the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.				
Safety Remarks				
• Do not engage targets closer than 150 meters (492 ft). • Use extreme caution when firing within 330 meters (1083 ft) of friendly troops. • Crews shall be trained not to engage targets closer than safe separation distance because fragmentation may cause injury of death. • Crews shall use extreme caution when firing within these distances of adjacent personnel and friendly troops.				
Legend: ADM – area deterrent munition; °C – degree Celsius; °F – degree Fahrenheit; ft – feet; in – inches; kg – kilogram; lbs – pounds; m – meters; mm – millimeter; m/s – minute per second; sec –seconds				

Table A-12. ADM 401, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
ADM 401			
The ADM (area deterrent munition) 401 projectile does not contain any propellant charge.			



Characteristics

The flechettes are arranged in two layers above the moving plunger as indicated. During the barrel phase of the projectile, high-pressure propellant gases flow through the opening in the projectile. The opening leads to a chamber beneath the moving plunger. When the projectile exits the barrel and enters atmospheric pressure, the pressure difference between the propellant gases behind the plunger and the atmospheric pressure become so great that the plunger is expelled forwards with the flechettes. The plunger separates from the flechettes in front of the muzzle and flies separately against the target area. Then the flechettes freely fly toward the target area and disperse in a circular pattern of 7-8 degrees from the muzzle of the weapon.

A target, at 100 m distance, consisting of 10-mm pin plywood and with a surface of 12-mm soft board, will be fully penetrated. Full penetration means that the flechettes penetrate the target so that the head of the flechette is visible on the backside of the target described above. The angle of impact is 90 degrees.

Aiming point shall be approximately 1 m above the selected hitting point at a distance of 100 m.

The slip ring acts as a seal between the barrel and the projectile and provides the projectile with suitable rotation.

Safety Information

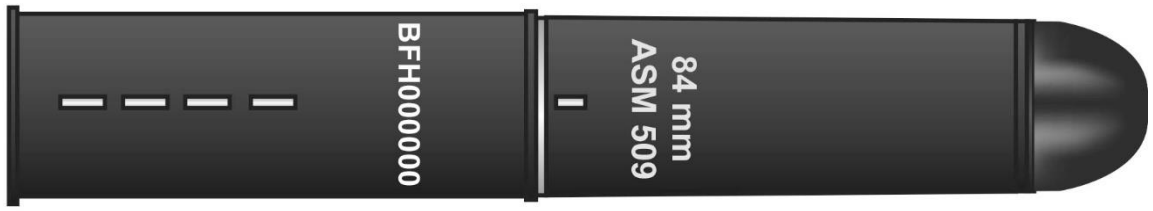
- The ammunition is not sensitive to electromagnetic radiation. The ammunition has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant in the cartridge case.
- Fuze in the safe condition withstands 12 meters in drop tests and is safe for dispersal.
- If the propellant charge is ignited in or outside of the package—
  - The projectile will separate from the cartridge case and project several meters.
  - The burning propellant may cause a fire to start.
  - The base plate of the cartridge case will rupture and parts of the projectile may project as far as 60 meters.

Note

Soldiers are not allowed to disassemble the ADM 401 round.

Legend: °C – degree Celsius, g – grams; m – meter; mm – millimeter

Table A-13. ASM 509, 84-mm cartridge



DODIC	CA41		Color Code		
Model	ASM 509		Projectile	Olive green with yellow markings	
Type	Antistructure munition		Selection mode	White letters I and D	
Complete round	9.25 lbs	4.2 kg			
Projectile	7.5 lbs	3.4 kg			
Length	21.14 in	537 mm			

Intended for use Against

The round is an antistructure munition designed to defeat targets like walls and parapets made of bricks and light concrete. The round can also be used to engage light armored vehicles.

Performance			Operating Temperature Range		
Muzzle velocity	170 m/s		Lower limit	-4 °F (-20°C)	
Time of flight out to	150 m	0.9 sec	Upper limit	+140 °F (+60°C)	
	300 m	1.89 sec			
	450 m	2.94 sec	Effective Range	Target Type	
Minimum engagement distance	12 m	39 ft	300 m	984 ft	Vehicles
Minimum arming distance	12 m	39 ft	300 m	984 ft	Field fortification

Description

- The round is an anti-structure munition designed to defeat targets like walls and parapets made of bricks and light concrete. The round can also be used to engage light armored vehicles.
- The round is an anti-structure munition designed to defeat targets like walls and parapets made of bricks and light concrete. The round can also be used to engage light armored vehicles.
- The fuze system in ASM 509 has two modes, an Impact mode (I) and a Delay mode (D). The Impact mode is used to defeat walls and parapets as well as light armored vehicles. To defeat an enemy behind a wall or inside a field fortification the delay mode is used.
- The required mode is set by turning the round to one of two positions guided by the cartridge case marking (I or D). When the round is inserted into the weapon, the selected mode is indicated by that letter (I or D) which shall face upwards.

Limitations

Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Safety Remarks

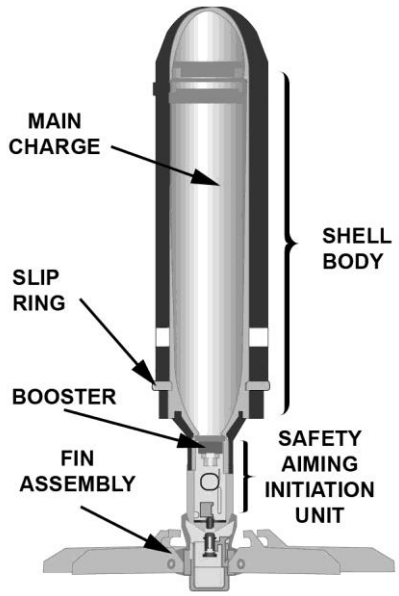
Do not engage targets closer than 12 meters (39 ft).
Use extreme caution when firing with 180 meters (590 ft) of friendly troops.

- Crews shall be trained not to engage targets closer than safe separation distance because fragmentation may cause injury of death.
- Crews shall use extreme caution when firing within these distances of adjacent personnel and friendly troops.
- Distances are measured from intended target or point of detonation.

Legend: ASM – antistructure munition, °C – degree Celsius; °F – degree Fahrenheit; ft – feet; in – inches; kg – kilogram; lbs – pounds; m – meters; mm – millimeter; m/s – minute per second; sec –seconds

Table A-14. ASM 509, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
Projectile Body			
Explosive (main charge)	PAX-47	2000	HMX A1 powder Binder & plasticizer
Booster	PBXN-5 PBXN-5	8.5 0.5	Octogen NSO30 Octogen NSO304
SAI (Safety, Aiming, and Initiation) unit			
EED (TAU 81C)	NTT 46 RDX RD1347	0.085 0.04	Lead azide Lead trinitroresorcinate RDX
Delay detonator	RDS NSH 46	0.075	RDX
	Z24	0.065	Silver azide Lead trinitroresorcinate
	NOA 30	0.215	Zirconium Bismuth thrioxide Zinc stearate Poly (butyl methacrylate)
	Z 22 A	0.09	Boron Potassium perchlorate Red lead oxide Antimony trisulphide Tetrazene



Legend: ASM – antistructure munition, °C – degree Celsius, g – grams; m – meter

Characteristics

- The projectile consists of the following main parts: projectile body, safety, aiming, and initiation unit, and fin assembly.
- In the ASM 509, the projectile body is made of aluminum and filled with an enhanced blast explosive. The design of the projectile body provides the ASM 509 with high pressure and splinter effects against the intended targets.
- The safety aiming initiation unit has two independent preconditions, gas pressure and acceleration, for achieving arming status.
- The fin assembly is made of light alloy. Before firing, the fins are folded inside the cartridge case. They unfold when the projectile leaves the barrel and are wrapped off when hitting such items as a bunker.
- The slip ring is located on the rear of the projectile body. Although the projectile is fired from a rifled barrel, the slip ring ensures that the spin does not reach a rate influencing the fin stabilization of the projectile or that would reduce the shaped charge performance.

Safety Information

- The ammunition is not sensitive to electromagnetic radiation. The ammunition has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant in the cartridge case.
- If the propellant charge is ignited in or outside of the package—
  - The projectile will separate from the cartridge case and project several meters.
  - The burning propellant charge may cause a fire to start.
  - The base plate of the cartridge case will rupture and parts of the projectile may project as far as 60 meters.
- If the projectile detonates, fragments will project approximately 200 m.

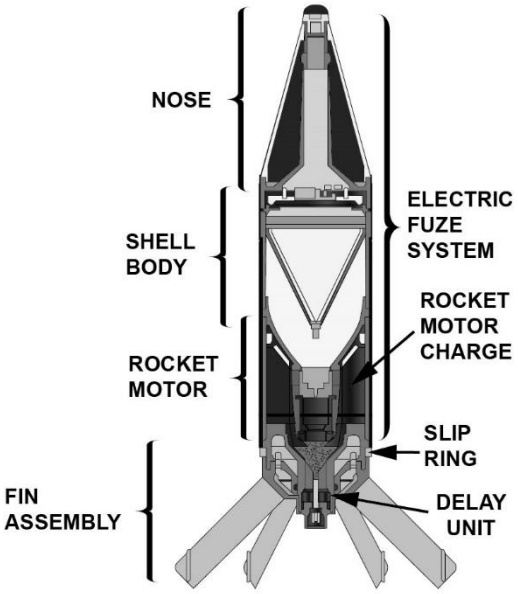
Legend: ASM – antistructure munition, °C – degree Celsius, g – grams; m – meter

Table A-15. HEAT 551, 84-mm cartridge

DODIC	CA 383		Color Code	
Model	HEAT 551		Cartridge	Black with white markings
Type	High explosive anti-tank		Projectile	Blue with yellow markings
Complete round	7.05 lbs	3.2 kg		
Projectile	5.29 lbs	2.4 kg		
Length	23.62 in	600 mm		
Intended for use Against				
Intended for use against all types of armored fighting vehicles including those fitted with protective devices such as skirting plates, grids, and other devices.				
Performance			**Dispersion, zone (height x width) with 50% hit probability**	
Muzzle velocity	254 m/s			
Time of flight out to	400 m	1.3 sec		
	500 m	1.6 sec	0.6 x 0.5 m	
	600 m	2.0 sec	08.8 x 0.7 m	
	700 m	2.3 sec		
Max effective range	700 m	2297 ft		
Minimum arming range	5-8 m	16-26 ft		
Penetration, armor	350 mm	13.78 in		
Operating Temperature Range				
Lower limit	-40 °F (-40 °C)			
Upper limit	+140 °F (+60 °C)			
Description				
• The 84-mm HEAT 551 round (high-explosive anti-tank) is intended for use against all types of armored fighting vehicles including those fitted with protective devices such as skirting plates, grids, and other devices. • It is also effective against concrete bunkers, landing craft, and similar hard targets. In addition to its great penetrating power, the fragments of the projectile body have a high lethal effect on personnel in close proximity to the target. • The projectile is fin-stabilized and rotates slowly in flight. • The shaped-charge projectile is fitted with a piezoelectric fuze system that functions at high angles of impact. The design of the fuze system makes it possible to fire the projectile through brush and scrub without the projectile initiating.				
Limitations				
Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.				
Legend: °C – degree Celsius; °F – degree Fahrenheit; ft – feet; in – inches; HEAT – high-explosive anti-tank; kg – kilogram; lbs – pounds; m – meters; mm – millimeter; m/s – minute per second; sec –seconds				

Table A-16. HEAT 551, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
Rocket Motor			
Rocket motor charge	NK 1299	270	Nitrocellulose Nitroglycerine
Ignition charge	NOA32	6	Zirconium/Nickel Bismuth trioxide Zink stearate Acrylic binder
Delay unit	Z47F	0.2	Boron Potassium nitrate Acrylic binder
	NOA 34	1	Zirconium Bismuth trioxide Zink stearate Acrylic binder
Projectile			
Bursting charge	Octol NSV 107	460	HMX/TN 70/30T
Booster	HMX, NSO 304	0.09	PBXN-5
	HMX, NSO 30	1	PBXN-5
	HMX, NSO 30	7.13	PBXN-5
SAI (Safety, Aiming and Initiation) Unit			
Electronic explosive detonator	Z30	0.07	Silver azide, graphite
(N8T)	Z210 RD1347	0.07 0.05	Silver azide RDX



Characteristics

- The projectile consists of the following main parts: Nose, projectile body, electric fuze system, rocket motor, and fin assembly.
- The nose consists of a plastic cap and a standoff tube (shock transmitter) made of light alloy. The front end of the standoff tube is fitted with a biting edge of steel to ensure that the projectile is not deflected at impact.
- The projectile body is made of light alloy and contains a bursting charge of Octol, a liner of copper and a PBXN-5 booster.
- The electric fuze system consists of a shock transmitter, piezoelectric generator with five crystals, connecting circuit and a safety, aiming and initiation unit. The conductors of the system are wires and metal parts in the projectile. After arming the projectile can, without being initiated, pass through a target consisting of bushes.
- The rocket motor body is made of light alloy. The rocket motor nozzle contains a delay unit and an igniting charge. The rocket motor charge consists of smokeless double-base propellant.
- The fin assembly consists of six folding fins and a plunger with two gas valves. The fin assembly is one piece of cold-extruded aluminum.
- The slip ring, in front of the fin assembly, acts as a seal between the barrel and the projectile and provides the projectile with a suitable initial rotation, which does not reduce the shaped charge performance in the HEAT version.
- For training purposes, there is an inert Target Practice (TP) Projectile 552. The TP 552 round has the same ballistic characteristics as the HEAT 551, the HEAT 551C round and the HEAT 551C RS round.

Safety Information

- The ammunition is not sensitive to electromagnetic radiation. It has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant in the cartridge case.
- Fuze in safe condition withstands 12 m in drop test and is safe for dispersal.
- If the propellant charge is ignited in or outside of the package—
  - The projectile will separate from the cartridge case and project, in worst case, 1800 m.
  - The burning propellant may cause a fire to start.
  - The base plate of the cartridge case will rupture and parts of it may project as far as 60 m.
- Detonation may cause projection of fragments, risk area 150 m. Rocket motor projection risk area is 1000 m. Burning with toxic fumes, NOx, and Co.
- If projectile detonates, fragments will project approximately 400 m.

Note

Soldiers are not allowed to disassemble the HEAT 551 round.

Legend: °C – degree Celsius; g – grams; HEAT – high-explosive anti-tank; m – meters

Table A-17. HEAT 551C, 84-mm cartridge

DODIC	CA 20	Model	HEAT 551C RS		
Type	High explosive anti-tank		Color Code		
Complete round	7.72 lbs	3.5 kg	Cartridge	Black with white markings	
Projectile	5.95 lbs	2.7 kg	Projectile	Blue with yellow markings	
Length	25.4 in	645 mm			

Intended for use Against

Intended for use against all types of armored fighting vehicles including those fitted with protective devices such as skirting plates, grids, and other devices.

Performance			Dispersion, zone (height x width) with 50% hit probability		
Muzzle velocity	254 m/s				
Time of flight out to	400 m	1.3 sec			
	500 m	1.6 sec	0.6 x 0.5 m		
	600 m	2.0 sec			
	700 m	2.3 sec	0.8 x 0.7 m		
Max effective range	700 m	2297 ft			
Minimum arming distance	5-8 m	16-26 ft	Penetration, solid armor	≈400 mm	15.75 in

Operating Temperature Range

Lower limit	-40 °F (-40 °C)	Upper limit	+140 °F (+60 °C)

Description

- The 84-mm HEAT 551C RS round (high-explosive anti-tank) is intended for use against all types of armored fighting vehicles including those fitted with protective devices such as skirting plates, grids, and other devices.
- It is also effective against concrete bunkers, landing craft, and similar hard targets. In addition to its great penetrating power, the fragments of the projectile body have a high, lethal effect on personnel in close proximity to the target.
- To obtain a flat trajectory, reduce time of flight and increase range. The projectile is fitted with a rocket motor, which starts when the projectile has left the barrel.
- The projectile is fin-stabilized and rotates slowly in flight.
- The shaped-charge projectile is fitted with a piezoelectric fuze system that functions at high angles of impact. The design of the fuze system makes it possible to fire the projectile through brush and scrub without the projectile initiating.
- RS means reduced sensitivity of the bursting charge; for example, withstands outer heat better than the Octol charge in the standard HEAT round.

Safety Remarks

- Do not engage targets closer than 85 meters (278 ft).
- Use extreme caution when firing within 85 meters (278 ft) of friendly troops.
- Crews shall be trained not to engage targets closer than safe separation distance because fragmentation may cause injury or death.
- Crews shall use extreme caution when firing within these distances of adjacent personnel and friendly troops. Distances are measured from intended target or point of detonation.

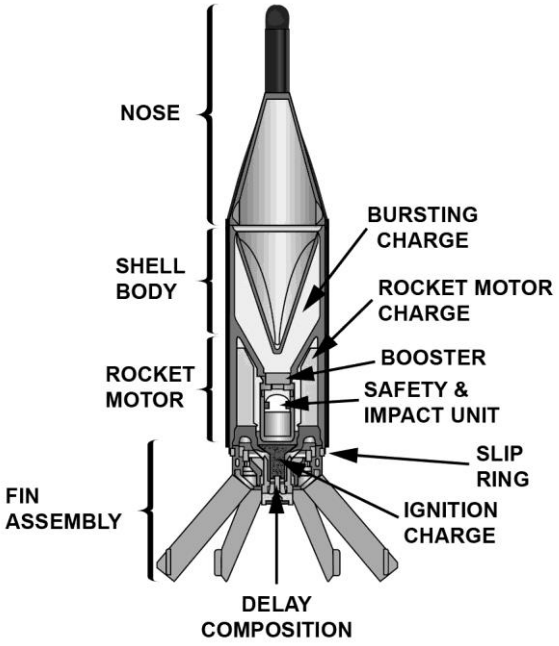
Limitations

Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Legend: °C – degree Celsius; °F – degree Fahrenheit; ft – feet; HEAT – high explosive anti-tank in – inches; kg – kilogram; lbs – pounds; m – meters; mm – millimeter; m/s – minute per second; sec –seconds

Table A-18. HEAT 551C, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
Rocket Motor			
Rocket motor charge	NK 1300	255	*Nitrocellulose* *Nitroglycerine* *Dietylphtalate* *2-nitro-diphenylamine* *2-lead-ethylhexonate* *Leadsalicylate* *Leadstearate*
Ignition charge	NOA32	6	Zirconium/Nickel Bismuth trioxide Zink stearate Acrylic binder
Igniter body with delay composition	NOA34	0.6	Zirconium Bismuth trioxide Zink stearate Acrylic binder
Shell			
Bursting charge	HMX, NSO 600 HMX, NSO 30 HMX, NSO 304	580 7 0.8	PBXN-110 PBXN-5 PBXN-5
Safety, Arming and Initiation) Unit			
Electronic explosive detonator (TAU) 81) — Not shown —	NTT 46 RDX 1347	0.085 0.04	Lead azide



Characteristics

- The projectile consists of the following main parts: Nose, projectile body, SAFETY, AIMING, AND INITIATION unit, rocket motor, and fin assembly.
- The nose consists is made of light alloy. The front end of the nose is fitted with a biting edge of steel to ensure that the projectile is not deflected at impact.
- The projectile body is made of light alloy and contains a bursting charge of PBXN-110, a liner of copper aluminum and a PBXN-5 booster.
- The safety, aiming and initiation unit has three different safety devices.
- The rocket motor body is made of light alloy. The rocket motor nozzle contains an igniter body and an igniting charge. The rocket motor charge consists of smokeless double-base propellant.
- The rocket motor body is made of light alloy. The rocket motor nozzle contains an igniter body and an igniting charge. The rocket motor charge consists of smokeless double-base propellant.
- The slipping ring, in front of the fin assembly, acts as a seal between the barrel and the projectile and provides the projectile with a suitable initial rotation which does not reduce the shaped charge performance.
- For training purposes there is an inert Target Practice (TP) Projectile 552. The TP 552 round has the same ballistic characteristics as the HEAT 551, the HEAT 551C round, and the HEAT 551C RS round.

Safety Information

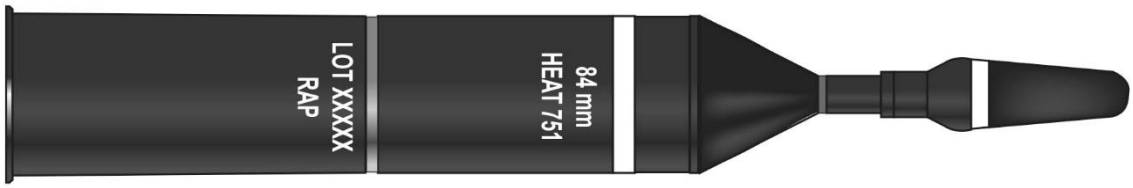
- The ammunition is not sensitive to electromagnetic radiation. It has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant charge in the cartridge case.
- Fuze in safe condition withstands 12 m in drop test and is safe for dispersal.
- If the propellant charge is ignited in or outside of the package—
  - The projectile will separate from the cartridge case and project, in worst case, 1800 m.
  - The burning propellant may cause a fire to start.
  - The base plate of the cartridge case will rupture and parts of it may project as far as 60 m.
- Detonation may cause projection of fragments, risk area 150 m. Rocket motor projection risk area is 1000 m. Burning with toxic fumes, NOx, and Co.
- If projectile detonates, fragments will project approximately 400 m.

Note

Soldiers are not allowed to disassemble the HEAT 551C RS round.

Legend: °C – degree Celsius, g – grams; m – meters

Table A-19. HEAT 751, 84-mm cartridge



DODIC		Model	HEAT 751		
Type	High explosive anti-tank		Color Code		
Complete round	8.38 lbs	3.8 kg	Cartridge	Black with white markings	
Projectile	6.39 lbs	2.9 kg	Projectile	Blue with yellow markings	
Length	29.9in	760 mm			

Intended for use Against
Intended mainly for the combat of infantry combat vehicles and main battle tanks (MBTs). It can also be used against other targets such as hard bunkers, aircraft on the ground, other types of vehicles, and radar stations.

Performance			Penetration, solid armor	
Muzzle velocity	210 m/s		ERA + >500 mm armor	ERA + >20 in armor
Time of flight out to	400 m	1.44 sec		
	500 m	1.75 sec		
	600 m	2.07 sec		
	700 m	2.3 sec		
Max effective range	700 m	2297 ft		
Minimum arming distance	20-40 m	65-131 ft		

Operating Temperature Range			
Lower limit	-40 °F (-40 °C)	Upper limit	+140 °F (+60 °C)

Description

- The 84-mm HEAT 751 (high explosive anti-tank) round is an armor-piercing, high explosive round with a high explosive shaped charge effect warhead. The projectile is provided with a tandem charge, which gives good effect in targets with explosive reactive armor and other types of external protection. HEAT 751 is intended mainly for the combat of infantry combat vehicles and MBTs. It can also be used against other targets such as hard bunkers, aircraft on the ground, other types of vehicles, and radar stations.
- Besides penetration and effect in the target, the projectile gives effect in the form of fragments around the target itself.
- The tandem warhead consists of a precursor and a main charge. The precursor penetrates the ERA, and the main charge then functions in the same way as a conventional shaped charge projectile.
- To obtain a flat trajectory, reduce time of flight, and increase range, the projectile is fitted with a rocket motor, which starts when the projectile has left the barrel. The projectile is fin-stabilized and rotates slowly in flight. The projectile has the following safety devices:
  - Two barrel safety devices.
  - A safety device influenced by rocket motor acceleration.
  - An electric short-circuiting function.

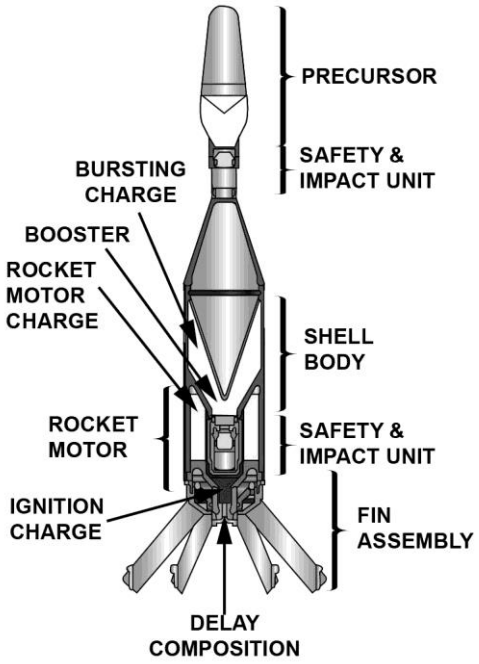
Limitations

Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Legend: °C – degree Celsius; °F – degree Fahrenheit; ERA – explosive reactive armor; ft – feet; in – inches; kg – kilogram; lbs – pounds; m – meters; mm – millimeter; m/s – minute per second; sec –seconds

Table A-20. HEAT 751, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
Rocket Motor			
Rocket motor charge	NK 1300	270	Nitrocellulose Nitroglycerine Dietylphtalate
Ignition charge	NOA32	6	Zirconium/Nickel Bismuth trioxide Zink stearate Acrylic binder
Delay composition	NOA34	0.6	Zirconium Bismuth trioxide Zink stearate Acrylic binder
Projectile			
Bursting charge	Octol	635	HMX/TNT
Booster	NSV 107 PBXN-5 (NSO30 PBXN-5 (NSO304)	 7.1 1.8 	70/30 HMX Vitone A HMX Vitone A



Characteristics

- The projectile consists of the following main parts: Precursor, safety, arming, and initiation units, projectile body, fin assembly, and rocket motor.
- The HEAT 751 round is fitted with separate safety, arming, and initiation units in the precursor and main charge.
- The safety, aiming, and initiation units are identical except for an electrical ignition delay unit in the main charge safety, arming, and initiation unit. This ignition delay has the task of making the main charge detonate with the correct time delay in relation to the precursor.
- The tandem warhead consists of a precursor and a projectile body.
- The task of the precursor is to penetrate explosive reactive armor or other exterior protection. It consists of a standoff cap, liner, precursor charge and safety, aiming, and initiation unit. The charge is of explosively formed projectile (EFP) type.
- The projectile body is made of aluminum and consists of a liner, bursting charge, booster and safety, aiming, and initiation unit.
- The rocket motor body is made of light alloy. The rocket motor nozzle contains a delay unit and an igniting charge. The rocket motor charge consists of smokeless double-base propellant.
- The fin assembly consists of six folding fins and a plunger with two gas valves. The fin assembly is made in one piece of cold-extruded aluminum.
- The slipping ring, in front of the fin assembly, acts as a seal between the barrel and the projectile and provides the projectile with a suitable initial rotation, which does not reduce the shaped charge performance in the HEAT version.

Safety Information

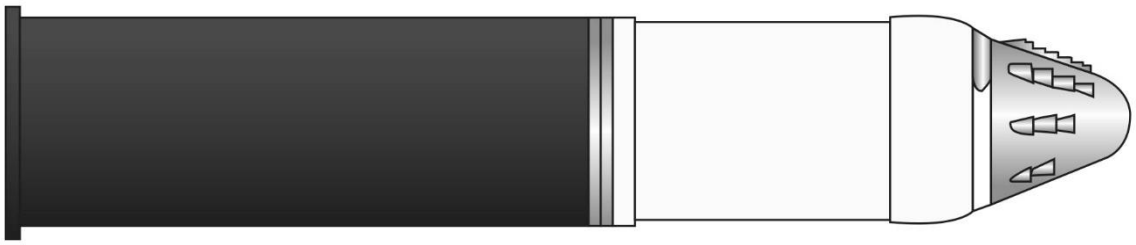
- The ammunition is not sensitive to electromagnetic radiation. It has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant charge in the cartridge case.
- Fuze in safe condition withstands 12 m in drop test and is safe for dispersal.
- If the propellant charge is ignited in or outside of the package—
  - The projectile will separate from the cartridge case and project several meters.
  - The burning propellant may cause a fire to start.
  - The base plate of the cartridge case will rupture and parts of it may project as far as 60 m.
- Detonation may cause projection of fragments, risk area 150 m. Rocket motor projection risk area is 1000 m. Burning with toxic fumes, NOx, and Co.
- If the projectile detonates, fragments will project approximately 400 m.

Note

Soldiers are not allowed to disassemble the HEAT 751 round.

Legend: °C – degree Celsius, g – grams; m – meters

Table A-21. Illuminator 545C, 84-mm cartridge



DODIC	CA36	Model	ILLUM 545C		
Type	Illumination	Color Code			
Complete round	6.38 lbs	3.1 kg	Cartridge	Black with white markings	
Projectile	4.85 lbs	2.2 kg	Projectile	White with black markings	
Length	18.3 in	466 mm			

Intended for use Against
Designed to meet the requirement for a very quick illumination of target areas.

Performance		
Muzzle velocity	260 m/s	
Minimum arming distance	40-85 m	131-279 ft
Practical maximum range of burst	2.100 m	6890 ft
Practical minimum range of burst	300 m	984 ft
Illuminated area, diameter	~400-500 m	1312-1640 ft
Rate of decent	~5 m/s	16 ft/s
Candle power	~650,000 cd	
Burning time	~30 sec	

Operating Temperature Range			
Lower limit	-40 °F (-40 °C)	Upper limit	+140 °F (+60 °C)

Description

- The 84-mm ILLUM 545C round has been designed to meet the requirement for a very quick illumination of target areas, offering facilities for all types of direct firing weapons and guided anti-tank weapons to engage armored fighting vehicles including support and other weapons.
- The ILLUM 545C round is also intended to facilitate for the subunits of a battalion to supply their own illumination of a battlefield, even continuously, when required.

Safety Remarks

Fire from a standing position only.

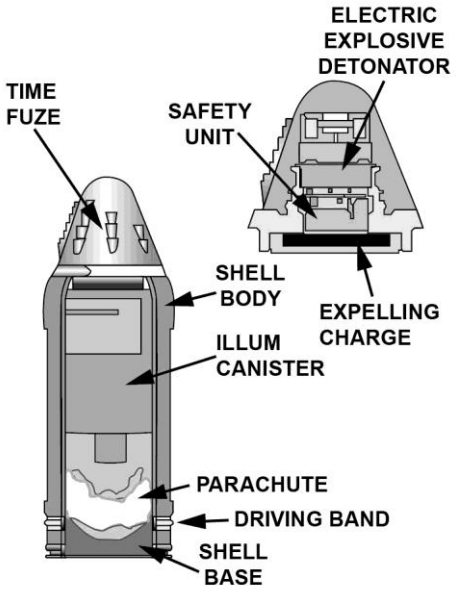
Limitations

Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Legend: cd – candela; °C – degree Celsius; °F – degree Fahrenheit; f/s – feet per second; ft – feet; ILLUM – illuminating; in – inches; kg – kilogram; lbs – pounds; m – meters; mm – millimeter; m/s – minute per second; sec –seconds

Table A-22. Illuminator 545C, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
Illuminating Body			
ILLUM composition	NOL 82	≈557	Magnesium powder Sodium nitrate Zinc stearate Uncured epoxy binder
Igniter body (not shown)	NOF 123		Tin oxide Titan dioxide Boron Zirconium Potassium perchlorate Zink stearate Acrylic binder
Fuze			
Expelling charge	m/90	6.2	Black powder
Blaze charge (not shown)	NOA32	0.7	Zirconium/nickel Bismuth trioxide Zinc stearate Acrylic binder
Detonator in safety unit (not shown)	M55	0.085	NOL 103 Lead azide RDX
EED		0.1	Tetracene Lead azide



Characteristics

- The projectile is spin stabilized and consists of the following parts: projectile body, time fuze, driving band, parachute, projectile base, and illum canister.
- The projectile body is made of light alloy.
- The driving band is made of copper.
- Canister with illuminant composition producing a sodium light with a candlepower of approx. 650,000 candlepower and an average burning time of 30 seconds.
- Canopy, shroud lines, and riser is mainly made of nylon. The riser is also glass fiber reinforced. The parachute gives the canister a stable descent at a controlled speed.
- Projectile base is of light alloy.
- The fuze consists of the following main parts: Body, safety unit, electrical unit, top, generator, electric explosive detonator, and booster cup.
- The fuze is a combined mechanical time and impact fuze equipped with the safety devices required for a modern fuze.
- The fuze is fitted with a graduated setting ring. The graduations range from 300-2100 meters and subdivided in 300 meter divisions. The fuze is set by hand and has a click indication for setting the desired range in darkness. It is also possible to identify the different distances by touching the different knobs.

Safety Information

- The ammunition is not sensitive to electromagnetic radiation. It has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant charge in the cartridge case.
- Fuze in safe condition withstands 12 m in drop test and is safe for dispersal.
- If the propellant charge is ignited in or outside of the package—
  - The projectile will separate from the cartridge case and project several meters.
  - The burning propellant may cause a fire to start.
  - The base plate of the cartridge case will rupture and parts of it may project as far as 60 m.

Note

Soldiers are not allowed to disassemble the HEAT 751 round.

Legend: °C – degree Celsius, EED – electric explosive detonator; g – grams; ILLUM – illuminator; m – meters

Table A-23. MT 756, 84-mm cartridge

DODIC	CA51	Type	Multi-target		
Model	MT 756				
		Color Code			
Complete round	9.7 lbs	4.4 kg	Cartridge	Black with white markings	
Projectile	7.72 lbs	3.5 kg	Projectile	White with yellow markings	
Length	27.95 in	710 mm			

Intended for use against					
Intended mainly for combat in urban areas and is; therefore, a wall piercing round.					
				Performance	
				In +21 °C	
Maximum velocity (at distance)	~266 m/s	(200 m)	Muzzle velocity	~185 m/s	
Time of flight out to:	300 m	1.28 sec	Minimum engagement distance	77 m	252 ft
	500 m	2.16 sec	Minimum arming distance	16 m	52 ft
Penetration			Max effective range	300 m	984 ft
Reinforced concrete walls	0.2 m	0.67 ft			
Triple brick walls	0.3 m	0.98 ft			
Temperature range	Lower limit	-40 °F (-40 °C)	Upper limit	+140 °F (+60 °C)	

Description

- The 84-mm MT 756 (multi target) is intended mainly for combat in urban areas and is therefore a wall-piercing round.
- The projectile is provided with a tandem warhead, which gives good effect in different types of targets as 8” reinforced concrete walls, 12” triple brick walls and earth and timber bunker.
- The tandem warhead consists of precursor and follow-through-charge. When hitting the wall the precursor detonates and creates a hole in the wall. The follow-through charge passes through the hole, detonating behind the wall distributing steel fragments and creating a blast effect.
- The follow-through charge achieves maximum lethality inside the building by ejected fragments.
- The projectile fuze system consists of a nose cap and two separate safety, aiming, and initiation units with the following arming conditions:
  - Acceleration in the barrel during launch.
  - Rocket motor acceleration in the trajectory.

Safety Remarks

- Do not engage targets closer than 77 meters (252 ft)
- Use extreme caution when firing within 115 meters (377 ft) of friendly troops.
- Crews shall be trained not to engage targets closer than safe separation distance because fragmentation may cause injury of death.
- *Crews shall use extreme caution when firing within these distances of adjacent personnel/friendly troops. Distances are measured from intended target or point of detonation.

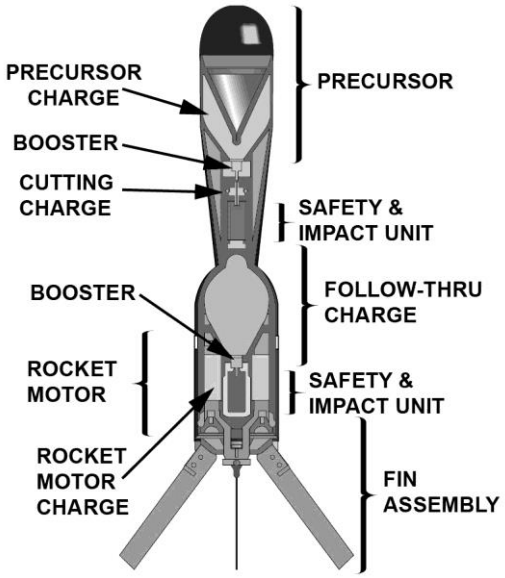
Limitations

Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator’s manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Legend: cd – candela; °C – degree Celsius; °F – degree Fahrenheit; f/s – feet per second; ft – feet; in – inches; kg – kilogram; lbs – pounds; m – meters; mm – millimeter; m/s – minute per second; sec –seconds

Table A-24. MT 756, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
Warhead			
Percursor charge	PBXN-110, type 2	253	HMX Binder
Follow-through charge	PBXN-110, type 2	470	HMX Binder
Booster (2 units)	PBXN-5 (NSO30)	2*5	HMX Vitone
	PBXN-5 (NSO304)	2*0.5	HMX Vitone
Cutting charge	PBXN-5 (NSO304)	5	HMX Vitone
SAI unit (2 units)	NTT46	2*0.09	Lead azide NTB 11 (W9-134-1) Lead trinitroresorcinate NTC 10 (W9-135-1)
	RDX RD 1347	*2*0.045*	RDX
Rocket Motor			
Rocket motor charge			Nitrocellulose Nitroglycerine Triacitin Arcadite II Ballistic modifiers
Igniting charge	NOA32	6.2	Zirconium/Nickel Bismuth trioxide Zink stearate Acrylic binder



Characteristics

- The projectile consists of the following main parts: Precursor, cutting charge, safety, aiming, and initiation units, follow-through charge, fin assembly, and rocket motor.
- The MT 756 round is fitted with separate safety, aiming, and initiation units in the precursor and the follow-through charge.
- The safety, aiming, and initiation units are identical except for an electrical ignition delay unit in the main charge, follow-through charge, and safety, aiming, and initiation unit. This ignition delay has the task of making the follow-through charge detonate with the correct time delay in relation to the precursor.
- The task of the precursor is to make a hole in the wall. It consists of a standoff cap, liner, precursor charge, booster, cutting charge, protective sleeve, and safety, aiming, and initiation unit.
  The charge is of shape charge type. A cutting charge brakes the connection between the precursor and the main charge. This prevents the shock from the precursor to transmit to the follow-through charge.
- The follow-through charge consists of a bursting charge, booster, safety, aiming, and initiation unit and a steel, projectile body forward and an aluminum projectile body rearwards. The projectile body delivers the fragments when the follow-through charge detonates behind the wall.
- The rocket motor body is made of light alloy. The rocket motor nozzle contains a delay unit and an igniting charge. The rocket motor charge consists of smokeless double-base propellant.
- The fin assembly consists of six folding fins and a plunger with two gas valves.
- The slipping ring, in front of the fin assembly, acts as a seal between the barrel and the projectile and provides the projectile with a suitable initial rotation.

*** For training purposes, there is an inert Target Practice Projectile 552.**

Safety Information

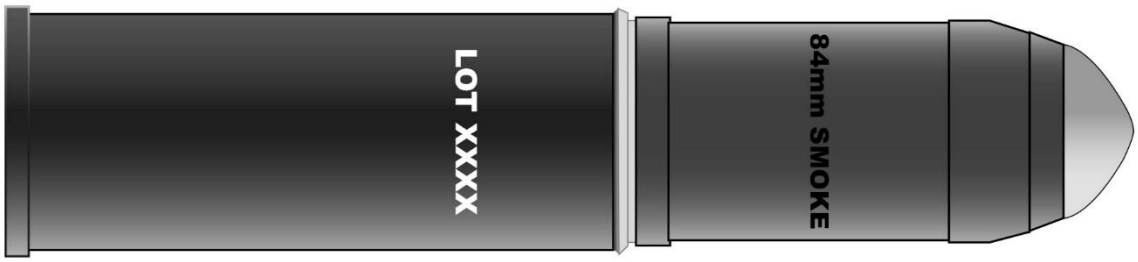
- Temperatures above +160 °C will cause self-ignition of the propellant charge in the cartridge case.
- Fuze in safe condition withstands 12 m in drop test and is safe for disposal.
- Detonation may cause projection of fragments, risk area 400 m. Rocket motor projection risk area is 1800 m. Burning with toxic fumes, NOx, and Co.

Note

Soldiers are not allowed to disassemble the MT 756 round.

Legend: °C – degree Celsius, g – grams; m – meters

Table A-25. SMOKE 469C, 84-mm cartridge



DODIC	SMOKE 469C			
Type	SMOKE		Color Code	
Complete round	7.27lbs	3.3 kg	Cartridge	Black with white markings
Projectile	5.07 lbs	2.29 kg	Projectile	Light green with black markings
Length	17.2 in	437 mm		

Intended for use Against

Intended for tactical use on the battlefield to obscure direct-fire weapons such as supporting tanks, self-propelled artillery, armored fighting vehicles, machine guns, and so forth.

Performance			
Muzzle velocity	240 m/s		Dispersion, zone (height x width) with 50% hit probability
Time of flight out to	400 m	1.8 sec	1.0 x 0.4 m
	800 m	3.9 sec	2.1 x 1.0 m
	1300 m	7.2 sec	4.1 x 2.2 m
Minimum arming distance	40-70 m	131-229 ft	
Max effective range	1300 m	4265 ft	
Width of smoke screen	~15 m	~49 ft	

Operating temperature range	Lower limit	-40 °F (-40 °C)	Upper limit	+140 °F (+60 °C)

Description

- The 84 mm SMOKE 469C round is intended for tactical use on the battlefield to obscure direct-fire weapons such as supporting tanks, self-propelled artillery, armored fighting vehicles, machine guns, and so forth.
- On impact, a smoke screen with a 10 to 15-m width and with good screening effect is instantly obtained.
- Using this round enables the subunit to lay a smoke screen rapidly when required.
- Used in many combat situations listed below:
  - Blinding: Launch round directly at target.
  - Screening: Between enemy and friendly position.
  - Marking: Show position of target to artillery or close air support.

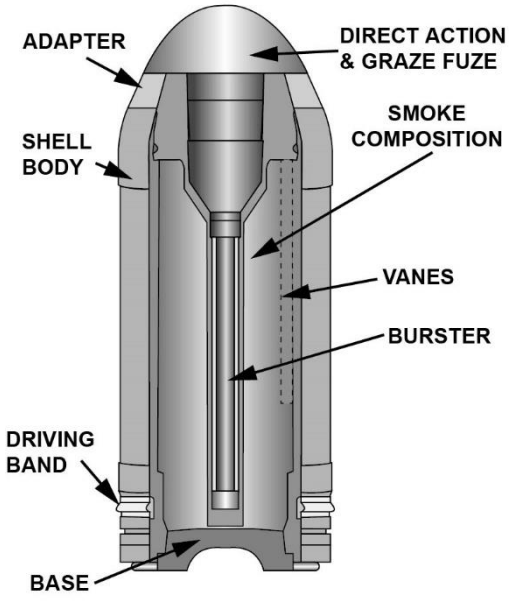
Limitations

Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Legend: °C – degree Celsius; °F – degree Fahrenheit; ft – feet; in – inches; kg – kilogram; lbs – pounds; m – meters; mm – millimeter; m/s – minute per second; sec –seconds

Table A-26. SMOKE 469C, 84-mm projectile

Parts of	*Explosive*	*Weight (g)*	*Composition*
Warhead			
SMOKE composition		800	Titanium tetrachloride Calcium cilicate
Burster	RDX/TNT	12	60/40
Fuze			
Detonator, SA unit (not shown)	M55	0.015 0.05 0.02	NOL 103 Lead azide RDX
Lead charge Lead charge Booster	PBXN-5 PBXN-5 PBXN-5	0.2 0.09 0.85	



Characteristics

- The projectile consists of the following main parts: base, driving band, projectile body, direct action and graze fuze, adapter, smoke composition, vanes, and burster.
- The projectile body assembly consists of a projectile body, an adapter and a base made of light alloy. The projectile is sealed by means of O-rings. To make the smoke composition follow the spin of the projectile and to increase the strength of the body, the inner surface of the body is provided with a number of vanes. The smoke composition is ignited by a burster.
- The driving band is made of copper.
- The fuze is a direct action and graze fuze provided with the safety devices required for a modern fuze. Initiation on impact is obtained by means of a centrally located detonator in the safety and impact unit. The fuze is completely sealed.
- From 0 to 40 m from the muzzle the fuze is not armed and the projectile can be fired through a target consisting of 25-mm pine plank without detonating. After 70 m the fuze is armed and will detonate on impact.
- The impact mechanism functions down to an angle of impact of about 5°.
- The smoke composition consists of titanium tetrachloride absorbed by pulverous synthetic hydrous calcium silicate. When the projectile bursts, the smoke composition is dispersed and a smoke screen is instantly obtained.

Safety Information

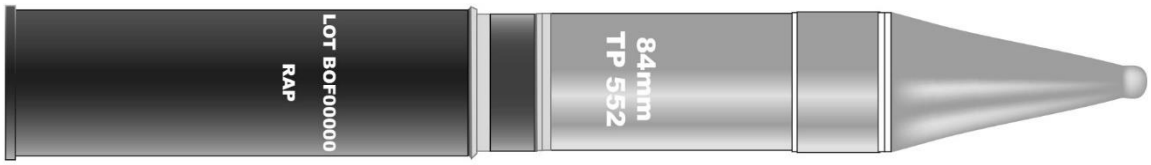
- The ammunition is not sensitive to electromagnetic radiation. It has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant in the cartridge case.
- Fuze in safe condition withstands 12 m in drop test and safe for dispersal.
- If the propellant charge is ignited in or outside the package:
  - The projectile will be separated from the cartridge case and be projected a distance of several meters.
  - The burning propellant charge may cause a fire.
  - The base plate of the cartridge case will be ruptured and parts of it may be projected as far as 60 m.
- If the projectile detonates, fragments will be projected approximately 300 m.

Note

Soldiers are not allowed to disassemble the SMOKE 469C.

Legend: °C – degree Celsius; g – grams; m – meters; mm – millimeter

Table A-27. TPT 552, 84-mm cartridge



DODIC	CA386			
Type	TP 552		Color Code	
Complete round	7.05lbs	3.2 kg	Cartridge	Black with white markings
Projectile	5.29 lbs	2.4 kg	Projectile	Blue with white markings
Length	23.62 in	600 mm		
Intended for use Against				
Intended to be used in training with the 84-mm, recoilless rifle (RCL), MAAWS gun.				
Performance				
Muzzle velocity	254 m/s		Dispersion, zone (height x width) with 50% hit probability	
Time of flight out to	400 m	1.3 sec		
	500 m	1.6 sec	0.6 x 0.5 m	
	600 m	2.0 sec		
	700 m	2.3 sec	0.8 x 0.7 m	
Effective range	700 m	2296 ft		
Rocket motor performance				
Total impulse	510 Ns			
Thrust	325 N			
Burning time	1.5 sec			
Operating Temperature Range				
	Lower limit	-40 °F (-40 °C)	Upper limit	+140 °F (+60 °C)

Description

- The 84-mm round with Target-Practice (TP) Projectile 552 is intended to be used in training with the 84-mm, RCL, Multi-role, Anti-armor, Anti-personnel Weapon System gun.
- The TP 552 projectile contains no fuze system, booster or main charge.
- To replace the weight of these explosive components and to match the center of gravity and ballistics of the 84-mm HEAT (high explosive antitank) Projectile 551, the material is thicker and a solid projectile base is used.
- The projectile has a rocket motor, which gives the projectile a flat trajectory and a short time of flight providing high hit probability even at long range.
- The projectile is fin-stabilized and rotates slowly in flight.
- The cartridge case contains a propellant charge.

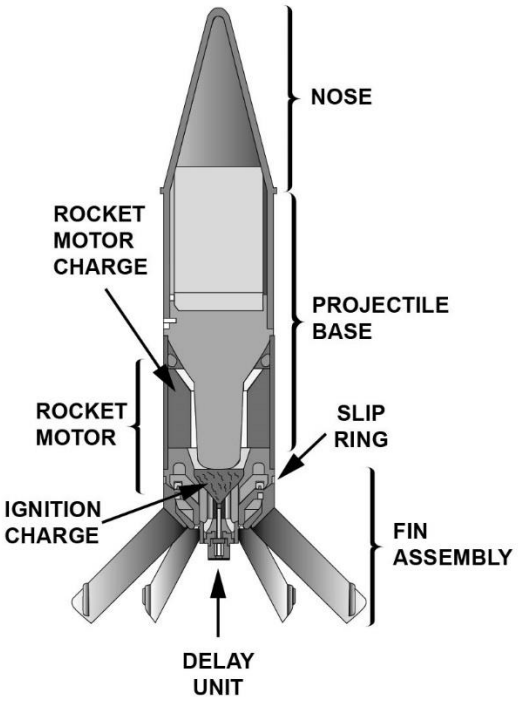
Limitations

Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.

Legend: °C – degree Celsius; °F – degree Fahrenheit; ft – feet; in – inches; kg – kilogram; lbs – pounds; m – meters; MAAWS – Multi-role, Anti-armor, Anti-personnel Weapon System; mm – millimeter; m/s – minute per second; sec –seconds

Table A-28. TPT 552, 84-mm projectile

Parts of	*Explosive*	*Weight in grams (g)*	*Composition*
Rocket Motor			
Rocket motor charge	NK 1299	270	Nitrocellulose Nitroglycerine Dietylphtalate 2-nitrodiphenylamine Leadstearate Lead 2-ethylhexonate Leadsalicylate
Ignition charge	NOA32	6	Zirconium/Nickel Bismuth trioxide Zink stearate Acrylic binder
Delay unit	Z47F NOA 34	0.2 1	Boron Potassium nitrate Acrylic binder Zirconium Bismuth trioxide Zink stearate Acrylic binder



Characteristics

- The projectile consists of the following main parts: Nose, projectile base, rocket motor, and fin assembly.
- The nose and projectile base are made of light alloy.
- The rocket motor body is made of light alloy. The rocket motor nozzle contains a delay unit and an igniting charge. The rocket motor charge consists of smokeless double-base propellant.
- The fin assembly consists of six folding fins and a plunger with two gas valves. The fin assembly is made in one piece of cold-extruded aluminum.
- The slip ring in front of the fin assembly acts as a seal between the barrel and the projectile and provides the projectile with a suitable initial rotation, which does not reduce the shaped charge performance.

Safety Information

- The ammunition is not sensitive to electromagnetic radiation. It has been tested in radio frequency fields, electrostatic discharge, electromagnetic pulse, and against lightning.
- Temperatures above +160 °C will cause self-ignition of the propellant in the cartridge case.
- If the propellant charge is ignited in or outside of the package—
  - The projectile will be separated from the cartridge case and be projected several meters.
  - The burning propellant may cause a fire to start.
  - The base plate of the cartridge case will be ruptured and parts of it may be projected as far as 60 meters.
- Rocket motor projection risk area is 1000 meters. Burning with toxic fumes, NOx, and Co.

Note

Disassembling the TP 552 round is NOT allowed.

Legend: °C – degree Celsius, g – grams

TRAINING AID

A-18. Training aids enhance a unit's ability to train, sustain, and evaluate tactical training. Training aids are tools the units use to conduct training. Leaders and trainers must identify the specific resources that increase a unit's ability to increase their proficiency. This section describes the various systems available for units to integrate for training and evaluations.

SUBCALIBER ADAPTER (SCA 553B)

A-19. An SCA 553B is a training aid for the M3 and can simulate backblast (see table A-29). The adapter is externally similar in shape to the 84-mm HEAT 551/551C RS round.

WARNING

Do not use standard 7.62-mm North Atlantic Treaty Organization ammunition when firing an SCA. If injury occurs, immediately seek medical attention. Failure to observe this warning could result in personnel injury or death.

Note. The projectile and propelling charge of the 7.62-mm tracer round 553B have been adapted to match the ballistics of the 84-mm HEAT 551/551C RS round.

A-20. The ammunition, 7.62-mm tracer round 553B, is intended for use when firing at ranges up to 2297 feet (700 meters). The nose of the bullet is white with a white band (pre 2009) or the nose of the bullet is red with a blue band (post 2009) around the projectile.

BACKBLAST CHARGE

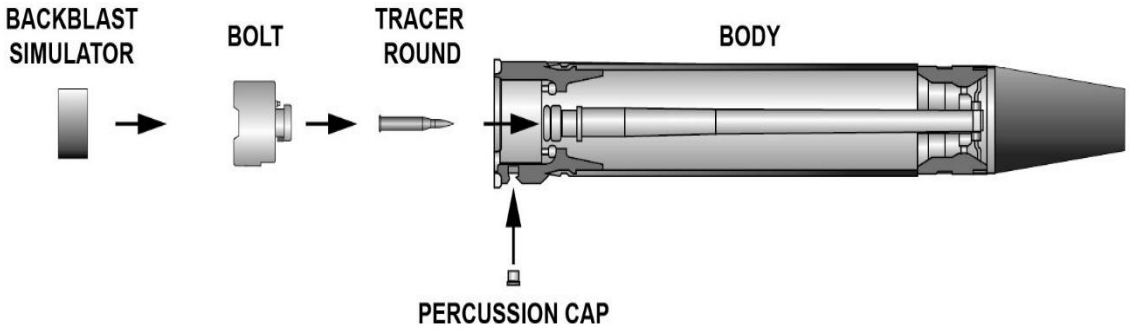
A-21. Loading, arming, and firing operations with the parent weapon is the same as when firing service ammunition. The bolt is set to fire when the adapter is fully inserted into the gun chamber. To simulate backblast, there is a backblast charge (DODIC L612), which is inserted into the bolt before placing the bolt into the SCA. To ignite the 7.62-mm primer, a percussion cap (L498) must be utilized.

A-22. For boresighting the parent weapon, the SCA has a boresighting device. Mean points of impact for all adapters are obtained using the boresighting device. Refer to the operator's manual (TM 9-1015-262-10) for further information on the operation, zeroing process, and the handling of ammunition for the SCA 553B.

WARNING

Always treat a loaded SCA as a loaded weapon. If injury occurs, immediately seek medical attention. Failure to observe this warning could result in personnel injury or death.

Table A-29. SCA 553B



DODIC subcal round	A254			
DODIC percussion cap	L498			
DODIC backblast simulator	L612		Color Code	
Type	Target practice		SCA Adapter	Olive drab
Weight	8 lbs		Subcal round	Grey band and tip
Length	24 in		Backblast charge	Blue
Intended for use Against				
Intended to be used in training with the 84-mm RCL (recoilless rifle) MAAWS gun				
Performance				
Muzzle velocity	254 m/s			
Time of flight out to	400 m	1.3 sec		
	500 m	1.6 sec		
	600 m	2.0 sec		
	700 m	2.3 sec		
Effective range	700 m	2296 ft		
Operating Temperature Range				
Firing	Lower limit	-40 °F (-40 °C)	Upper limit	
Description				
• The subcaliber (SCA) 553B with the subcaliber 7.62-mm round is intended to be used in training with the 84-mm MAAWS. • The SCA contains no fuze system, booster, or main charge. • To replace the weight of these explosive components and to match the center of gravity and ballistics of the 84-mm, HEAT projectile 551, the material has been made thicker and a solid projectile base is used. • The projectile is a specific 7.62-mm round, which replicates the service projectile's trajectory and a short time of flight providing high hit probability even at long range.				
Limitations				
Cartridge is subject to firing limitations. Refer to table A-1 and A-2 or the operator's manual (TM 9-1015-262-10) for information on the maximum allowable quantity of cartridges that may be fired per 24-hour period.				
Legend: °C – degree Celsius; °F – degree Fahrenheit; ft – feet; HEAT – high-explosive anti-tank; in – inches; lbs – pounds; m – meters; MAAWS – Multi-role, Anti-armor, Anti-personnel Weapon System; mm – millimeter; m/s – minute per second; sec – seconds				

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Appendix B

Ballistics

Ballistics is the science of the processes that occur from the time the weapon is fired to the time when the projectile impacts its target. Soldiers must be familiar with the principles of ballistics as they are critical in understanding how the projectile functions, and performs during flight including the actions of the projectile when it strikes the intended target. The profession of arms requires Soldiers to understand their weapons, how they operate, how they function, and how to employ them.

The flight path of a projectile includes three stages: the travel down the barrel, the path through the air to the target, and the actions the projectile takes upon impact with the target. The internal, external, and terminal ballistics categories define the stages of the projectile's flight path.

INTERNAL BALLISTICS

B-1. 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 projectile down the barrel. For spin stabilized projectiles, the projectile engages the lands and grooves (rifling) imparting a spin on the bullet that facilitates stabilization of the projectile during flight. For fin stabilized projectiles, the slip ring engages the lands and grooves and spins independently of the projectile. This action allows the round to travel through the barrel without imparting spin on the projectile. After leaving the barrel, the fins deploy and impart spin to stabilize the round. Internal ballistics ends at shot exit, where the bullet leaves the muzzle.

B-2. The following key terms are used when discussing the physical actions of internal ballistics (see figure B-1, page B-2):

- Bore. The interior portion of the barrel forward of the chamber.
- Chamber. The part of the barrel that accepts the ammunition for firing. The chamber has a recess for the cartridge case's rim and is fitted with a guide that aligns the percussion cap of the cartridge case with the firing pin.
- 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 measured 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.

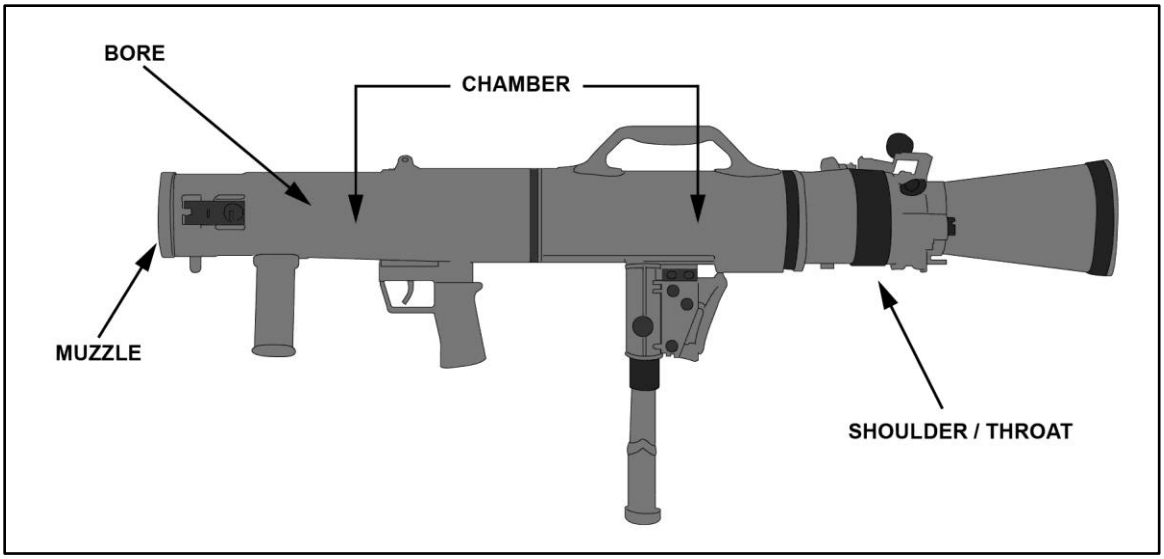

Figure B-1. Internal ballistics terms

EXTERNAL BALLISTICS

B-3. 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 that the projectile strikes the target.

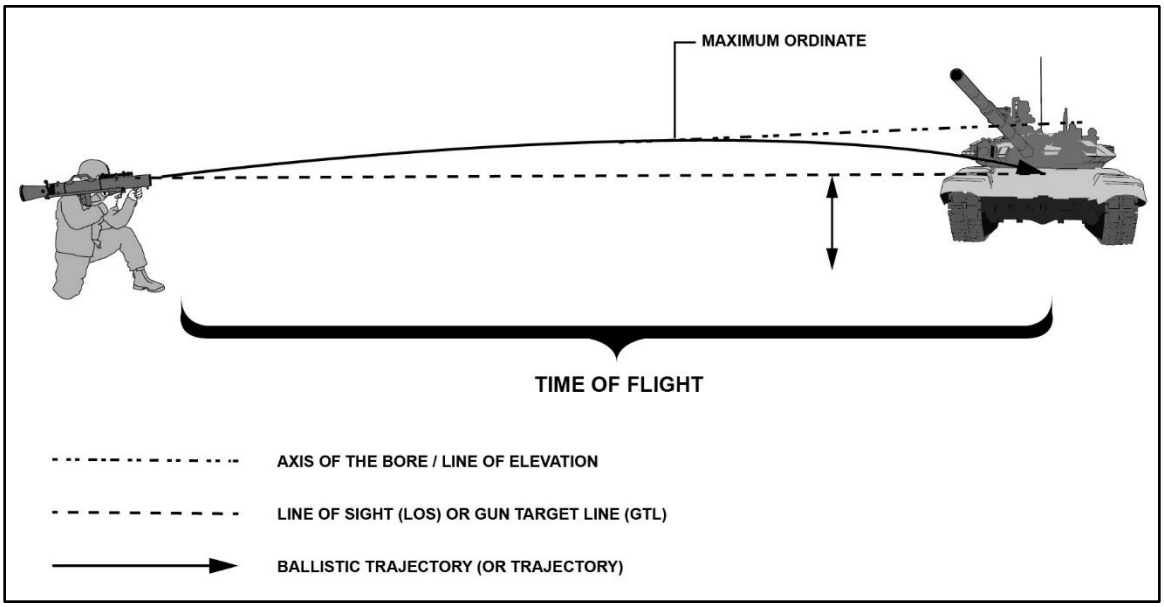

Figure B-2. External ballistics terms

B-4. The following terms and definitions 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 or gun target line. A straight line between the sights or optics and the target. This is never the same as the axis of the bore. The line of sight 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 line of sight is synonymous with the gun target line when viewing the relationship of the sights to a target.

- Line of elevation. 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 travels 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.

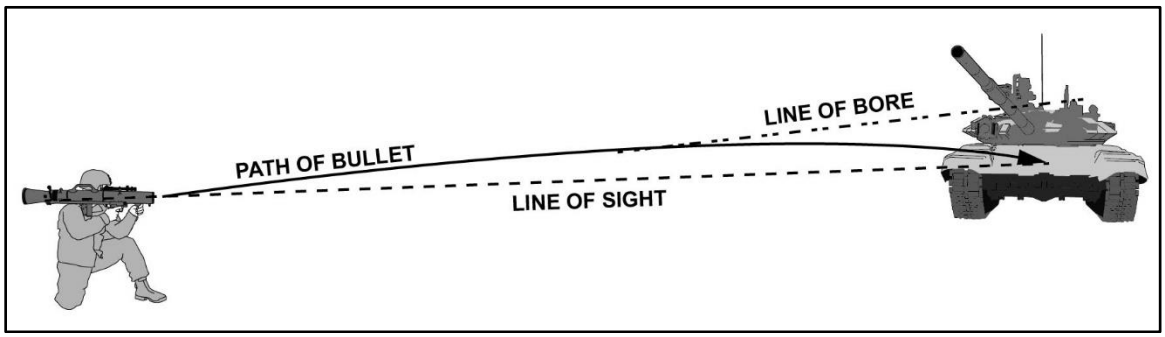

Figure B-3. Trajectory

- 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. 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.
- 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 barrel consists of a steel liner around which is wound laminate of epoxy and carbon fiber. The liner has 24 right-hand, twist, rifling grooves.
- Shot exit. The moment the projectile clears the muzzle of the barrel, where the barrel no longer supports the bullet.
- 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 crosswind 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 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 TC, the trajectory ends at the point of impact.
- Wind. 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 as described below:
  - Time (T). The amount of time the projectile is exposed to the wind along the trajectory. The greater the range to target, the greater the 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-5. 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.

B-6. Chemical energy is the result of chemical reaction upon impact. Upon impact, one of the projectile switches is closed. The fuze then detonates the HE-shaped charge, which collapses the cone assembly, creating a high-velocity focused shock wave and a jet of metal particles that penetrate the target.

B-7. The principles of a shaped or hollow charge is that a shaped or hollow charge warhead has a concave metal cone of copper (aluminum in some warheads), known as a liner surrounded by an HE. When the HE detonates, the liner is squeezed together and a shaped or hollow charged jet is formed, which on impact can penetrate an armor.

ACTIONS AFTER THE TRIGGER SQUEEZE

B-8. Once the Soldier squeezes the trigger, the ballistic actions begin. Although not all ammunition and weapons operate in the same manner, the following list describes the general events that occur with the M3 MAAWS:

- The trigger is pulled to the rear, disengaging the trigger sear from the firing rod head.
- The mainspring causes the firing rod to move violently to the rear. The inclined surface of the cam plate strikes the appropriate inclined surface in the firing pin causing it to strike upon the percussion cap.
- 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 expands from the pressure of the burning propellant, firmly locking the case to the chamber walls.
- The expanded cartridge case is held firmly in place by the chamber walls and the base plate, which provides 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.
- The projectile spins 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 to push it down the length of the barrel.
- The gasses created continue to seek the path of least resistance as the propellant continues to burn. As the cartridge case is firmly seated and the projectile is moveable, the gas continues to exert its force on the projectile. The propellant gasses also escape to the rear of the weapon creating a backblast.
- The projectile is no longer supported by the barrel itself as the end of the projectile leaves the muzzle. Shot exit occurs.
- The shot exit causes most of the expanding and burning gasses to move outward and around the projectile causing the muzzle flash.

- The projectile achieves its maximum muzzle velocity at shot exit. From shot exit until the projectile impacts an object, the projectile loses velocity at a steady rate due to air resistance.
- The bullet drops consistently by the effects of gravity as the round travels along its trajectory.
- The actual line of departure is an elevated angle from the line of sight, so 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 more than halfway to the target, typically, depending on the range to target. The high point is called the round's maximum ordinate or max ord.
- The projectile descends into the target from the max ord.
- 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.
- The projectile delivers its kinetic energy at the point of impact once it strikes a target or object.

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Appendix C

Complex Engagements

Appendix C provides detailed information on the calculations for determining deliberate holds for complex engagements and various engagement techniques. This appendix is designed for the advanced shooter; however, all Soldiers should be familiar with the contents of this appendix to build mastery and proficiency with their individual weapon. This appendix builds upon the concepts discussed in chapter 7 and includes topics specific only to deliberate hold determinations.

COMPLEX ENGAGEMENTS

C-1. A complex engagement includes any shot that cannot use the center of visible mass as the point of aim to ensure a target hit. Complex engagements require a Soldier to apply various points of aim to defeat the threat successfully.

C-2. Complex 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. One or more of the conditions listed below characterizes increased engagement difficulty:

- Target conditions:
  - Range to target.
  - Moving targets.
  - Oblique targets.
  - Evasive targets.
  - Limited exposure targets.
- Environmental conditions:
  - Wind.
  - Angled firing.
  - Limited visibility.
- Firer conditions:
  - Canted weapon engagements.
  - Chemical, biological, radiological, and nuclear operations engagements.

C-3. Each of these firing conditions may require the Soldier to determine an appropriate aim point that is not the center of visible mass. The hold is the Soldier-calculated aim point. 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.
- Counterrotation lead required when the Soldier is moving in the opposite direction of the moving target.
- Wind speed, direction, and duration between the firer 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 applies the appropriate aim (hold) based on the firing instances presented. The two hold determinations are immediate and deliberate. All Soldiers must be familiar with the immediate hold

determination methods. Soldiers should apply hold determination methods naturally when the engagement conditions require them.

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 firer, 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. The firer should be confident in applying several range determination methods to determine the proper hold-off for pending engagements. There are two types of range determination methods: Immediate and deliberate.

Immediate Range Determination

C-7. Immediate methods of range determination afford the firer the most reliable means of determining the most accurate range to a given target. The immediate methods include—

- Laser range finder.
- Recognition method.
- 100-meter, unit-of-measure method.
- Mil relationship method.

Laser Range Finder

C-8. Equipment like the AN/PSQ-23, STORM has an on-board laser range finder that is accurate to within +/– 5 meters. Soldiers who have 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.

Recognition Method

C-9. When observing a target, the amount of detail seen at various ranges gives the firer a solid indication of the range to target. With practice, range determination by recognition is quick and accurate; however, this method does not work with passive or thermal sights. The principle of the recognition method is simple. When the weapons team sees a target, they can determine the range according to what they recognize. For example, if a target can be recognized as a tank with the unaided eye, it is within 1500 meters; if a target can be recognized as a tank through magnifying optics (such as binoculars), it is within 5000 meters (see table C-1). Table C-2 gives the effects of target condition on range estimations for targets seen with the unaided eye and through magnifying optics (binoculars).

Table C-1. Recognition method

Range Determination	*Recognition Method*	
Target	**Unaided Eye**	**Magnification 8 Power**
Tank crew, troops, machine gun, mortar, antitank gun, antitank missile launchers	500 meters	2000 meters
Tank, personnel carrier, truck (by model)	1000 meters	4000 meters
Tank, howitzer, personnel carrier, truck	1500 meters	5000 meters
Armor vehicle, wheel vehicle	2000 meters	6000 meters

C-10. When using the recognition method, the firer must consider the size and clarity of the target in relation to its background. Some light and terrain conditions make a target seem closer; other conditions make it seem farther away. The conditions outlined in the following table may cause an error in estimating range when using the recognition method.

Table C-2. Effect of target conditions on range estimation

Target Conditions	
Seems Closer	**Seems Farther**
Bright, clear day	Fog, rain, haze, twilight
Large targets	Camouflaged targets
At sea	Sun behind target
Sun in front of target	Small targets
Targets at higher elevations	Targets at lower elevations
Bright colors: white, red, yellow	Dark colors
Contrast	
Desert	
Looking across ravines, hollows, rivers, depressions	

100-meter Unit of Measure Method

C-11. To determine the total distance to the target using the 100-meter unit of measure method, firers 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 firer and the target.

C-12. The greatest limitation of the unit of measure 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 the firer and the target can be seen, it become difficult to use the unit of measure method of range estimation with accuracy.

C-13. Proficiency in the unit of measure method requires constant practice. Throughout training, Soldiers should make comparisons continuously between the range estimated by the firer and the actual range as determined by pacing or other more accurate measurements.

Mil Relationship Method

C-14. Soldiers may use the mil relationship method in deliberate range determination. When using the mil relation method, the crew must use binoculars or a sight system with a calibrated mil-scale to measure the target.

C-15. The basis of the mil relation method is that one mil equals a width (or height) of 1 meter at a range of 1000 meters or in a unit of angular measurement, equal to 1/6400 of a circle or about 17.79 (17.8) degrees. The relationship of the angle, the length of the sides of the angle (range), and the width (height) between the sides remains constant. Figure C-1, page C-4, illustrates the constant relationship as the angle increases from 1 to 2 mils and the range increases from 1000 to 2000 meters.

C-16. Standard Army measurements are completed and expressed in the metric system. Other units of measurement (yards, feet, or inches) may be substituted to express the target size or range; however, all information must be expressed in the same unit of measure.

C-17. To use the mil relation method, the gunner must know the width, height, and length of the target. The gunner determines the known dimension with the binoculars' mil scale or a non-ballistic sight reticle, substitutes the mil relation, and computes the range (see figure C-1, page C-4). When measuring the frontal width, the firer measures only the vehicle's front slope (from left front corner to right front corner). When measuring flank width, the gunner measures the entire vehicle (see figure C-2, page C-5). Accuracy of this method depends on knowing the target dimensions and the gunner's ability to make precise measurements with binoculars or the sight reticle.

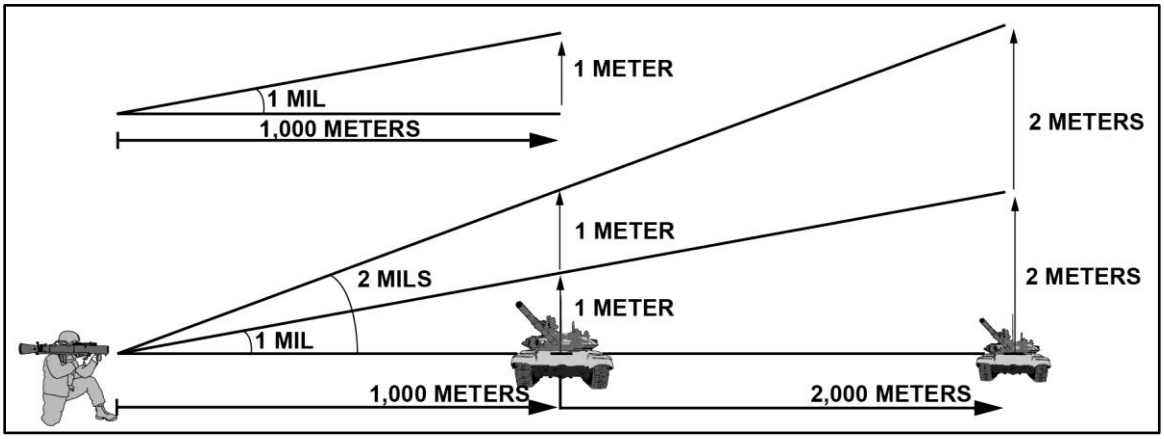


Figure C-1. Constant mil angle relationship

C-18. Using table C-3 and proper vehicle identification, a crewmember can properly determine the standard mil size of the vehicle. This can then be utilized into the calculation of the mil relationship method of range determination. Figure C-2 shows the frontal and flank view of a Boyevaya Mashina Pekhoty (known as BMP)-2 and where the information in the table applies.

Table C-3. Dimensions and mil relation for various targets

Target Dimensions and MIL relation									
BMP-2									
Target width (mils)	5	4.5	4	3.5	3	2.5	2	1.5	1
Flank 6.75 meters	1400	1500	1700	1900	2300	2700	3400	4500	6800
Front 3.0 meters	600	700	800	900	1000	1200	1500	2000	3000
Height 2.3 meters	500	500	600	700	800	900	1200	1500	2300
BRDM-2									
Target width (mils)	5	4.5	4	35	3	2.5	2	1.5	1
Flank 5.5 meters	1100	1200	1400	1600	1800	2200	2800	3700	5500
Front 2.35 meters	500	500	600	700	800	1000	1200	1600	2400
Height 2.3 meters	500	500	600	700	800	900	1200	1500	2300
T-72									
Target width (mils)	5	4.5	4	3.5	3	25	2	1.5	1
Flank 6.7 meters	1300	1500	1700	1900	2200	2700	3400	4500	6700
Front 3.4 meters	700	800	900	1000	1100	1400	1700	2300	3400
Height 2.3 meters	500	500	600	700	800	900	1200	1500	2300
T-80									
Target width (mils)	5	4.5	4	3.5	3	2.5	2	1.5	1
Flank 7.0 meters	1400	1600	1800	2000	2300	2800	3500	4700	7000
Front 3.6 meters	700	800	900	1000	1100	1400	1700	2300	3400
Height 2.2 meters	500	500	600	700	800	900	1200	1500	2300
T-90									
Target width (mils)	5	4.5	4	3.5	3	2.5	2	1.5	1
Flank 6.9 meters	1400	1500	1700	2000	2300	2800	3500	4600	6900
Front 3.8 meters	800	900	1000	1100	1300	1500	1900	2500	3800
Height 2.2 meters	500	500	600	700	800	900	1200	1500	2300
Note. This table is a quick reference for determining the range of widely sold vehicles at various ranges. The ranges have been rounded-off to the nearest hundredth.									

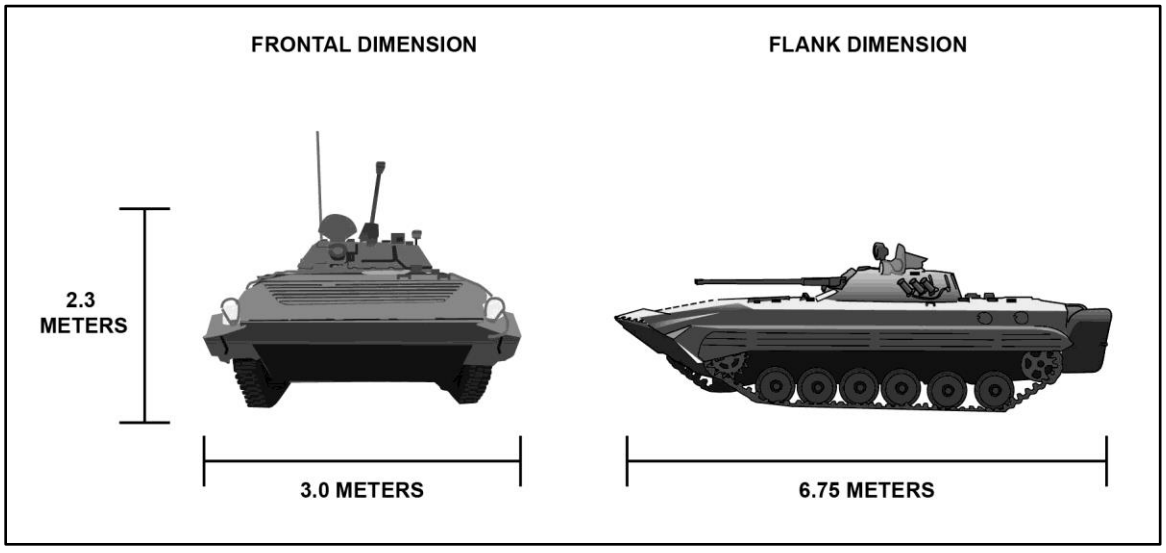


Figure C-2. Frontal and flank dimension of BMP-2

C-19. Since the relationship of the target width in mils (m) and meters (W) is constant at varying distances, accurate range determination is possible. The mil relation holds true whether the (W) factor is width, height, or length. Therefore, the range can be determined provided the target dimensions are known. Target height may be the most consistent measurement, because length and width are changing as targets move on the battlefield.

C-20. There are two WORM formulas (illustrated below) that crewmembers can use to determine information about an object or target. The crewmember determining the range is responsible for deciding which formula to use based on known information gathered as illustrated below:

C-21. The first formula (see figure C-3) should be used to determine range. This formula needs both the width and mil value of the vehicle (see table C-3). See figure C-4, page C-6, for an example solution.

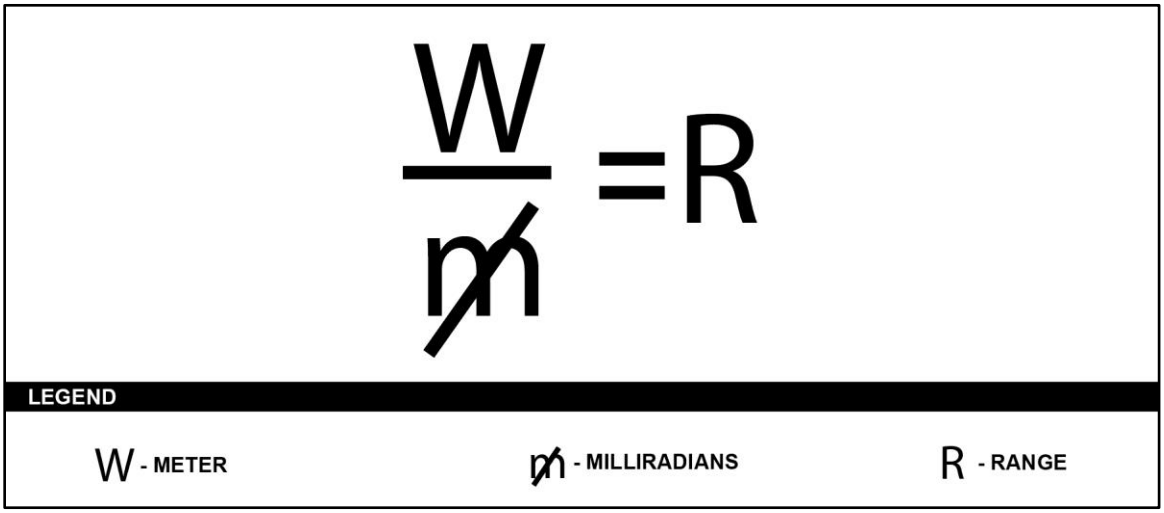


Figure C-3. First formula

Example

*Using Formula 1

Step 1: The BMP is 6.75 meters long (W). Using binoculars, the commander determines that the BMP measures 10 mils in length.

Step 2: The individual determining range substitutes known information into the formula.

$$\frac{6.75}{10} = R \quad \text{or} \quad \frac{6.75}{10} = 0.675$$

Step 3: Since (R) is expressed in thousands of meters, multiply by 1000, and round off to the nearest tenth. For example: 0.675=0.7 so 0.7 x 1000 = 700 meters; the range to the BMP.

Figure C-4. First formula, example

MOVING TARGETS

C-22. Moving targets are those threats that appear to have a consistent pace and direction. Targets on any battlefield do not remain stationary for long periods. Soldiers must have the ability to deliver precise,

aimed shots 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 Techniques

C-23. The gunner aims at a point ahead of the target equal to the estimated number of leads, maintains this lead by tracking the target (manipulates the weapon at the same angular speed as that of the target), and then fires. Tracking places the gunner in position for a second burst if the first one misses.

Trapping Techniques

C-24. The gunner establishes an aiming point forward of the target and along the target path. They pull the trigger as the target reaches the appropriate point in regard to lead.

Hold for Moving Targets

C-25. 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.

C-26. To hit a moving target, the weapon must be aimed far enough ahead of the target to cause the bullet and target to arrive at the same point at the same time. This distance is measured in target lengths. One target length as seen by the gunner is one lead.

Speed Estimation

C-27. To estimate the speed of a moving, main battle tank or an armored, personnel carrier (see figure C-5), count, “One-thousand-one” takes one second.

C-28. Start counting when the front of the target passes a fixed object and estimate how far the target moved during one second.

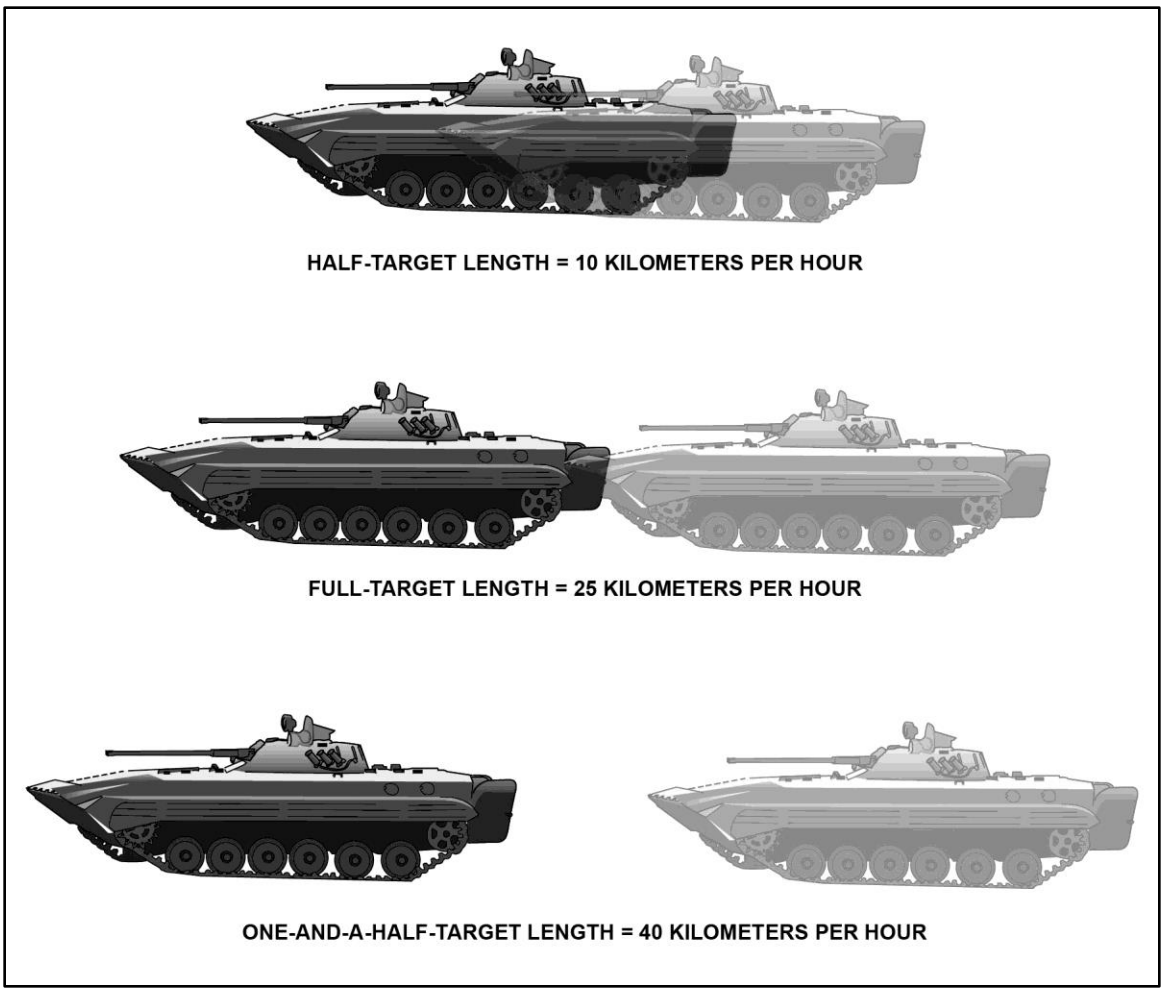
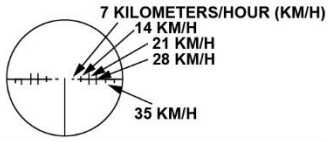


Figure C-5. Speed estimation

C-29. Measure leads from the center of mass. Figure C-6 and figure C-7 give the amount of lead needed to hit a target moving at right angles to the gunner and at speeds and ranges indicated.

WHEN ENGAGING ARMOURED FIGHTING VEHICLES
- DETERMINE (ESTIMATE) RANGE AND SPEED
- SET THE RANGE
- SELECT AIMING POINT

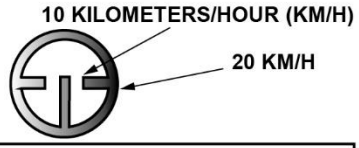


RULE	TARGETS	SIGHT PICTURES
AIM WITH CENTER POST AT CENTER OF MASS	STATIONARY OR WHEN TARGET IS PROCEEDING DIRECTLY AT YOU OR AWAY FROM YOU	
AIM WITH 1ST LEAD MARK AT CENTER OF MASS	MOVING TARGETS (7 KM/H)	
AIM WITH 2ND LEAD MARK AT CENTER OF MASS	MOVING TARGETS (14 KM/H)	

FOR OBLIQUE TARGETS AIM WITH CENTER POST AT FRONT OF MASS

Figure C-6. Telescopic sight, hold for moving target, HEDP 502 RS

WHEN ENGAGING ARMOURED FIGHTING VEHICLES
- DETERMINE (ESTIMATE) RANGE AND SPEED
- SET THE RANGE
- SELECT AIMING POINT



RULE	TARGETS	SIGHT PICTURES
AIM WITH CENTER POST AT CENTER OF MASS	STATIONARY OR WHEN TARGET IS PROCEEDING DIRECTLY AT YOU OR AWAY FROM YOU	
AIM WITH LEAD MARK AT CENTER OF MASS	MOVING TARGETS (10 KM/H)	
AIM WITH FRONT SIGHT RING AT CENTER OF MASS	MOVING TARGETS (20 KM/H)	

FOR OBLIQUE TARGETS AIM WITH CENTER POST AT FRONT OF MASS

Figure C-7. Open sight, hold for moving target, HEDP 502 RS

Oblique Targets

C-30. Oblique targets are threats that are moving diagonally toward or away from the firer. They offer a unique problem set to the firers where the target may be moving at a steady pace and direction; however, their oblique direction of travel makes them appear to be moving slower.

C-31. Soldiers should adjust their hold based on the angle of the target's movement from the gun-target line. The following guide helps Soldiers determine the appropriate change to apply to the moving target hold to engage the moving oblique threats (see figure C-8).

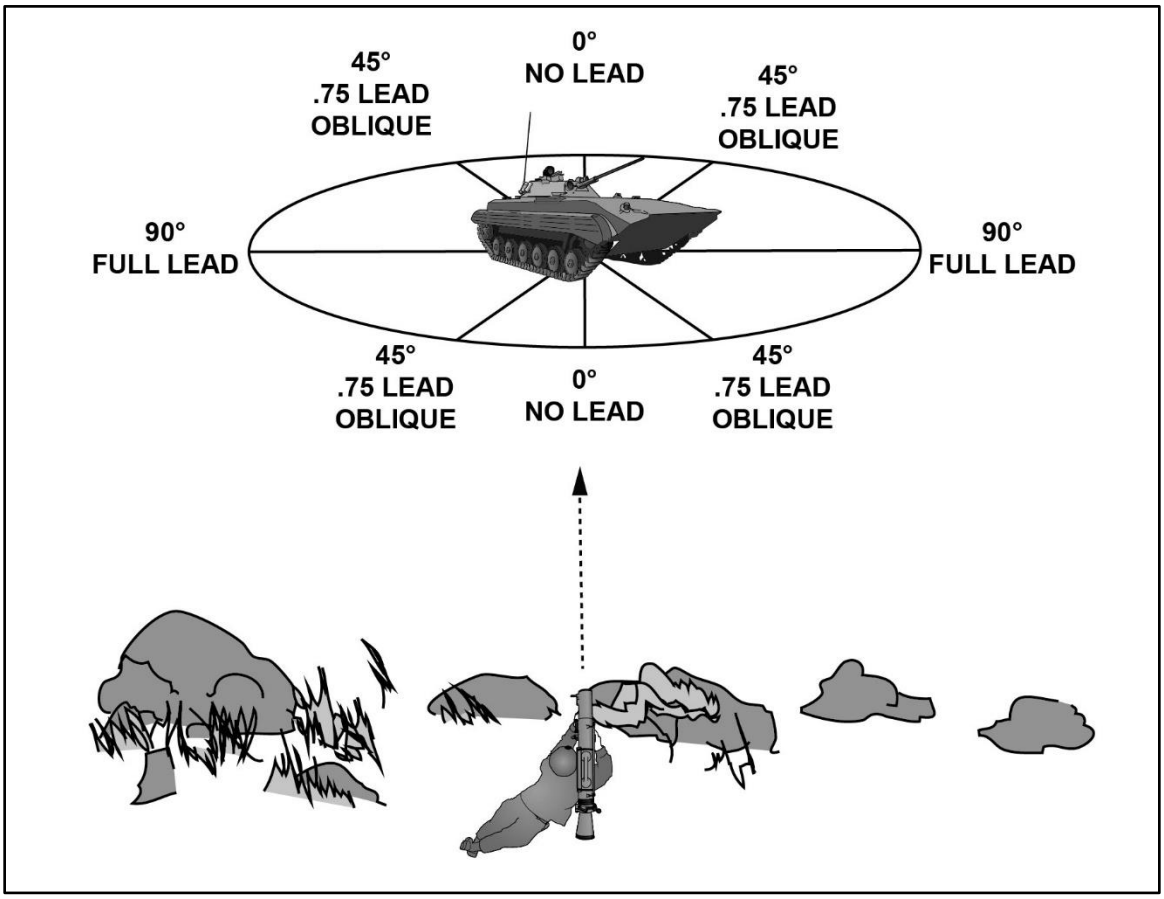


Figure C-8. Oblique target

ENVIRONMENTAL CONDITIONS

C-32. The environment can complicate the firer's actions during the shot process with excessive wind or limited visibility conditions requiring the Soldier to use angled firing. 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-33. 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 slightly in the direction of the wind, resulting in a gradual drift of the bullet in the direction of the wind. The effects of wind can be compensated for by the firer 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-34. 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.

C-35. The clock system can be used to determine the direction and value of the wind (see figure C-9). Picture a clock with the firer oriented downrange towards 12 o'clock.

C-36. Once the direction is determined, the value of the wind is next. The value of the wind is how much effect the wind has 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 have the most effect on the projectile. Winds from 1, 5, 7, and 11 o'clock are considered half-value winds and have roughly half the effect of a full-value wind. Winds from 6 and 12 o'clock are considered no-value winds and have little or no effect on the projectile.

Example

A 10-mph (miles per hour) wind blowing from the 1 o'clock direction is a half-value wind and has the same effect as a 5 mph, full-value wind on the projectile.

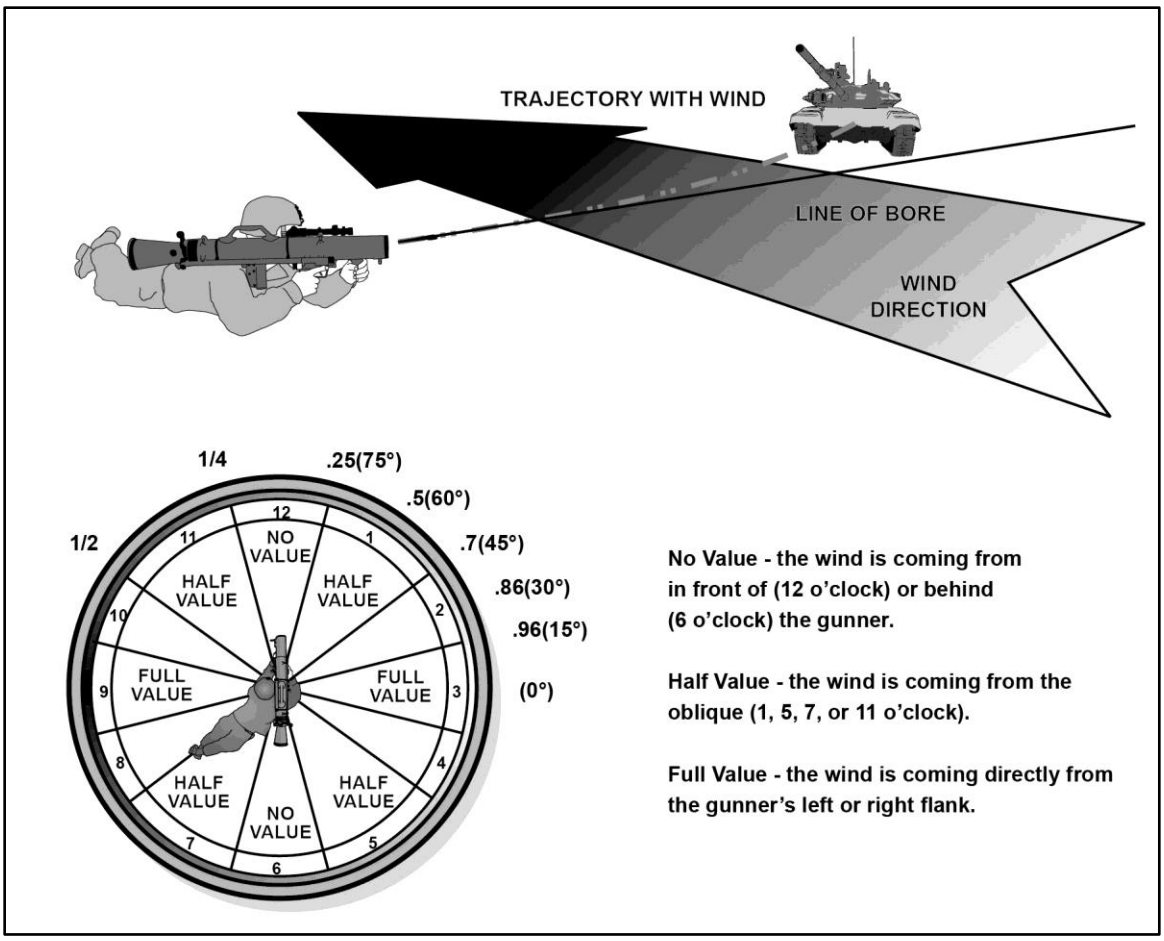


Figure C-9. Wind effects

WIND SPEED

C-37. Wind speeds can vary from the firing line to the target. An average of the winds blowing on the range determines the wind speed. 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 has the most effect on the projectile since that is the point where most projectiles lose a large portion of their velocity and are beginning to destabilize.

C-38. The wind speed blowing at the Soldier's location may not be the same as the wind speed blowing on the way to the target. The Soldier can observe the movement of items in the environment downrange to determine the wind speed. Each environment has assorted vegetation that reacts differently. 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.

WIND ESTIMATION

C-39. Soldiers must be comfortable and confident in their ability to judge the effects of the wind to make accurate and precise shots consistently. Soldiers use wind indicators between themselves and the target that provide windage information to develop the proper compensation or hold off. To estimate the effects of the wind on the shot, Soldiers need to determine the three windage factors listed below:

- Velocity (speed).
- Direction.
- Value.

IMMEDIATE HOLD DETERMINATION

C-40. Immediate holds are based on the values of a target form, where the increments shown are sufficient for rapid target hits without ballistic computations. Figure C-10, page C12, illustrates immediate hold locations for azimuth (wind or lead).

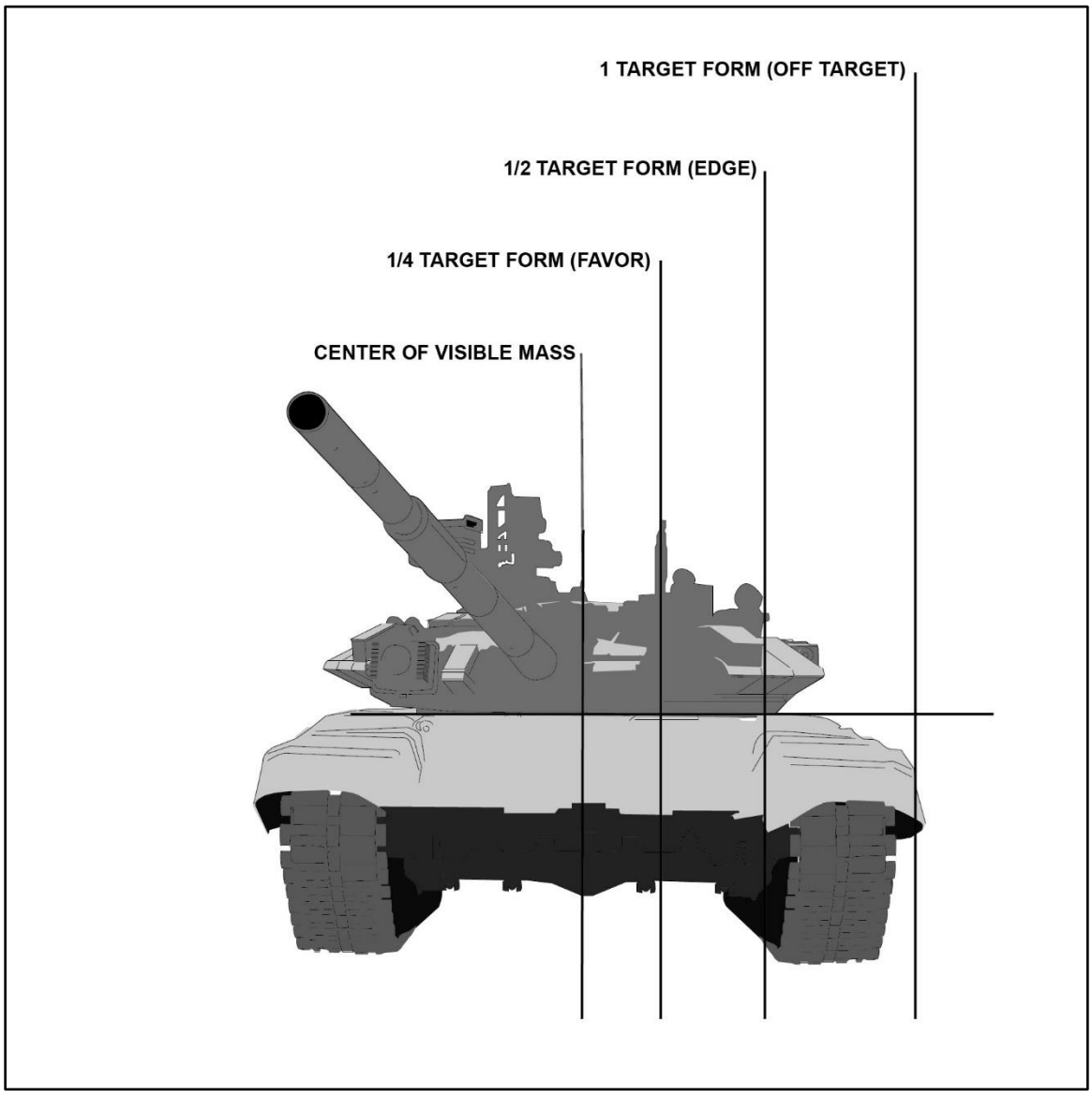


Figure C-10. Immediate hold locations for wind and lead

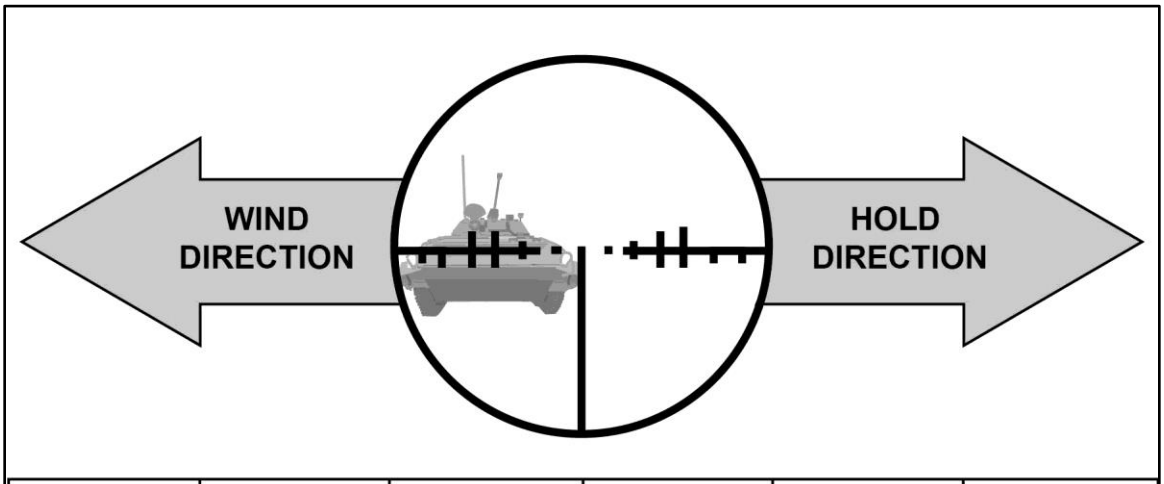
IMMEDIATE WIND HOLD

C-41. Using a hold involves changing the point of aim to compensate for the wind drift. For example, if wind causes the projectile to drift 1/2 form to the left, the aiming point must be moved 1/2 form to the right (see figure C-11).

Example

This is based on a stationary BMP-2 with lateral wind blowing from 3 o'clock with a wind speed of 10 mph (miles per hour) and at 15 mph.

Note. This example is based on a constant wind speed and direction at known distances. Wind speed and direction can vary from the weapons team's position to the identified target.



TARGET TYPE	RANGE	DEFLECTION WITH 10 MILE-PER-HOUR WIND SPEED	RECOMMENDED WIND HOLD	DEFLECTION WITH 15 MILE-PER-HOUR WIND SPEED	RECOMMENDED WIND HOLD
VEHICLES	300	0.52 METERS	1/4 TARGET FORM	0.74 METERS	1/2 TARGET FORM
FIELD FORTIFICATION	500	2.18 METERS	3/4 TARGET FORM	3.08 METERS	1 TARGET FORM

Figure C-11. Wind hold 84-mm, HEDP 502 RS for a BMP-2

C-42. Firers must adjust their points of aim into the wind to compensate for its effects. If they miss a distant target and the wind is blowing from the right, they should aim to the right for the next shot.

C-43. 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

C-44. Soldiers must be lethal at night and in limited visibility conditions, as well as during the day. Their lethality depends largely on whether they can fire effectively with today's technology such as night vision devices, IR aiming devices, and thermal weapon sights.

C-45. 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.

C-46. 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. Soldiers achieve confidence in the equipment through drills such as 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 night vision devices, for example).

GUNNER CONDITIONS

C-47. The ability to aim properly while the weapons team is at various location such as firing in a confined space or fighting in a chemical, biological, radiological, and nuclear environment creates additional difficulties to achieve the appropriate point of aim. The weapons team can mitigate their conditions to ensure effective point of aim and target defeat.

WARNING

Due to a risk for physical injury, only HEAT 655 CS is allowed to be fired from a confined space. Refer to appendix A for further information on the characteristic and capabilities of the various other ammunitions.

COMPOUND CONDITIONS

C-48. When combining difficult target firing occasion information, Soldiers can apply the rules specific to the situation to determine the appropriate amount of hold-off to apply.

C-49. The example below shows the application of different moving target directions with varying speed directions. Figure C-12 is a general example to provide the concept of applying multiple hold-off information to determine complex ballistic solutions for an engagement. The same concept is applied to immediate and deliberate methods of determining hold.

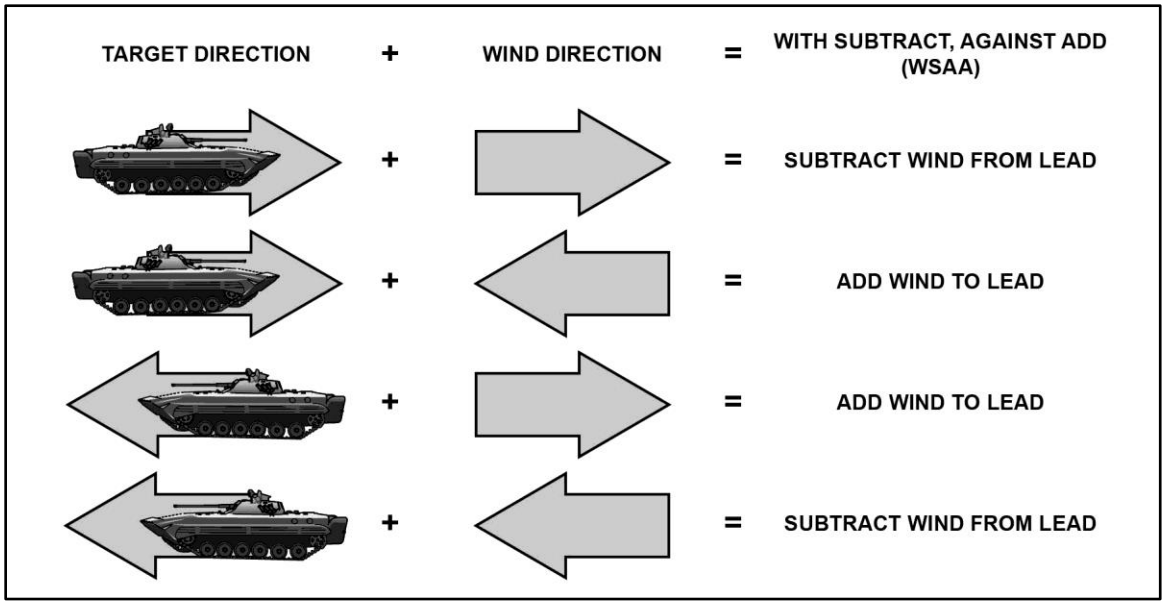


Figure C-12. Compound wind and lead determination

AIMING RULES

C-50. The figures below depict the aiming rules specific to the projectile being fired. Figure C-13 and figure C-14, page C-16, contain aiming rules for the telescopic sights. Figure C-15, page C-16, and figure C-16, page C-17, depict aiming rules for the open sights.

HEAT 551C RS

WARNING

Minimum arming distance of HEAT 551C RS round is 22 meters. Crews shall be trained not to engage targets closer than 85 meters. Fragmentation could cause injury or death to personnel. Seek immediate medical attention if injury occurs.

C-51. The telescopic sight's mil reticle is utilized to induce lead holds for moving target based off of estimate target speed and the given projectiles external ballistics. See figure C-13 and figure C-14, page C-16, for appropriate holds when firing HEAT 551C with the telescopic sight at a moving target.

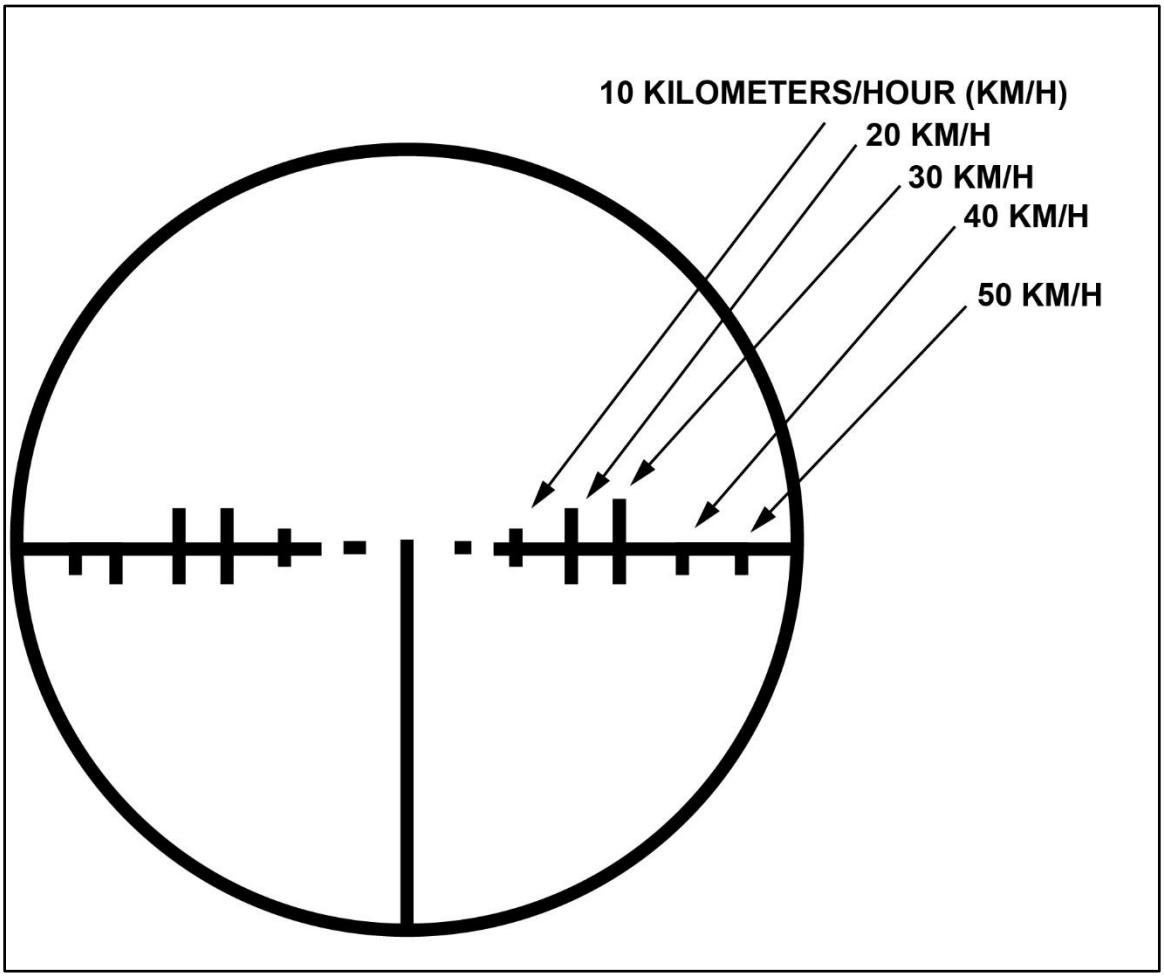


Figure C-13. HEAT 551C, moving target aiming adjustment

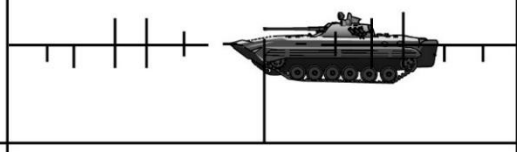
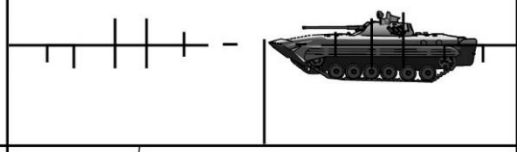
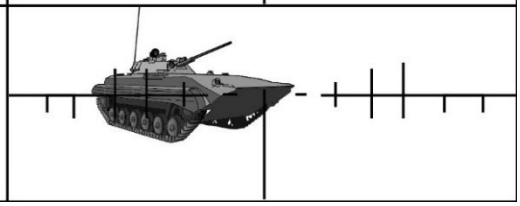
TARGET	RULE	TELESCOPIC SIGHT
STATIONARY OR WHEN TARGET IS PROCEEDING DIRECTLY AT YOU OR AWAY FROM YOU	AIM WITH CENTER POST AT CENTER OF MASS	
MOVING TARGETS (10 KILOMETERS PER HOUR) (6.2 MILES PER HOUR)	AIM WITH 1ST LEAD MARK AT CENTER OF MASS	
MOVING TARGETS (20 KILOMETERS PER HOUR) (12.5 MILES PER HOUR)	AIM WITH 2ND LEAD MARK AT CENTER OF MASS	
OBLIQUE TARGETS	AIM WITH CENTER POST AT FRONT OF MASS	

Figure C-14. HEAT 551C, telescopic sights

C-52. The open sight's center post and ring are utilized to induce lead holds for the moving target based off the estimated target speed and the given projectile's external ballistics. See figures C-15 and C-16 for appropriate holds when firing HEAT 551C with open sights at a moving target.

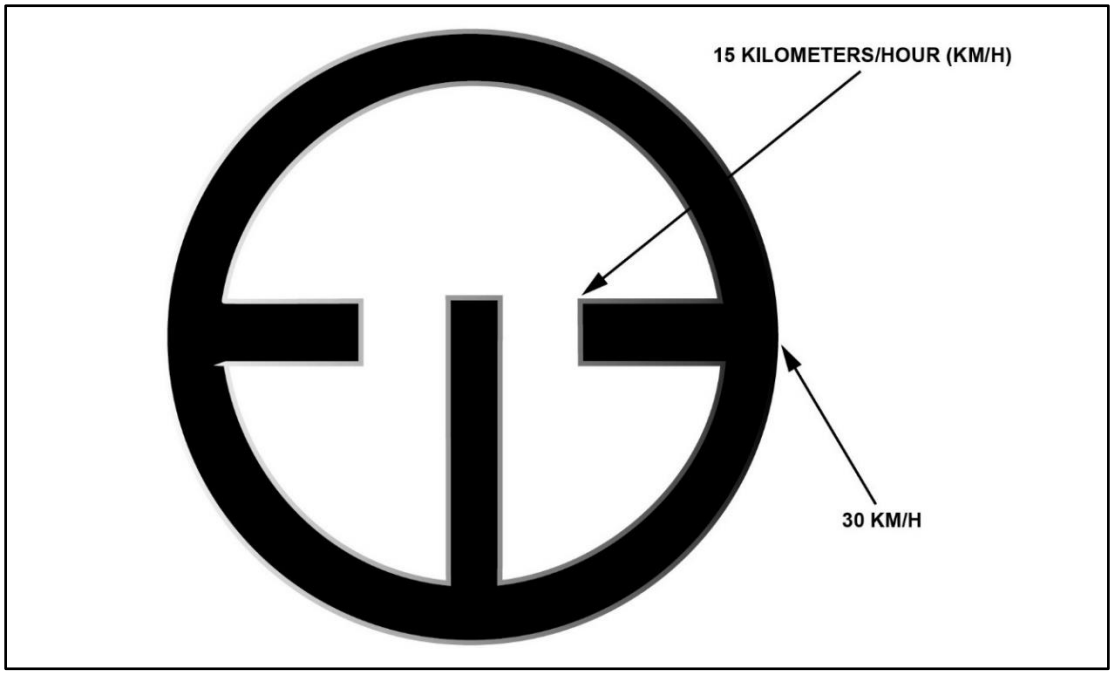


Figure C-15. HEAT 551C RS, moving, target aiming adjustment

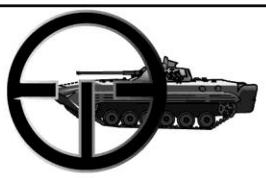
TARGET	RULE	FRONT SIGHT
STATIONARY OR WHEN TARGET IS PROCEEDING DIRECTLY AT YOU OR AWAY FROM YOU	AIM WITH CENTER POST AT CENTER OF MASS	
MOVING TARGETS (15 KILOMETERS PER HOUR) (9.3 MILES PER HOUR)	AIM WITH LEAD MARK AT CENTER OF MASS	
MOVING TARGETS (30 KILOMETERS PER HOUR) (18.6 MILES PER HOUR)	AIM WITH FRONT SIGHT RING AT CENTER OF MASS	
OBLIQUE TARGETS	AIM WITH CENTER POST AT FRONT OF MASS	

Figure C-16. HEAT 551C RS, open sight

C-53. When engaging armored fighting vehicles:

- Determine (estimate) range and speed.
- Set the range on range knob.
- Set the aiming point.

Note. The range drum on the PFCD must be set on the first ammunition indicator ring. Use range scale marked 551 when using open sights

General

C-54. HEAT 551C RS is for armored vehicles with armor less than 16 inches thick.

Loading

C-55. Gunner and assistant gunner take same measures as in normal loading.

HEDP 502 RS

WARNING

Arming distance of HEDP 502 RS round is 17-20 meters (56-66 feet). DO NOT engage targets closer than 183 meters (600 feet), Fragmentation could cause injury or death to personnel. Extreme caution must be used when firing within 330 meters of friendly troops. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

C-56. The telescopic sight's mil reticle is utilized to induce lead holds for a moving target based off an estimated target speed and the given projectiles external ballistics. See figure C-17 for appropriate holds when firing HEDP 502 RS with the telescopic sight at a moving target.

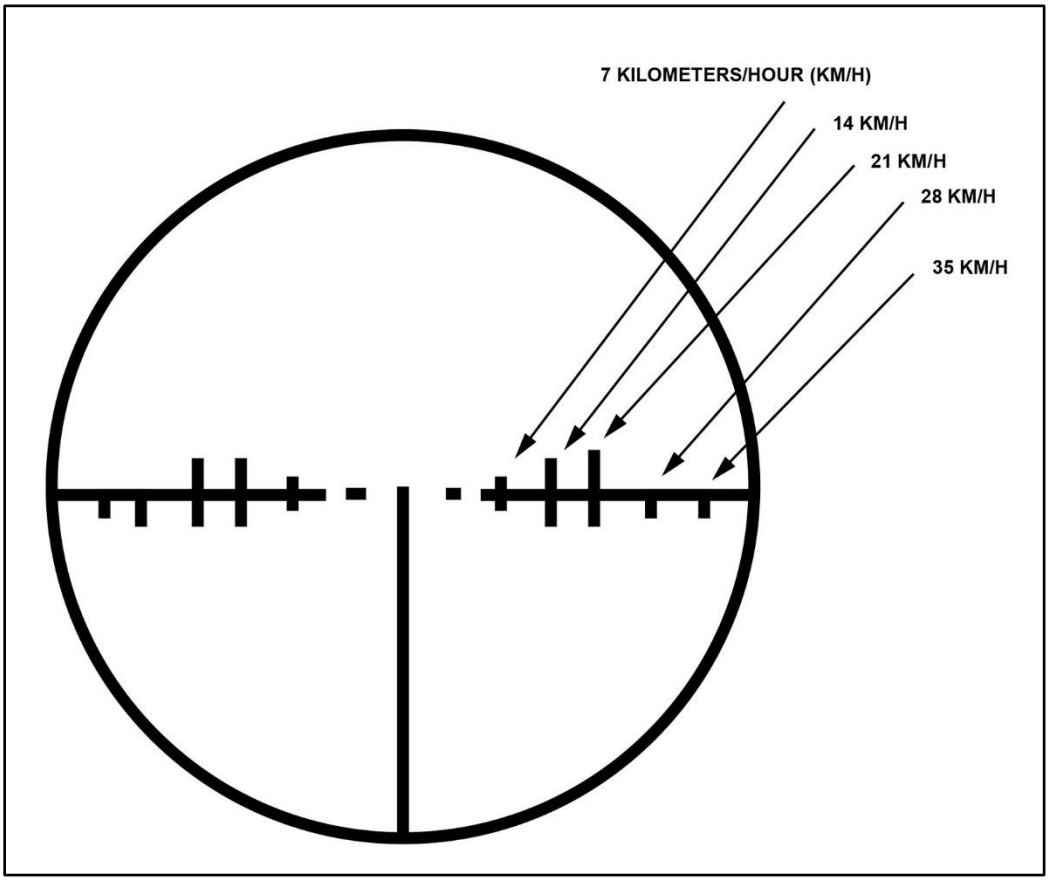


Figure C-17. HEDP 502 RS, telescopic sight, moving target aiming adjustment

C-57. The open sight’s center post and ring are utilized to induce lead holds for a moving target based off an estimated target speed and the given projectiles external ballistics. See figures C-18 and C-19 for appropriate holds when firing HEDP 502 RS with open sights at a moving target.

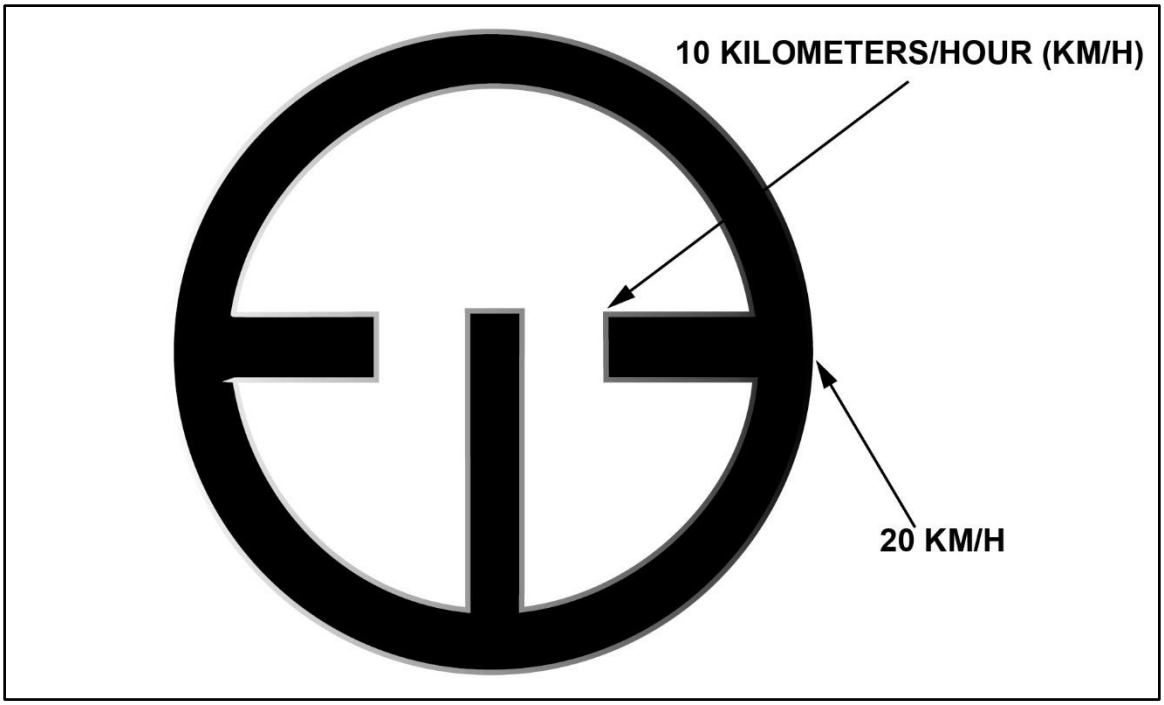


Figure C-18. HEDP 502 RS, open sights, moving target aiming adjustment

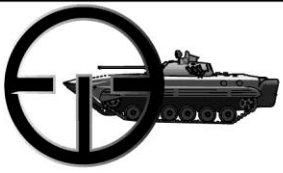
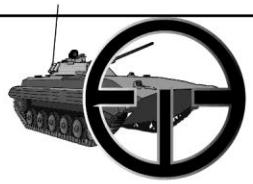
TARGET	RULE	FRONT SIGHT
STATIONARY OR WHEN TARGET IS PROCEEDING DIRECTLY AT YOU OR AWAY FROM YOU	AIM WITH CENTER POST AT CENTER OF MASS	
MOVING TARGETS (10 KILOMETERS PER HOUR) (6.2 MILES PER HOUR)	AIM WITH LEAD MARK AT CENTER OF MASS	
MOVING TARGETS (20 KILOMETERS PER HOUR) (12.5 MILES PER HOUR)	AIM WITH FRONT SIGHT RING AT CENTER OF MASS	
OBLIQUE TARGETS	AIM WITH CENTER POST AT FRONT OF MASS	

Figure C-19. HEDP 502 RS, open sights

C-58. When engaging armored fighting vehicles—

- Determine (estimate) range and speed.
- Set the range on range knob.
- Set the aiming point.

Note. The range drum on the PFCD must be set on the third ammunition indicator ring. Use range scale marked 502 when using open sights.

General

C-59. HEDP 502 RS (see table C-4) is an HE, dual purpose round for use against armored personnel carriers and field fortifications. The round has an impact (I) mode and a delay (D) mode. The impact mode provides HEAT capability against armored personnel carriers and reinforced concrete walls. The delay mode provides delay burst capability when firing into buildings and field fortifications.

Note. Only impact mode may be used to engage armored vehicles.

Loading

Table C-4. HEDP 502 RS, loading and special handling

Gunner	*Assistant Gunner*
Call out, "Dual purpose impact (or delay)—load."	
Take the same measures as in normal loading.	Insert round into chamber with mark I (impact) at 12 o'clock position or D (delay) for field fortifications..
Take the same measures as in normal loading.	Take the same measures as in normal loading.

Antistructure Munition 509

WARNING

The arming distance of ASM 509 round is 12 meters. Safe separation for the gunner and assistant gunner is 12 meters. Personnel within 180 meters are at risk of fragmentation that could cause injury or death to personnel. Use extreme caution when firing within 180 meters of friendly troops. Failure to comply with this warning could result in injury or death to personnel.

C-60. The ASM 509 is designed to defeat structures and light armored vehicles. Impact mode is used to defeat masonry walls and light armored vehicles. Delay mode is used to defeat field fortifications and the enemy inside structures or behind masonry walls. See figure C-20 for an example.

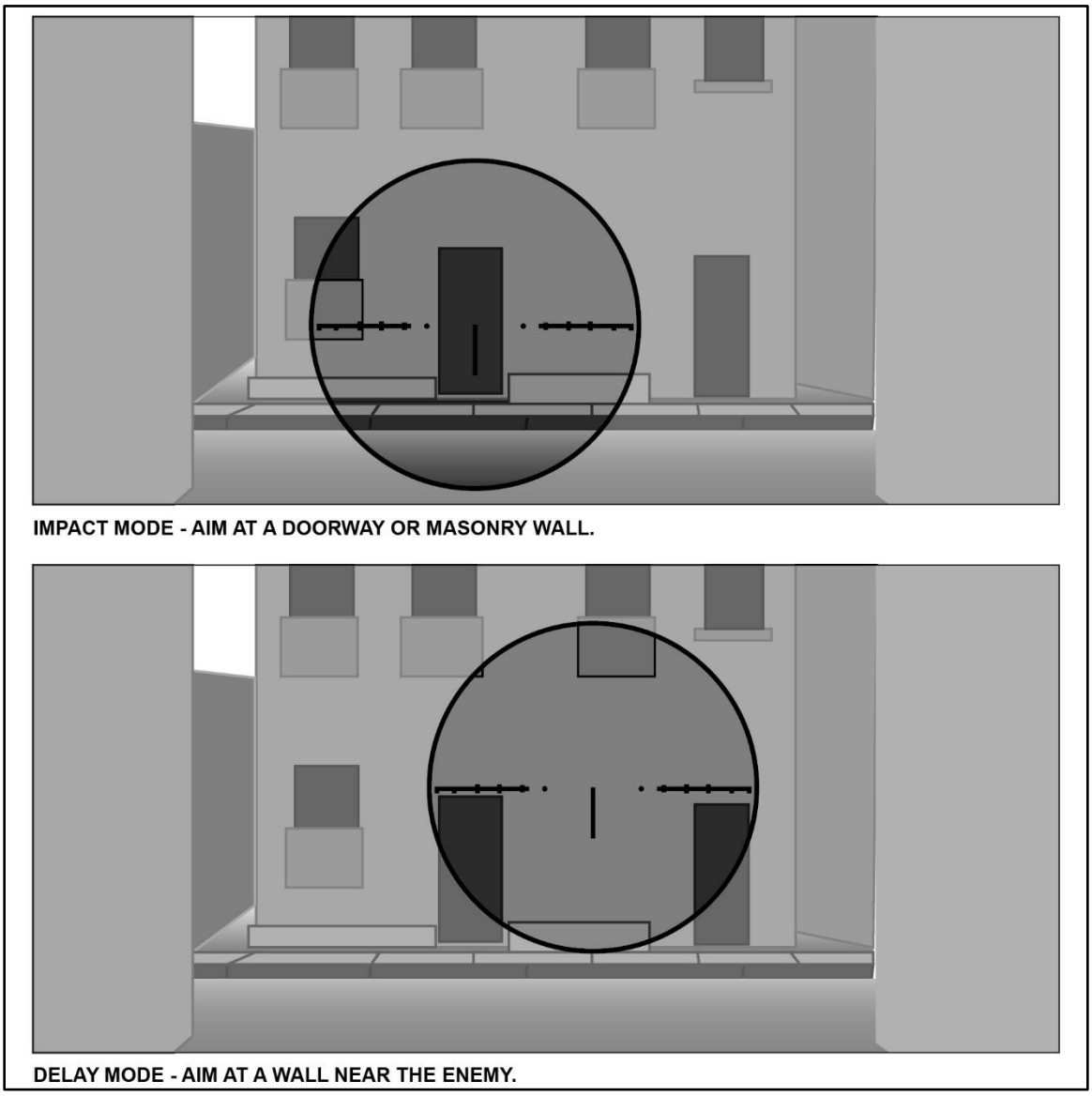


Figure C-20. ASM 509, aiming rules

C-61. When engaging a target—

- Determine (estimate) range and speed.
- Set the range on range knob.
- Set the aiming point.

Note. The range drum on the PFCD must be set on the fourth ammunition indicator ring. For open sights, use the scale marked 509.

General

C-62. ASM 509 is designed to defeat structures but provides defeat capability against masonry walls and light armored vehicles. The fuze system has an impact (I) mode and a delay (D) mode (see figure C-21, page C-23). The impact mode defeats masonry walls and light, armored vehicles. The delay mode defeats enemy inside structures and field fortifications as well as any enemy behind masonry walls when they are

close to the impact point. Table C-5, page C-22, lists the responsibilities of the gunner and assistant gunner when loading the ASM 509.

Table C-5. ASM 509, loading and special handling

Gunner	*Assistant Gunner*
Call out: “Anti-structure impact (or delay)–load".	
Take same measures as in normal loading.	Insert round into chamber with mark I (impact) at 12 o'clock position or D (delay).
Take the same measures as in normal loading.	Take the same measures as in normal loading.

HE 441D RS

C-63. The HE 441D RS is used to destroy troops in the open, behind cover, or in trenches as well as in soft skin vehicles. When engaging soft skin vehicles, set the fuze to impact setting and aim directly at the target. See Figure C-21 for an example.

C-64. When engaging troops in the open, behind cover, or inside a trench set the time fuze to the target distance, add 100 meters to the target distance on the aiming device, and aim directly at the target. This method ensures the round bursts over the target. If the desired effects are not achieved, adjust the time fuze setting in a bracketing method. See figure C-22 for an example.

WARNING

The arming distance of the HE 441D RS round is 46 meters (151 feet). DO NOT engage targets closer than 250 meters (820 feet). Fragmentation could cause injury or death to personnel. Use extreme caution when firing within 300 meters of friendly troops. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

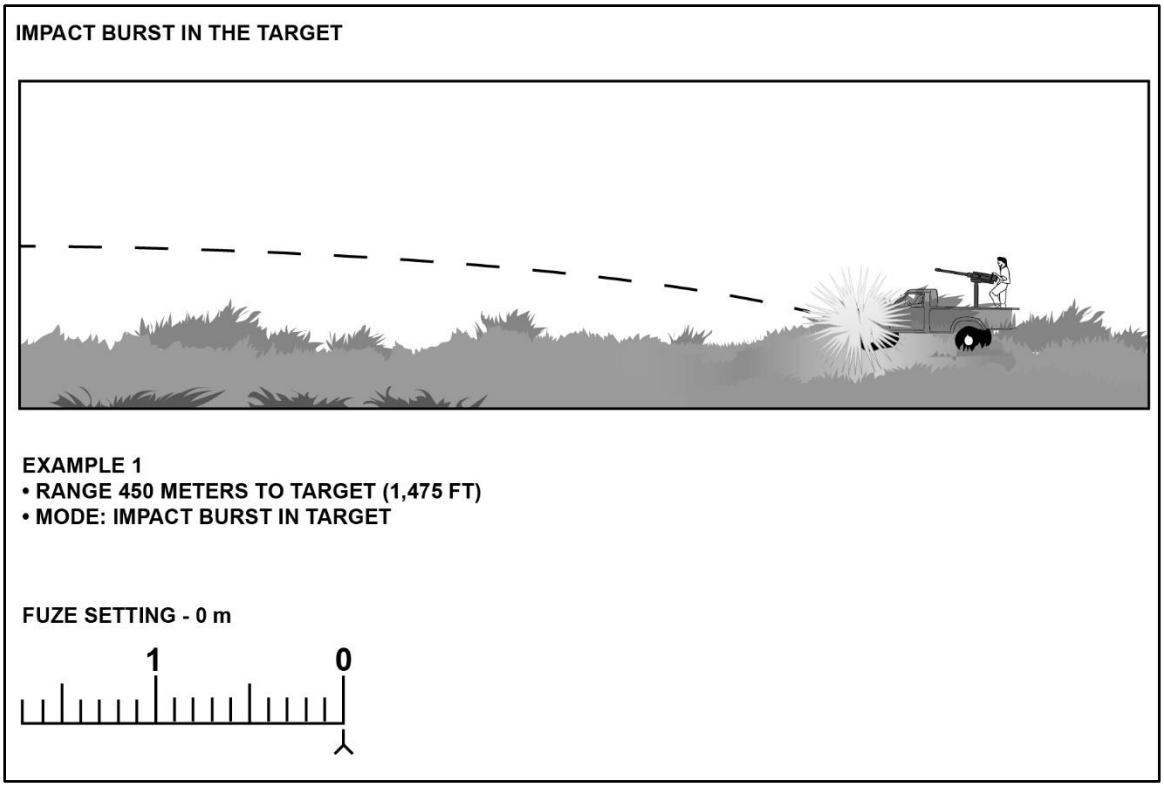


Figure C-21. HE 441D RS, impact on target

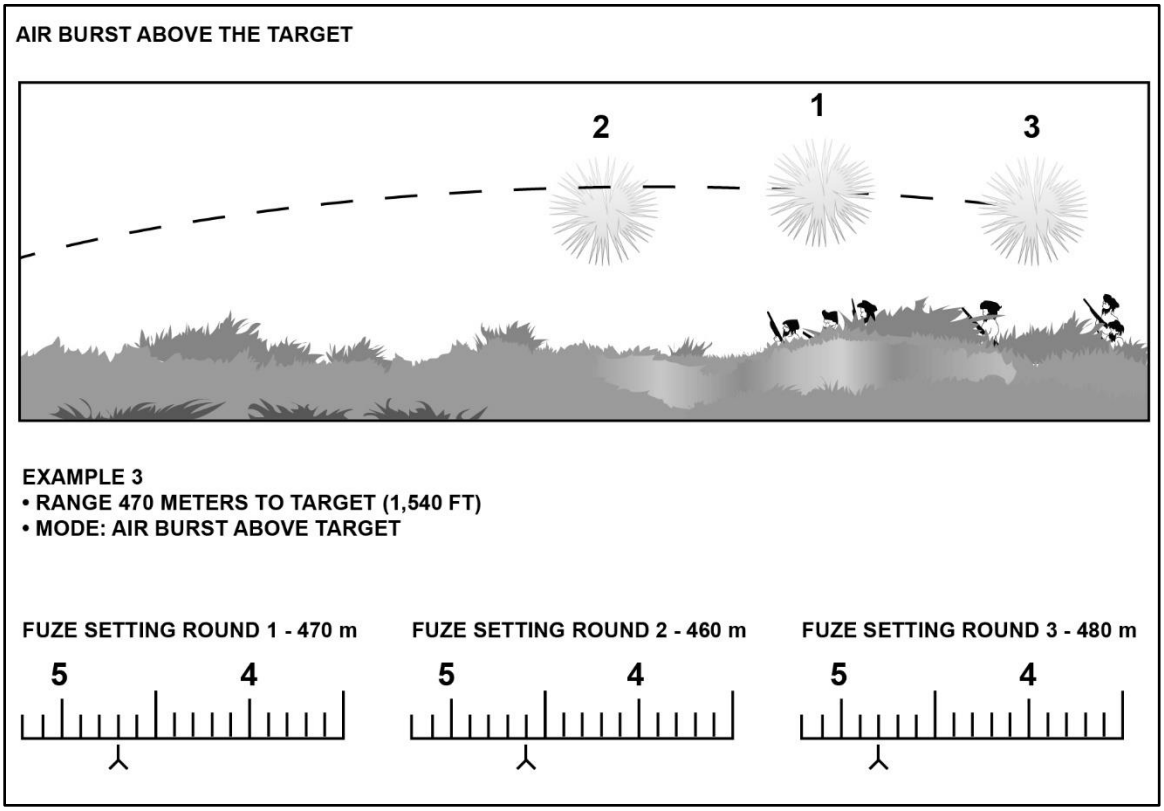


Figure C-22. HE 441D RS, airburst above target

Note. The range drum on the PFCD must be set on the second ammunition indicator ring. The range drum on the PFCD adjusts to max range of 1000 meters. The HE 441D RS has effective ranges that exceed 1000 meters. Use the range scale marked 441 when using open sights.

Fuze Setting

C-65. The fuze is set by hand without tools as follows:

- Setting is made between 40 and 1250 meters.
- Scale is subdivided into 10-meter divisions (see figure C-23).
- Fuze may be turned clockwise or counterclockwise to desired range setting.
- Fuze can be reset to S (safe) position and reused (see figure C-23).
- From 0 to 40 meters, the round can be fired through obstruction consisting of brush type vegetation.
- Ignition of the round always occurs on impact, independent of position of fuze setting scale even with index at S (safe) position.

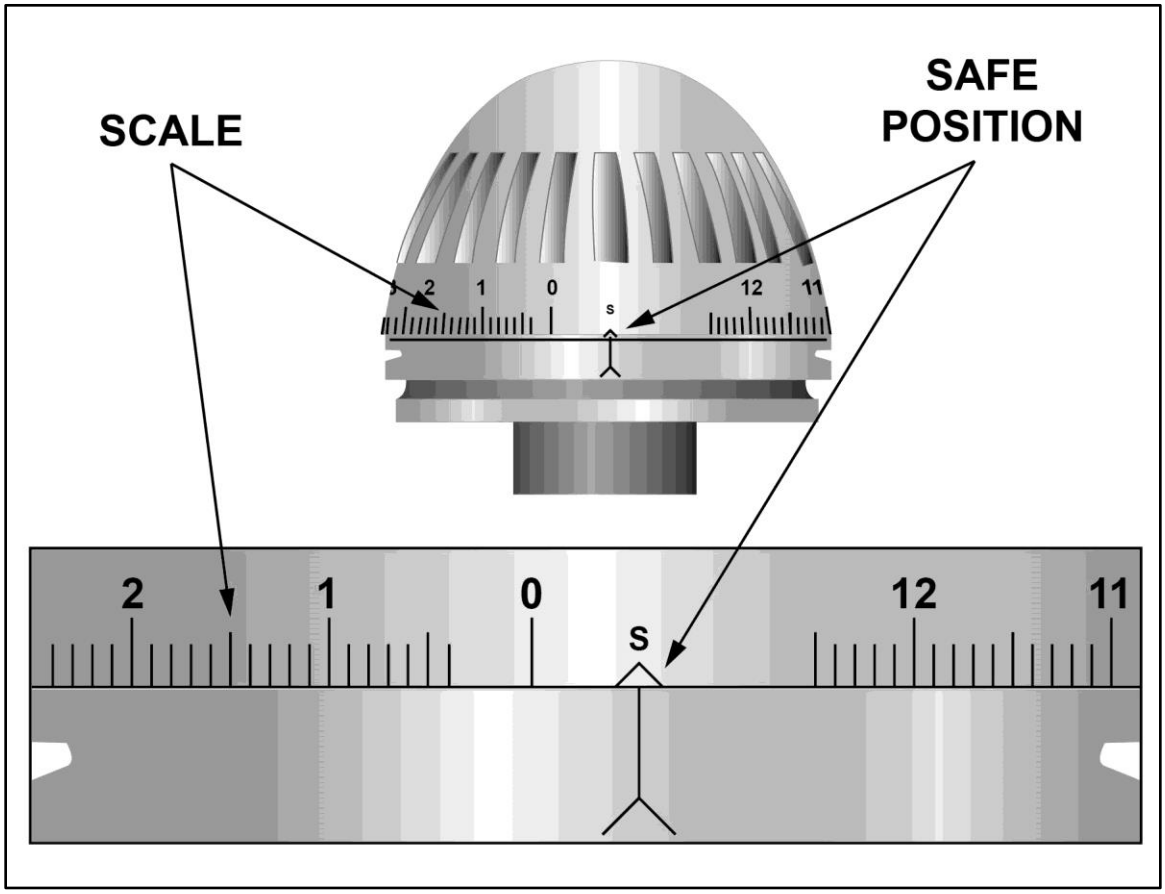


Figure C-23. HE 441D RS, fuze setting

Loading

C-66. Table C-6 lists the responsibilities of the gunner and assistant gunner when loading the HE 411D RS.

Table C-6. HE 411D RS, loading and special handling

Gunner	*Assistant Gunner*
Call out “High Explosive impact (or range) — load”.	
Take same measures as in normal loading.	Set range on round fuze setting to target range.
Take the same measures as in normal loading.	Take the same measures as in normal loading.

Aiming Rules

C-67. An example of the impact burst on the target is depicted in figure C-24. Determine range to target as follows:

- Add 100 meters to range on round fuze settings.
- Set range scale to target range, PFCD, or open sights.
- Aim and fire at target directly.

C-68. An example of an airburst above a target is shown in figure C-22, page C-23. Determine range to target as follows:

- Set range scale on the PFCD or open sights for airburst as indicated below:
- Set sight to target range +100 meters for targets out to 500 meters.
- Set sight to target range +50 meters for targets over 500 meters.
- Set range on round fuze setting to target range. For string effect, increase and or decrease range on round fuze setting for subsequent engagements.

C-69. Aim and fire at target directly as shown in figure C-24.

ADM 401B

C-70. The ADM 401B is made for close-in protection in tight conditions of jungle or urban warfare. The ADM 401B contains approximately 300 ball bearings (see figure C-24).

Loading

C-71. The gunner and assistant gunner take the same measures as in normal loading.

Aiming Rules

> ***Note***. Use any range scale set on 0. When firing at ~100 meters, aim approximately 1 meter above the center of the target. The effective firing range is ~200 meters.

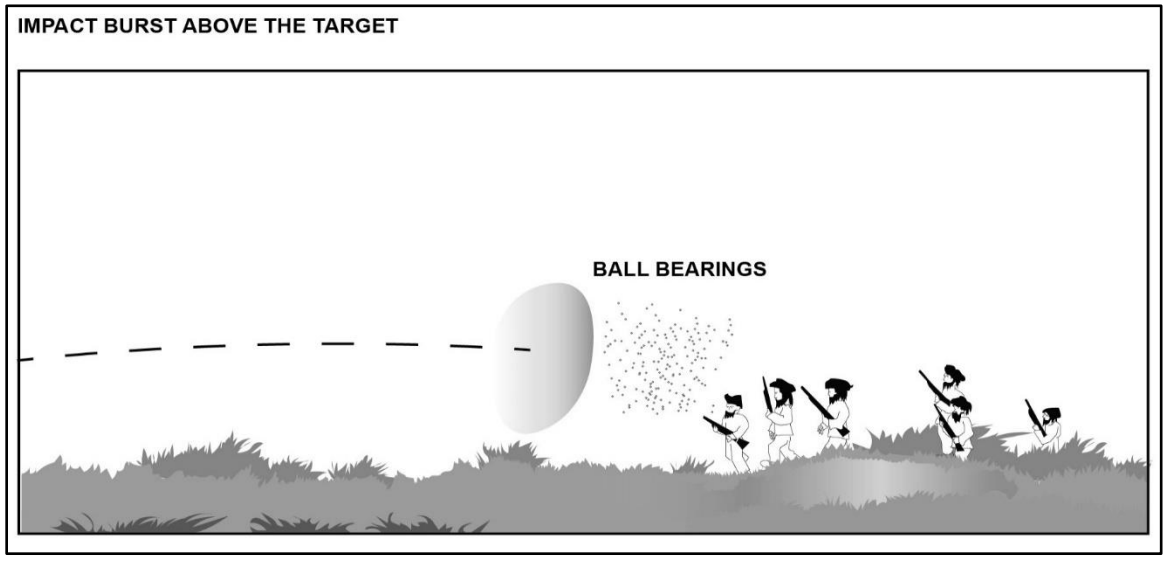


Figure C-24. ADM 401B

ILLUM 545C

C-72. The ILLUM 545C (table C-7, page C-30) is spin stabilized and fitted with an electronic time fuze that has a mechanical safety and arming device. The fuze has an impact detector that can be used alone by setting the nose cap to the I (impact) position. The fuze has an arming distance of 40–70 meters.

WARNING

Crews must train not to engage targets closer than 150 meters when firing illumination rounds in impact mode. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

Firing the ILLUM 545C from the prone position is limited to a horizontal firing elevation (zero degrees). Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

Fuze Setting

C-73. The fuze is set by hand without tools as follows:

- Setting is made between 300 meters and 2100 meters.
- Scale is subdivided into 300-meter divisions.
- Time setting is done by turning nose cap counterclockwise to desired distance.
- Reset and reuse fuze by turning nose cap counterclockwise to I (impact) position (see figure C-25).

Note

From 0 to 40-meters, the round can be fired through obstruction consisting of brush type vegetation.

Ignition of the round always occurs on impact, independent of position of fuze setting scale even with index at the S (safe) position.

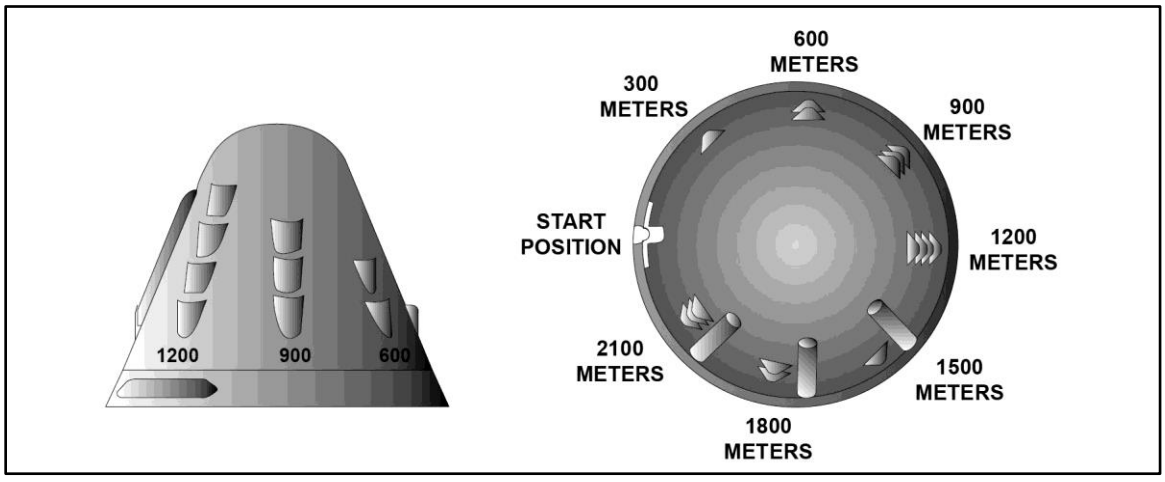


Figure C-25. Fuze setting

Loading

C-74. Table C-7 lists the responsibilities of the gunner and assistant gunner when loading the ILLUM 545C.

Table C-7. ILLUM 545C, loading and special handling

Gunner	*Assistant Gunner*
	Before opening venturi, set fuze for required range.
Take same measures as in normal loading.	Take same measures as in normal loading.
	If round is not used, fuze is to be reset to I (impact) position.

Aiming Rules

C-75. Both the gunner and assistant must ensure they follow the aiming rules listed below:

- Rule 1. For ranges at 900, 1200, 1500, and 2100 meters, use 20-degree luminous groove (figure C-26). Aim with luminous groove at center mass.
- Rule 2. For ranges at 300 meters and 600 meters, use 25-degree luminous groove (see figure C-26). Aim with luminous groove at center mass. Also, refer to figure C-27, page C-28.

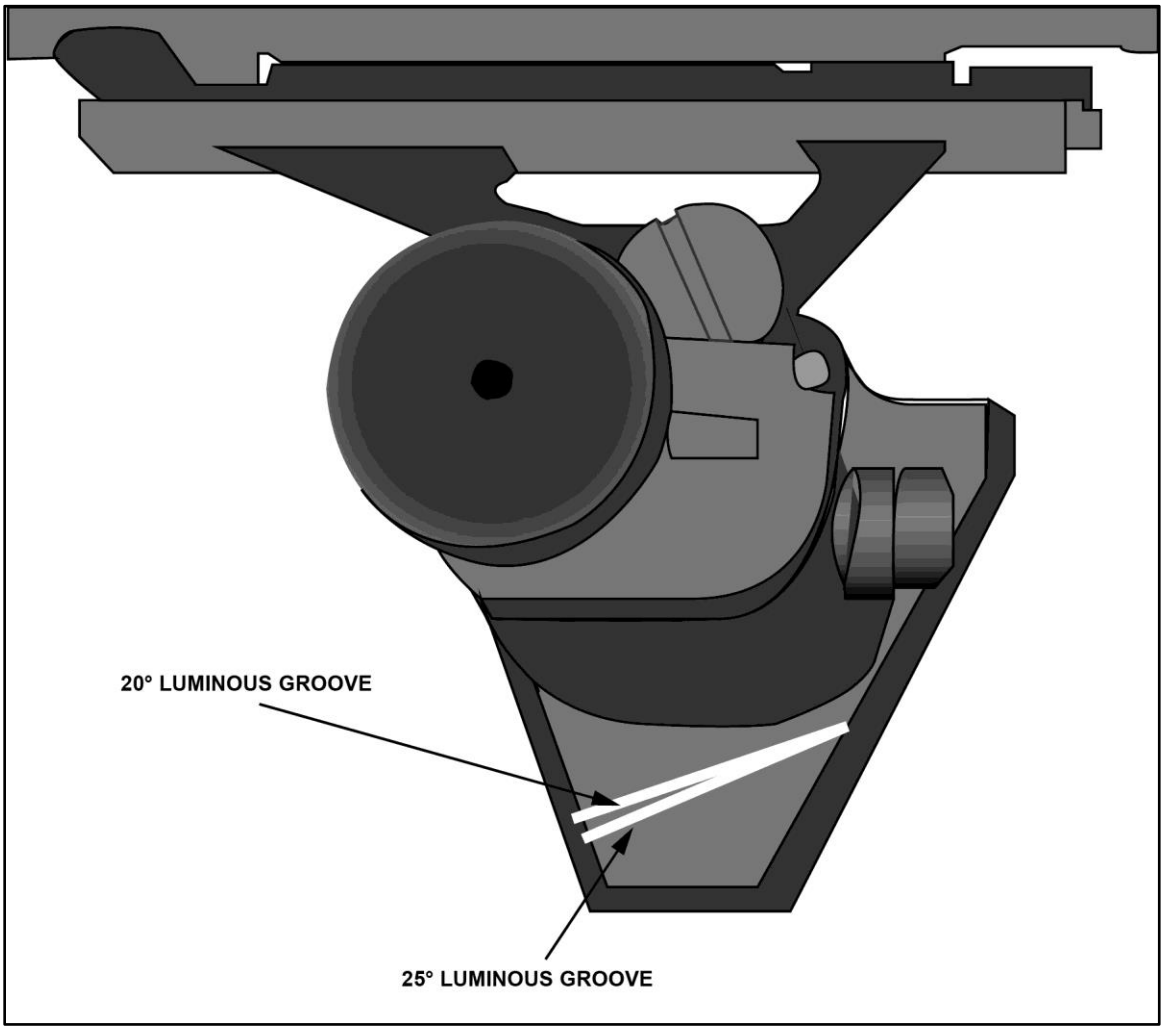


Figure C-26. ILLUM 545C, PFCD luminous grooves

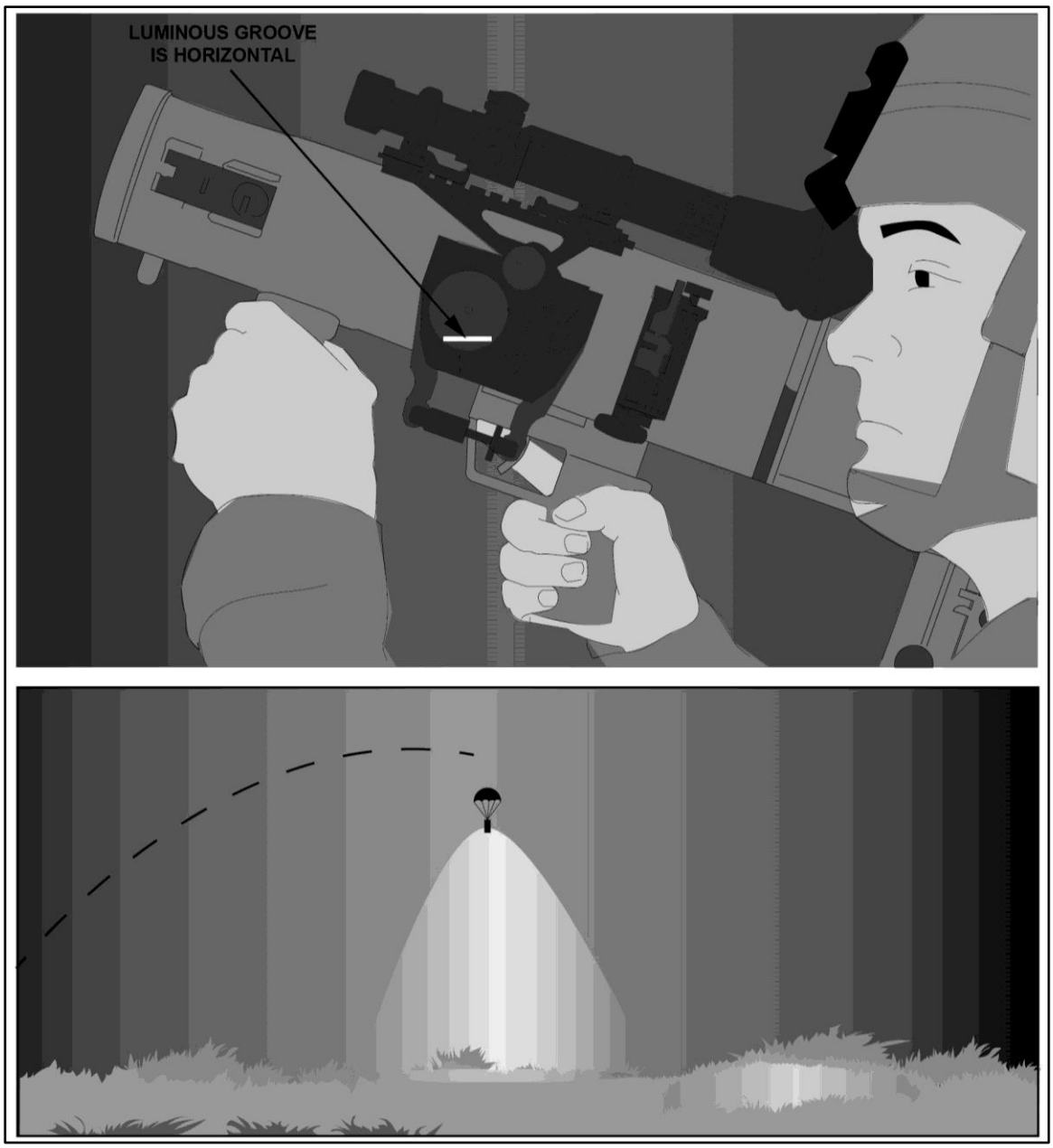


Figure C-27. ILLUM 545C

SMOKE 469B

C-76. The SMOKE 469B (see figure C-28) round is intended for blinding and screening as well as pointing out targets for artillery and close air support. Smoke is instantly obtained.

C-77. The fuze has an arming distance of 20 meters–0 meters.

Loading

C-78. Gunner and assistant gunner take the same measures as in normal loading.

Aiming Rules

C-79. Smoke should be aimed 10 to 20 meters short of and at the base of the target. This ensures the smoke builds in front of the target and achieves the desired results. Soldiers must consider wind speed and direction and apply a hold so that the smoke develops in the desired location.

Note. The range drum on the PFCD must be set on the second ammunition indicator ring. When using open sights, use range scale marked 441, green scale.

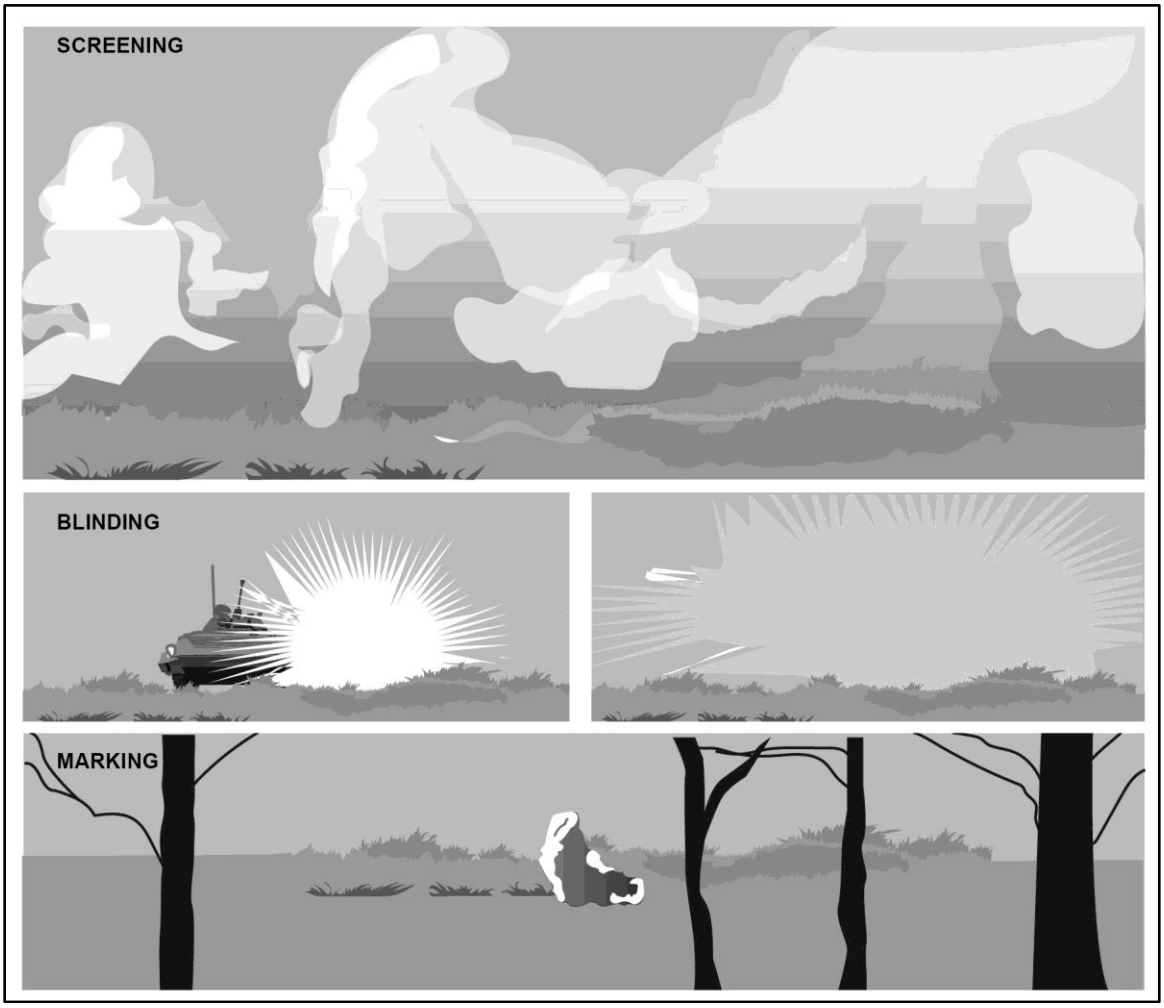


Figure C-28. SMOKE 469B

TPT 141 and TP 552

C-80. TPT 141 and TP 552 are full caliber training ammunition that carry no fuze and no explosive. TPT 141 is fitted with a tracer that is visible throughout a trajectory at ranges up to 300 meters.

C-81. TP 552 is a rocket-assisted projectile and has a range of 700 meters.

Loading

C-82. The gunner and assistant gunner take the same measures as in normal loading.

Aiming Rules

C-83. Both the gunner and assistant must ensure they follow the aiming rules listed below:

Note. The range drum on the PFCD must be set on the first ammunition indicator ring.

- Rule 1. Determine and set the range, select aiming point.
- Rule 2. TPT 141, use scale marked 551 up to 300 meters.
- Rule 3. TP 552, use scale marked 551 which has same aiming rules as HEAT 551. Refer to HEAT 551C RS aiming rules when employing TPT 141 or TP 552.

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Appendix D
Drills

Appendix D describes the various drills for the 84-mm MAAWS and their purpose. The drill structure is standardized for all individual and crew served weapons to reinforce the most common actions all Soldiers need to execute routinely with their 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. Soldier's use the drills discussed in this appendix build and maintain skills needed to achieve proficiency and mastery of the weapon. Soldiers ingrain these skills into their daily use with the weapon.

BUILDING CONFIDENCE

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 depends on the Soldier's ability to think clearly, accurately, and 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.

EFFICIENCY

D-5. Efficiency is 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 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 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 their 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 engaging targets; different types of enemies and scenarios require the use of different techniques.

D-10. 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 does a Soldier create the muscle memory necessary to serve them 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 1000 meters and any variance in between. Fast and efficient presentation of the weapon 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 and maintains the initiative. Speed should be developed throughout the training cycle and maintained during operations.

D-19. As the distance between the Soldier and a threat decreases, so does the time to engage with well-placed lethal fires. As distance increases, the Soldier gains time to refine their aim and conduct manipulations.

CONDUCT DRILLS

D-20. To build the skills necessary to master the functional elements of the shot process, leaders integrate certain tasks into the 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.

WEAPON CHECK

D-22. The weapon check drill is a precombat check. The drill is a visual inspection of the weapon by the Soldier. At a minimum, a weapon check includes verifying the following:

- Weapon is clear.
- Weapon serial number.
- Aiming device serial number.
- Attachment points of all aiming devices, equipment, and accessories.
- Functions check.
- Proper location of all attachments on the adaptive rail system.
- Serviceability of all ammunition and ammunition containers.

D-23. Soldiers conduct a weapon check 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.

SLING AND UNSLING OR STOW AND UNSTOW

D-24. This drill is a precombat check. This drill exercises the Soldier's ability to change the location of the weapon on demand. The drill reinforces the Soldier's ability to maintain situational and muzzle awareness during rapid changes of the weapon's sling posture. It 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. This drill reinforces the Soldier's ability to stow and unstow the weapon system from their ruck or weapon carrying case according to unit SOPs.

D-25. When conducting this drill, Soldiers should—

- Verify the proper adjustment of 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.

EQUIPMENT CHECK

D-26. The drill is a precombat check that ensures the Soldier's aiming devices, equipment, and accessories, to include batteries, are secured correctly, that the equipment does not interfere with tactical movement, and the basic load of ammunition is stowed properly.

D-27. The performance steps for the precombat checks drill are listed below:

Step 1. Receive the weapon and attachments.

Step 2. Clear the weapon as follows:

(a) Push the cocking lever fully forward with the right-hand thumb. Place the weapon on safe.

(b) Set safety catch to S (safe) position.

(c) Using right hand, move venturi locking lever forward and open venturi.

(d) Inspect chamber for live round or empty projectile casing to ensure weapon is clear.
(e) Close venturi ensuring locking lever is fully engaged.

Step 3. Verify weapon serial number.
Step 4. Verify attachments' serial numbers (if applicable).
Step 5. Inspect attachment points and proper location of all aiming devices, serviceability of equipment, and accessories (if applicable) as follows:
(a) Ensure attachments are secured properly.
(b) Ensure location of attachments do not interfere with operation of the weapon.
(c) Ensure all attachments are serviceable, have fresh batteries, and operate properly according to respective equipment technical manuals.
Step 6. Conduct prefire inspection according to TM 9-1015-262-10.
Step 7. Conduct a functions check of the weapon.

D-28. Inspect serviceability of basic issue items and stow them in load carrying equipment according to the unit SOP.

D-29. Soldiers sling the weapon as follows:
Step 1. Point the muzzle in a safe direction.
Step 2. While holding the weapon at the low ready, grasp sling with nonfiring hand.
Step 3. Move sling up and over the helmet and nonfiring shoulder, allowing the sling to hang below the the nonfiring arm and release the sling.
Step 4. Grasp the rifle forward grip with the nonfiring hand.

D-30. Soldiers adjust the sling as follows:

Note: Maintain muzzle awareness.

Step 1. Adjust the sling to an appropriate distance to allow the Soldier to rotate their torso left and right. Ensure the sling or weapon does not hang up on any equipment.
Step 2. Ensure the Soldier can maintain effective use of the weapon through all positions (standing, kneeling, sitting, and prone).

D-31. The Soldier orients the weapon on an assigned target and moves between firing positions.

D-32. From the standing position, the Soldier raises the weapon to the READY UP position and aims at an assigned target as follows:
Step 1. Move to the kneeling position while maintaining the weapon's orientation toward the target, and ensuring the weapon and equipment do not interfere with tactical movement.
Step 2. Move to the sitting position while maintaining the weapon's orientation toward the target, and ensuring the weapon and equipment do not interfere with tactical movement.
Step 3. Move to the prone position while maintaining the weapon's orientation toward the target, and ensuring the weapon and equipment do not interfere with tactical movement.

LOAD

D-33. Load allows the Soldier to develop reliable loading techniques. Leaders should incorporate this drill with the fight down drill to improve muscle memory on the various firing positions. The performance steps for load drill are listed below:
Step 1. Gunner: Ensures muzzle awareness, weapon is pointed in a safe direction.

Note: If applicable: Remove the muzzle cover and the venturi cover.

Step 2. Gunner: Assumes a firing position.
Step 3. Assistant gunner: Assumes a position to the right of the gun.

Step 4. Gunner: Holds weapon horizontally on right shoulder and supports bipod against upper body (if attached).

Step 5. Assistant gunner: Takes round from container and holds it on left forearm with nose of round to right and recess in cartridge case turned down.

Step 6. Gunner: Grasps firing grip with right hand and front grip with left hand.

Step 7. Gunner: Pushes cocking lever fully forward with right-hand.

Step 8. Gunner: Sets safety catch to S (safe) position.

Step 9. Gunner: Orders: "Load".

Step 10. Assistant gunner: Pulls venturi locking lever towards muzzle and opens venturi.

Step 11. Assistant gunner: Looks into barrel and checks that venturi, chamber, and bore are free from foreign objects.

Step 12. Assistant gunner: Inserts round into chamber using right hand as a guide and left hand to align recess in cartridge case with cartridge case guide.

Step 13. Assistant gunner: Uses right hand to close venturi and ensures venturi locking lever completely rotates to rear and locks venturi in closed position. Places hand on venturi locking lever and maintains hold. Calls, “Ready”.

CARRY

D-34. Carry is a series of four specific methods Soldiers use to carry their weapon. These four methods are closely linked with range operations in the training environment, but are specifically tailored to combat operations. The drill demonstrates the Soldier’s proficiency moving between:

- Stowed carry.
- Sling carry.
- Low ready.
- Ready (standing, kneeling, sitting, and prone).

D-35. The leader announces the appropriate carry term to initiate the drill. Each carry method should be executed in a random order a minimum of three times. The performance steps for the carry position drill are listed below:

Step 1. Receive the weapon, sling, and attachments.

Step 2. Demonstrate stowed carry position on the command, ASSUME STOWED CARRY—

Note: Maintain muzzle awareness through all carry positions.

(a) Clear the weapon system.

(b) Stowe the MAAWS on the load carrying equipment according to the unit SOP.

Step 3. Move to and demonstrate the slung carry position. On the command, ASSUME SLING CARRY—

(a) Sling weapon according to the gunner’s preference.

(b) Ensure gunner maintains positive control and that the weapon does not hang up on any equipment.

(c) Ensure gunner maintains effective use of primary weapon while MAAWS is slung.

Step 4. Move to and demonstrate the low ready carry position. On the command, ASSUME LOW READY CARRY—

(a) Unsling weapon while maintaining muzzle awareness.

(b) Grasp the carrying handle and maintain positive control of the MAAWS with the nonfiring hand.

(c) Ensure gunner maintains effective use of the primary weapon while MAAWS is on the low ready carry.

Step 5. Move to and demonstrate the ready carry position. On the command, GO READY—

(a) Maintain muzzle awareness.

(b) Move to the ready carry position from the standing position.

(c) Move to the ready carry position from the kneeling position.
(d) Move to the ready carry position from the sitting position.
(e) Move to the ready carry position from the prone position.

FIGHT DOWN

D-36. 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-37. Each position should be executed a minimum of three times. Leaders use the fight down drill in conjunction with the fight up drill. The following paragraphs discuss the performance steps for the fight down drill.

D-38. On the command FIGHT DOWN, the Soldier must rapidly move to the next lower firing position and reacquire the target.

Note: Maintain muzzle awareness through all positions.

- On the first command FIGHT DOWN, the Soldier—
  Step 1. Drops from the standing firing position to the kneeling firing position.
  Step 2. Achieves a stable firing position.
  Step 3. Reacquires the assigned target.
- On the second command FIGHT DOWN, the Soldier—
  Step 1. Drops from the kneeling firing position to the sitting firing position.
  Step 2. Achieves a stable firing position.
  Step 3. Reacquires the assigned target.
- On the third command FIGHT DOWN, the Soldier—
  Step 1. Drops from the sitting firing position to the prone firing position to—
  Step 2. Achieves a stable firing position.
  Step 3. Reacquire the assigned target.

FIGHT UP

D-39. 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 position announced by the leader. The fight up drill exercises the following positions in sequence:

- Prone.
- Sitting.
- Kneeling.
- Standing.

D-40. Each position should be executed a minimum of three times. Leaders use the fight up drill in conjunction with the fight down drill. 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, the leader may switch between drills at any time at varying tempos. The performance steps for the fight up drill are listed below:

Note: Maintain muzzle awareness through all positions.

- On the command FIGHT UP, the Soldier—
  - Step 1. Moves from the prone firing position to the sitting firing position.
  - Step 2. Achieves a stable firing position.
  - Step 3. Reacquires the assigned target.
- On the second command FIGHT UP, the Soldier—
  - Step 1. Moves from the sitting firing position to the kneeling firing position.
  - Step 2. Achieves a stable firing position.
  - Step 3. Reacquires the assigned target.
- On the third command FIGHT UP, the Soldier—
  - Step 1. Moves from the kneeling firing position to the standing firing position.
  - Step 2. Achieves a stable firing position.
  - Step 3. Reacquires the assigned target.

GO TO PRONE

D-41. The go to prone drill develops the Soldier's agility to rapidly transition to a prone firing position. Standard time should be below two seconds.

D-42. Leaders announce the starting position for the Soldier to assume. Once the Soldier has correctly executed the start position to standard, the leader announces, GO TO PRONE. The drill should be conducted a minimum of five times stationary and five times while walking.

D-43. 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 this drill.

D-44. The performance steps for the go to prone drill are as follows:

On the command of GO TO PRONE, the Soldier—

Note: Maintain muzzle awareness.

- Points the weapon down range towards the target.
- Posts their nonfiring hand on the ground naturally in front of them.
- Kicks their legs rearward and out so that their body lays naturally on the ground in a good prone firing position.
- Reacquires the assigned target.

RELOAD

D-45. The Soldier executes the reload drill when they are wearing complete load bearing equipment. The reload drill provides exercises to assure fast, reliable reloading through repetition at all firing positions or postures. The Soldier should perform the reload drill from each of the following positions a minimum of seven times each:

- Standing.
- Sitting.
- Kneeling.
- Prone.

D-46. Leaders may include other drills while directing the reload drill to the Soldier to reinforce the training as necessary. Following are the performance steps for the reload drill:

Note: Maintain situational and muzzle awareness through all movement and firing positions.

- Gunner: Maintain weapon in firing direction.
- Gunner: Push cocking lever fully forward with right hand.
- Gunner: Set safety catch to S (safe) position.
- Gunner: Call out: RELOAD.
- Assistant gunner: Move venturi locking lever forward and open venturi.
- Assistant gunner: Pull venturi locking lever towards muzzle, forcing round rearwards.
- Assistant gunner: Remove round or cartridge case from weapon and put it down. Load with a new round.
- Assistant gunner: Close venturi.
- Assistant gunner: Call out: READY.

MISFIRE PROCEDURES

D-47. This drill includes the methods to clear the most common misfires on the MAAWS in a rapid manner, while maintaining muzzle and situational awareness. Soldiers should perform all three variations of misfire procedures based on their leader's commands.

D-48. Each of the variations of the misfire procedures drill should be executed five times. Once complete, leaders should incorporate this with other drills to ensure the Soldier can execute the tasks at all positions fluently.

D-49. The performance steps for the misfire procedure follow:

Perform Immediate Action

Note. Maintain muzzle awareness.

Step 1. Hear the firing pin with an audible click.
Step 2. Keep weapon on target and wait five seconds and recock firing mechanism.
Step 3. Aim and pull trigger. If M3 still misfires, keep aim on target.
Step 4. Recock firing mechanism.
Step 5. Aim and pull trigger. If M3 still misfires, keep aim on target.
Step 6. Maintain firing position and wait two minutes.
Step 7. Remove round and reload with new round.

Note. Apply immediate action only one time for given stoppage. If weapon still fails to fire, inspect M3 to determine cause of stoppage or malfunction and take appropriate remedial action.

Perform Remedial Action

Note. Maintain safe muzzle awareness.

Step 1. Clear weapon.
Step 2. Perform safety function check.
Step 3. Change ammunition and attempt to fire.
Step 4. If weapon does not fire, return weapon to field maintenance or organizational-level maintenance for maintenance and troubleshooting.

UNLOAD AND CLEAR

D-50. The Soldier should execute the drill a minimum of six times to simulate the maximum rounds that the weapons team can be exposed to. Refer to appendix A for further information on ammunition limitation. This drill should be executed in tandem with the load drill.

D-51. The Soldier can execute the drill without ammunition in the weapon or leaders may opt to use the TPT 553B subcaliber adapter without the ammunition. The adapter is externally similar in shape to the 84-mm HEAT 551/551C RS round. In garrison environments, leaders should use this drill on demand to reinforce the Soldier's skills and attention to detail.

D-52. The performance steps for the unload drill are listed below:

Note: Maintain situational and muzzle awareness through all movement and firing positions.

Step 1. Gunner: maintain weapon in firing direction.
Step 2. Gunner: push cocking lever fully forward with right-hand.
Step 3. Gunner: set safety catch to S (safe) position.
Step 4. Gunner: call out: UNLOAD.
Step 5. Assistant gunner: move venturi locking lever forward and open venturi.
Step 6. Assistant gunner: pull venturi locking lever towards muzzle, forcing round rearwards.
Step 7. Assistant gunner: remove round and cartridge case from weapon and put it down.
Step 8. Assistant gunner: close venturi.

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Appendix E

Boresighting

Boresighting is the process of aligning the bore of the weapon and the weapon's sight system at a known distant point. The boresighting procedure is the most critical skill that the gun team must perform to increase lethality and success in the battlefield. Properly performed boresighting is a prerequisite of combat effectiveness. Boresighting should be checked frequently and especially when the telescopic sight has been removed from the weapon, such as after transportation in vehicles.

TOOLS AND EQUIPMENT

E-1. The required tools and equipment needed to boresight the weapon system are provided as part of the basic issue item. The tools and equipment required include the front boresight disc, rear boresight disc (bag no.2), and the 3/16 inch (5.5 mm) flat tip screwdriver (bag no.1). For further information and location of this equipment, refer to chapter 2 or TM 9-1015-262-10.

WARNING

Weapon MUST be cleared before inspecting, cleaning, disassembling, transporting, or storing to be considered SAFE. Failure to comply with this warning could result in injury or death to personnel. Seek immediate medical attention if injury occurs.

BORESIGHT OPEN SIGHTS

E-2. The gun team performs the following steps to boresight the open sights:

Step 1. Cock weapon and place on S (safe).

Step 2. Clear weapon.

Step 3. Insert front boresight disc into muzzle so straight edges of boresight disc are horizontal (see figure E 1).

Figure E-1. Front disc

Step 4. Open venturi and place rear boresight disc into chamber and close venturi (see figure E-2).

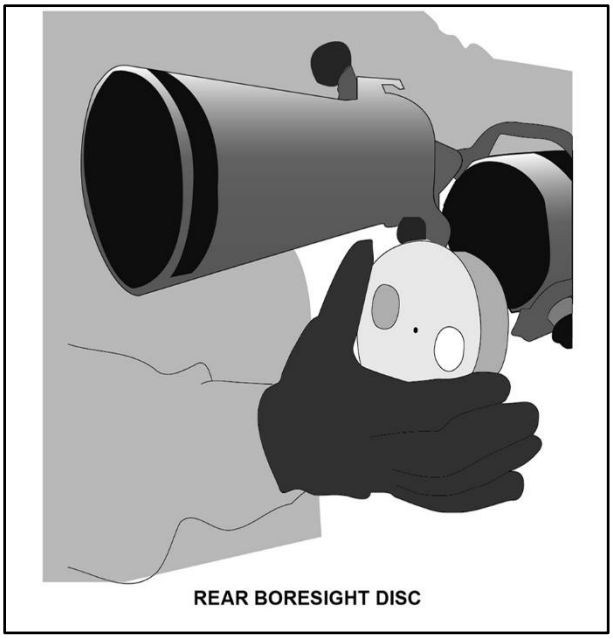


Figure E-2. Rear disc

Step 5. Rotate front and rear sights to open position.

Step 6. Set rear sight to zero by turning the elevation knob to align the middle of the index mark with zero (figure E-3).

Step 7. Identify a clearly defined aiming point on an object at a range of at least 200 meters.

Step 8. Grasp weapon by venturi. Look through small hole in center of rear boresight disc and align front and rear discs with distant object (figure E-3, page E-4).

Note. Assistant gunner should keep the weapon stabilized. The gunner makes the necessary adjustments to align sights with distant objects.

Step 9. Maintain alignment with distant object and keep gunner informed during adjustments.

Step 10. Adjust for elevation by turning rear sight elevation knob clockwise or counterclockwise until rear sight aperture is aligned vertically with distant object (figure E-3, page E-4.)

Step 11. Adjust azimuth by loosening the rear sight aperture set screw and then moving the rear sight aperture (left or right to align sight with distant object. When the rear sight aperture is properly aligned, tighten the rear sight aperture set screw (and ensure alignment is correct (figure E-3, page E-4.)

Step 12. Loosen range indicator set screw using 3/16-inch (5.5 mm) flat-tip screwdriver, and center the range indicator's index mark on zero. Tighten range indicator screw (figure E-3, page E-4).

Step 13. Switch positions and verify settings.

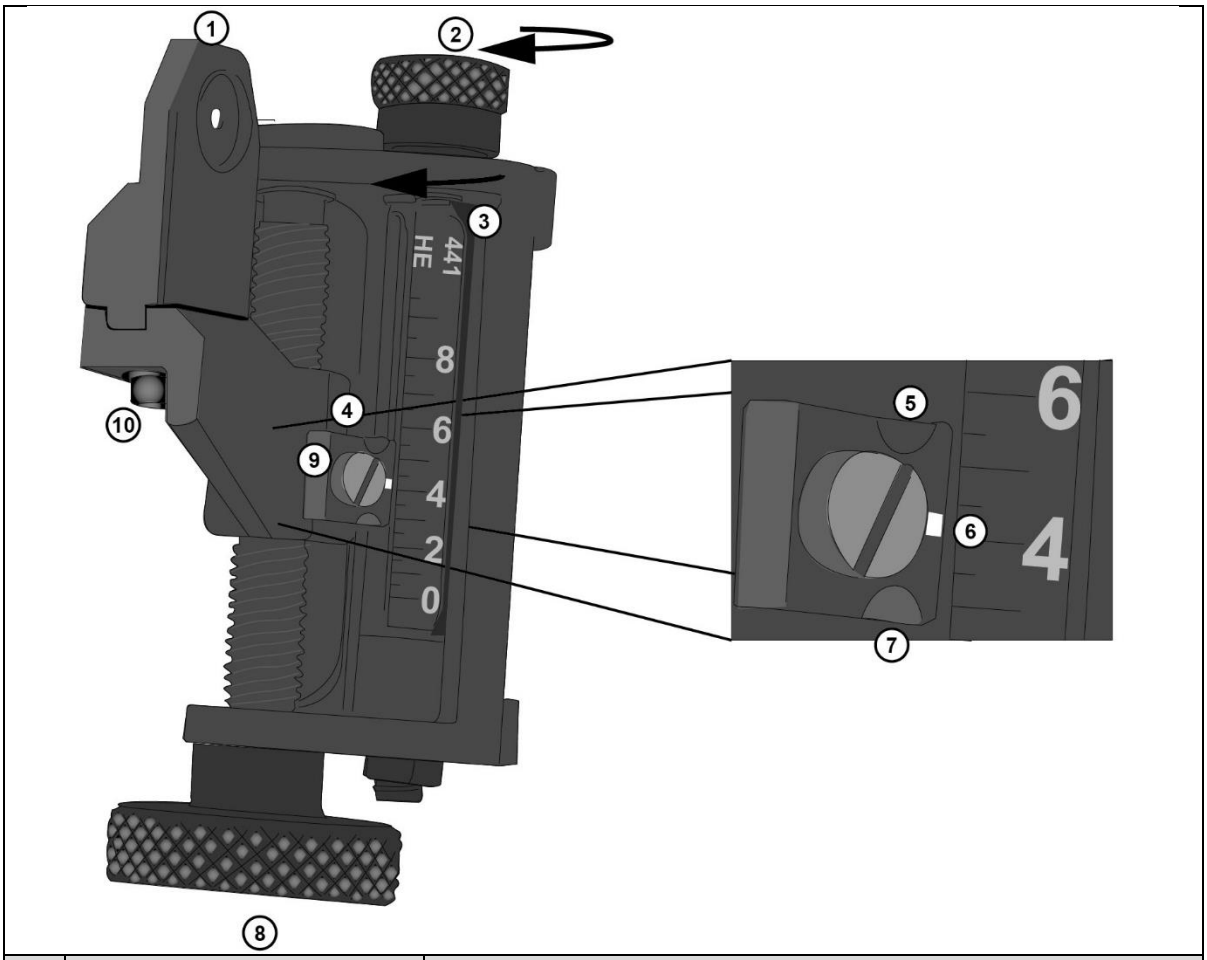
Step 14. Open venturi.

Step 15. Remove boresight discs and place in bag no. 2.

Step 16. Close venturi.

Step 17. Place the weapon on fire.

Step 18. Fire the MAAWS to relieve spring tension.



Item	*Name*	*Description/Function*
1	Rear Sight Aperture	Aperture adjusts in left and right for azimuth adjustments.
2	Pillar Knob	Turn counterclockwise (CCW) to rotate pillar assembly when selecting ammunition type.
3	Pillar Assembly	Ammunition type is indicated at top of each. Range scale compensates for ballistics associated with selected ammunition type.
4	Range Indicator	Used in conjunction with range scale on range pillar to select desired engagement range and ammunition temperature setting.
5	Red Temperature index	Used in conjunction with range scale when ammunition temperature is greater than 86 °F (30 °C).
6	White Index	Used in conjunction with range scale when ammunition temperature is between 86 °F and 32 °F (30 °C and 0 °C).
7	Blue Temperature Index	Used in conjunction with range scale when ammunition temperature is less than 32 °F (0 °C).
8	Elevation Knob	Rotate to select desired range to target.
9	Range Indicator Set Screw	Loosen to permit vertical adjustment of range indicator when boresighting.
10	Rear Aperture Set Screw	Loosen to permit azimuth adjustment of rear sight aperture when boresighting.

Figure E-3. Rear sight elevation and azimuth adjustment

TELESCOPIC SIGHT

E-3. The gun team performs the following steps to boresight the telescopic sights:

Step 1. Cock weapon and place on S (safe) position.

Step 2. Clear the weapon.

Step 3. Install telescopic sight assembly.

Step 4. Insert front boresight disc (see figure E-5) into muzzle so straight edges of boresight disc are horizontal.

Step 5. Open venturi and place rear boresight disc (see figure E-5) into chamber and close venturi.

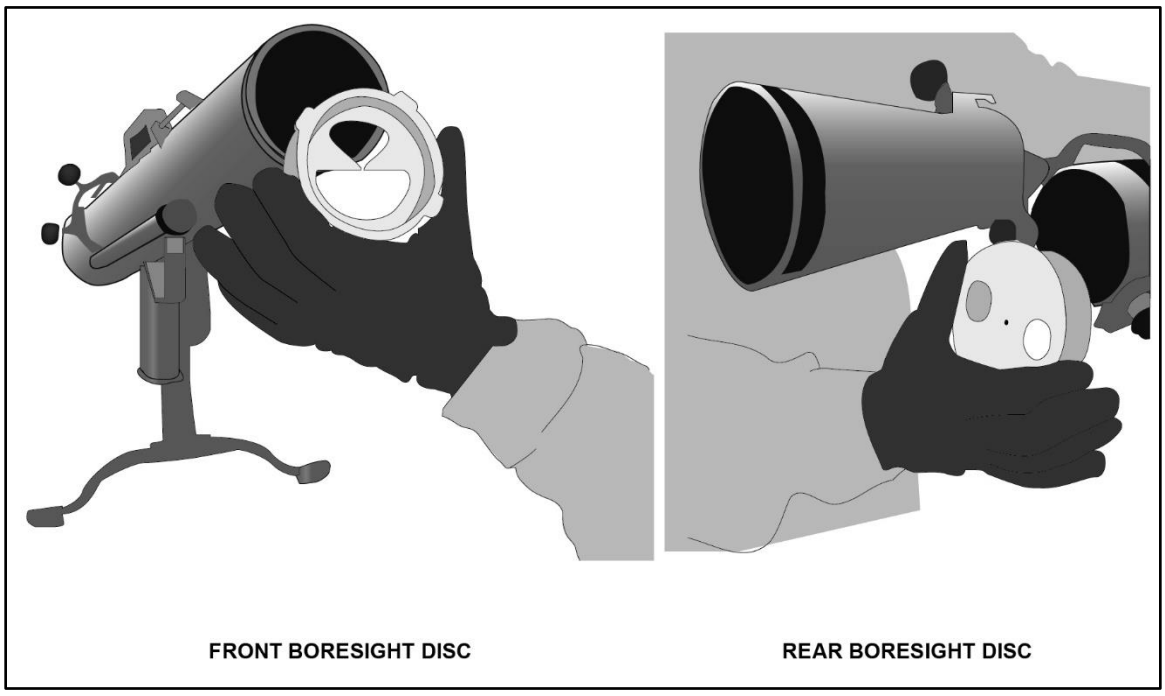


Figure E-4. Front and rear boresight disc

Step 6. Loosen locking screws (see figure E-5, page E-6) on telescopic sight elevation and azimuth drums.

Note. Set range to zero on the range drum before selecting ring and ammunition type on the PFCD. Ensure range-setting knob is pushed in completely and ammunition indicator rings are not visible.

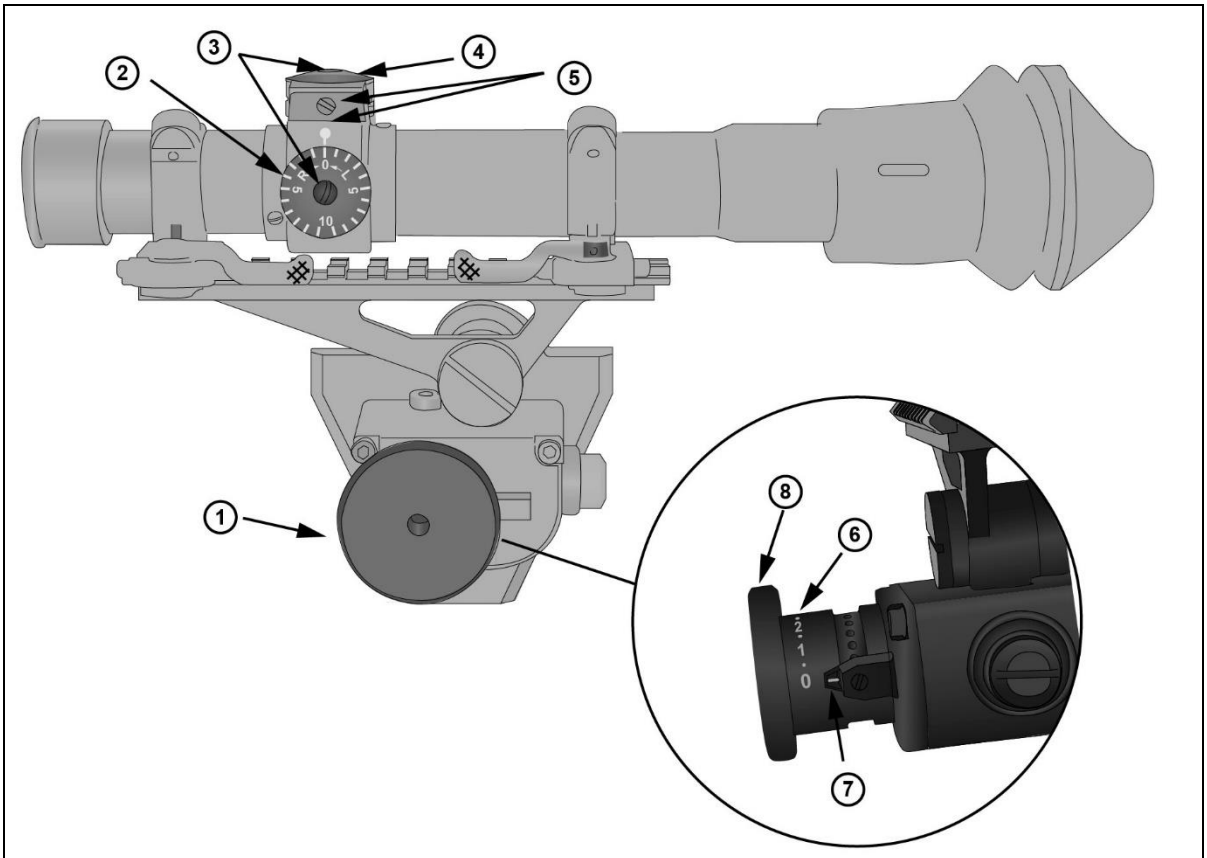
Step 7. Set range drum on the PFCD to zero.

Step 8. Identify distant object at minimum range of 200 meters for boresight target.

Note. Assistant gunner should keep the weapon stabilized while the gunner makes the necessary adjustments to align sights with distant objects.

Step 9. Grasp weapon by venturi. Look through small hole in center of rear boresight disc and align front and rear discs with distant object.

Step 10. Maintain alignment with distant object and keep gunner informed during adjustments.



Item	*Name*	*Description/Function*
1	Range Drum	Used to select ammunition and range to target during boresighting and firing.
2	Azimuth Drum	Used for azimuth adjustments during boresighting.
3	Clamping Screws	Loosen to slip elevation scale to zero during boresighting.
4	Elevation Drum	Used for elevation adjustments during boresighting and temperature adjustment during boresighting and firing.
5	Locking Screws	Used to permit changes to elevation and azimuth setting during boresighting.
6	Range Scale	Used for selecting target ranges up to 1000. Scale is in 50m increments.
7	Range Index	Align desired range on range scale to select desired range.
8	Range Knob	Range knob slides in and out to select proper ammunition indicator ring and rotates to select target range.

Figure E-5. Telescopic sights

Step 11. Look through telescope. Adjust reticle by turning elevation and azimuth drums to align reticle with distant object (see figure E-6).

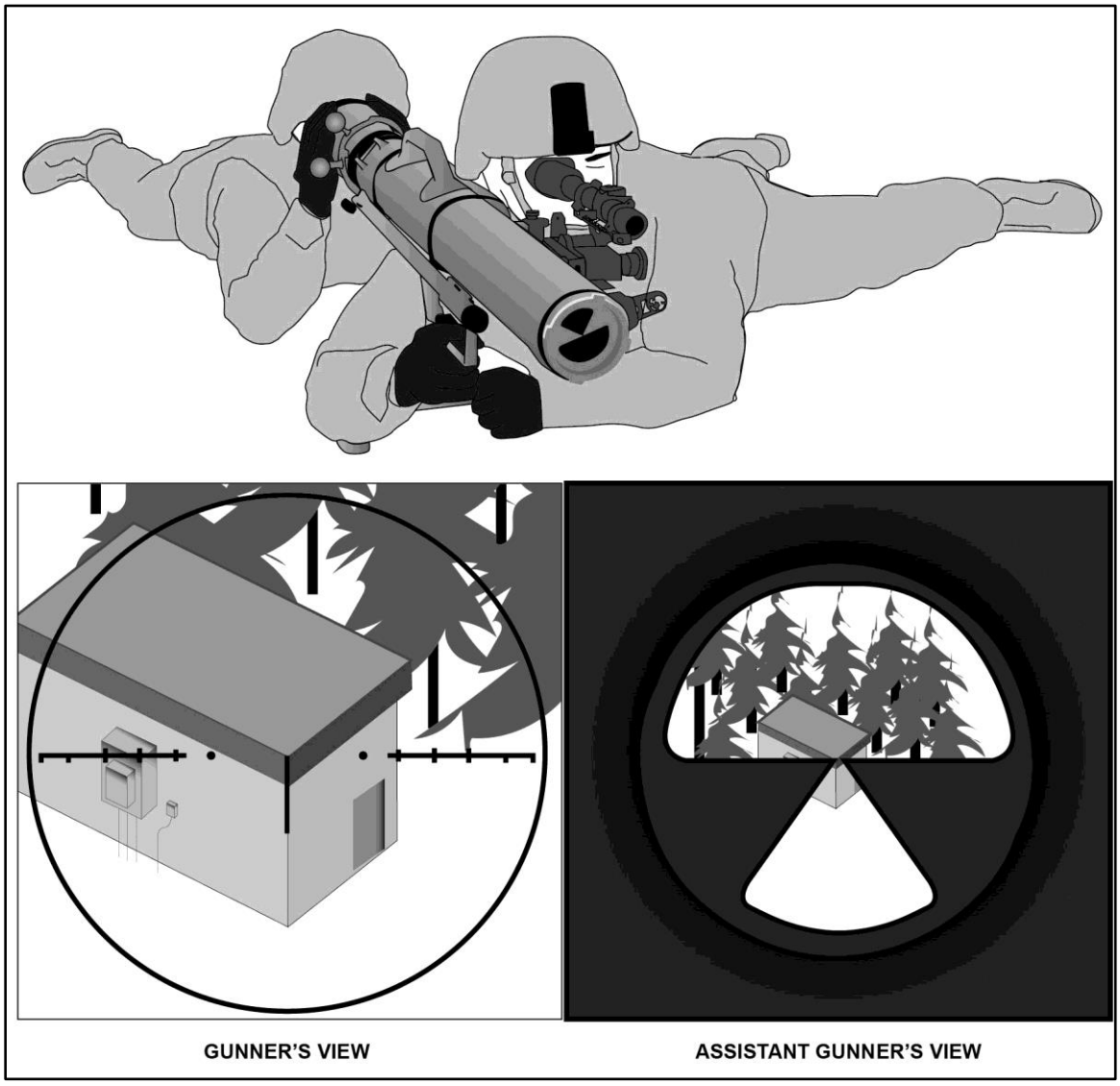


Figure E-6. Boresight disc and telescopic sight alignment

Step 12. Tighten locking screws on elevation and azimuth drums.

Step 13. Switch positions and verify settings.

Step 14. Loosen elevation scale clamping screw (see figure E-7) using 3/16-inch (5.5 mm) flat tip screwdriver, slip elevation scale to zero (zero index mark aligned with white temperature index), and tighten.

Step 15. Loosen azimuth scale clamping screw (see figure E-7) using 3/16-inch (5.5 mm) flat tip screwdriver, slip azimuth scale to zero (zero index mark aligned with white temperature index), and tighten.

Step 16. Remove boresight discs and place in bag no. 2.

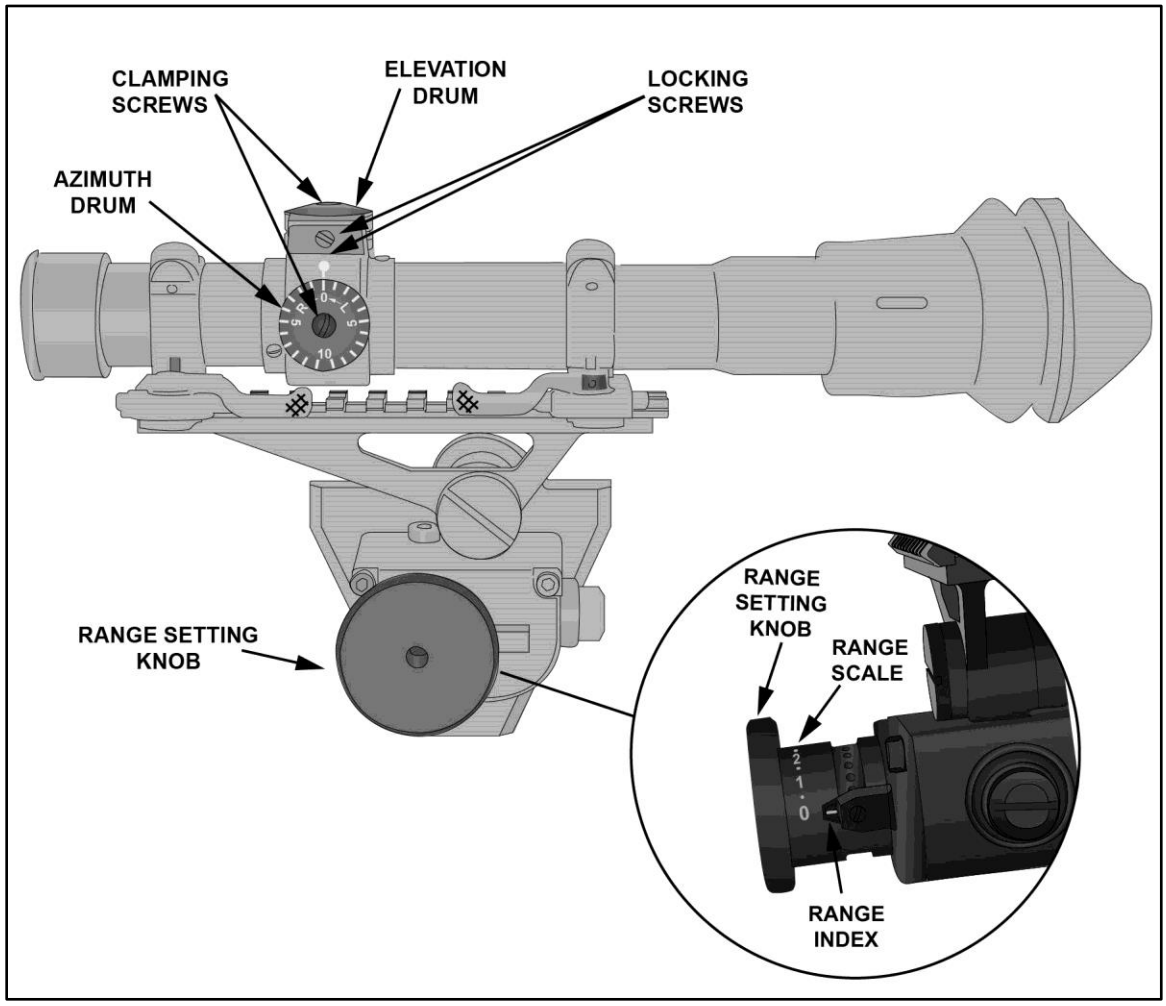


Figure E-7. Azimuth and elevation drums

TEMPERATURE ADJUSTMENT

E-4. Perform temperature correction adjustment after the boresighting procedure. Both the open sight and the telescopic sight have temperature correction indexes. If ammunition temperatures differ considerably from the normal one, 32 degrees Fahrenheit (0 degrees Celsius) to 86 degrees Fahrenheit (30 degrees Celsius), the position of the mean point of impact changes. To correct for this error, the sights have three temperature indexes: a red one for hot ammunition above 86 degrees Fahrenheit (30 degrees Celsius), a blue one for cold ammunition below 32 degrees Fahrenheit (0 degrees Celsius) to 86 degrees Fahrenheit (30 degrees Celsius), and a white one for normal ammunition temperature between 32 degrees Fahrenheit (0 degrees Celsius) to 86 degrees Fahrenheit (30 degrees Celsius).

Note. Do not align red or blue temperature index marks with desired range on range scale. Red and blue temperature indexes indicate alignment of white index mark with regards to ammunition temperature.

Make temperature adjustments to correct the mean point of impact based on ambient temperatures.

OPEN SIGHT AMMUNITION TEMPERATURE ADJUSTMENTS

Step 1. Using range knob to set desired range at bottom of white index for ammunition temperatures below 32 °F (0 °C) (see figure E-8).

Step 2. Using range knob to set desired range in middle of white index for ammunition temperatures between 32 to 86 °F (0 to 30 °C) (see figure E-8).

Step 3. Using range knob to set desired range at top of white index for ammunition temperatures above 86 °F (30 °C) (see figure E-8).

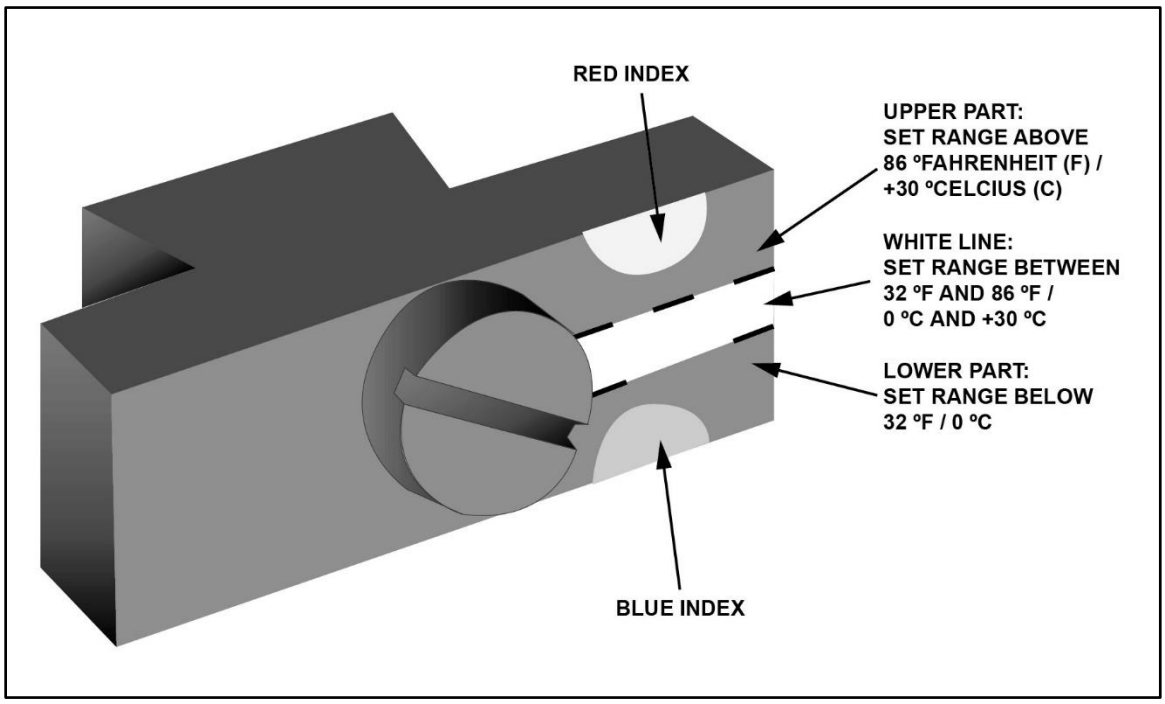


Figure E-8. Open sights ammunition temperature adjustment

TELESCOPIC SIGHT AMMUNITION TEMPERATURE ADJUSTMENTS

Note. Temperature adjustments are made to correct the mean point of impact based on ambient temperatures.

Step 1. Loosen locking screw (see figure E-9) on elevation drum using 1/8-inch (3.5 mm) flat tip screwdriver from bag No. 1.

Step 2. If ammunition has been stored at temperatures below 32 °F (0 °C), align zero on scale with blue temperature index (see figure E-9).

Step 3. If ammunition has been stored at temperatures between 32 to 86 °F (0 to 30 °C), align zero on scale with white temperature index (see figure E-9).

Step 4. If ammunition has been stored at temperatures above 86 °F (30 °C), align zero on scale with red temperature index (see figure E-9).

Step 5. Re-tighten elevation drum locking screw (see figure E-9).

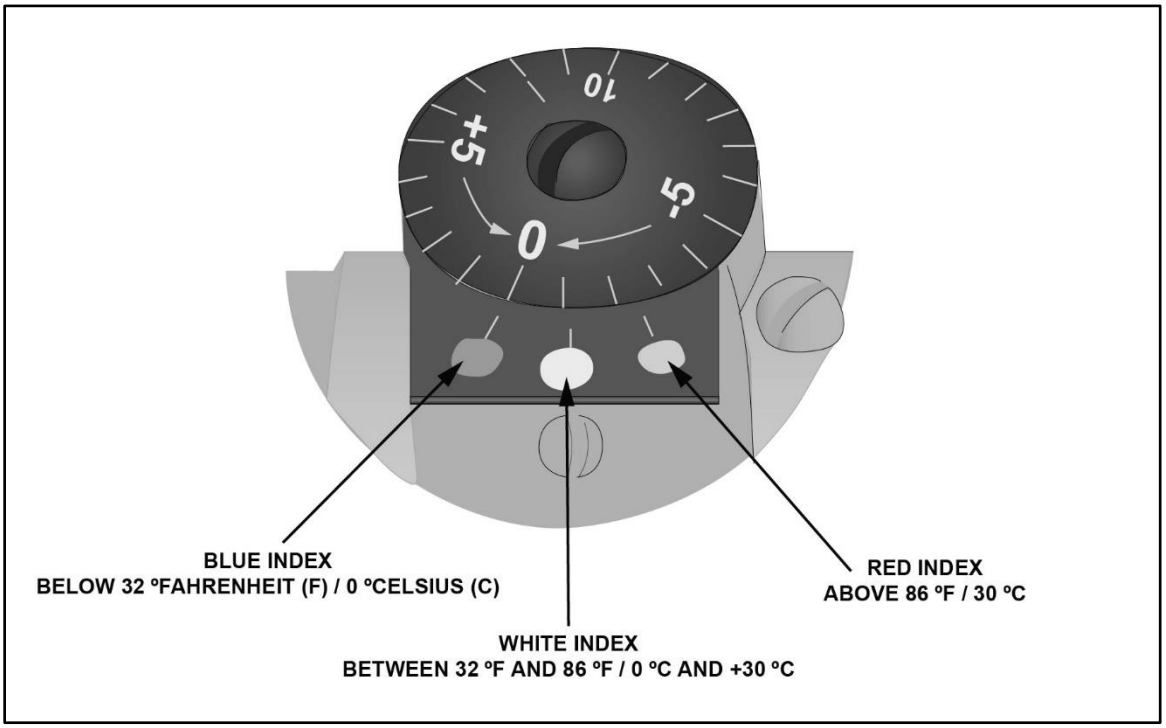


Figure E-9. Telescopic sights ammunition temperature adjustment

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 3-22.84 is the proponent are marked with an asterisk (*). The proponent manual for other terms is listed in parentheses after the definition.

SECTION I – ACRONYMS AND ABBREVIATIONS

Acronym	Definition
C	Celsius
DA	Department of the Army
DODIC	Department of Defense Identification Codes
F	Fahrenheit
FOV	field of view
FM	field manual
HE	high explosive
HEDP	high-explosive dual-purpose
LCD	liquid crystal display
IR	infrared
MAAWS	Multi-role, Anti-armor, Anti-personnel Weapon System
mm	millimeter
MOA	minute of angle
SOP	standard operating procedure
TC	training circular
TM	technical manual
WCS	weapon control status

SECTION II – TERMS

This section contains no entries.

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DOD Dictionary of Military and Associated Terms, June 2019.

RELATED PUBLICATIONS

These documents contain relevant supplemental information.

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Entries are by paragraph number.

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TC 3-22.84

18 July 2019

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