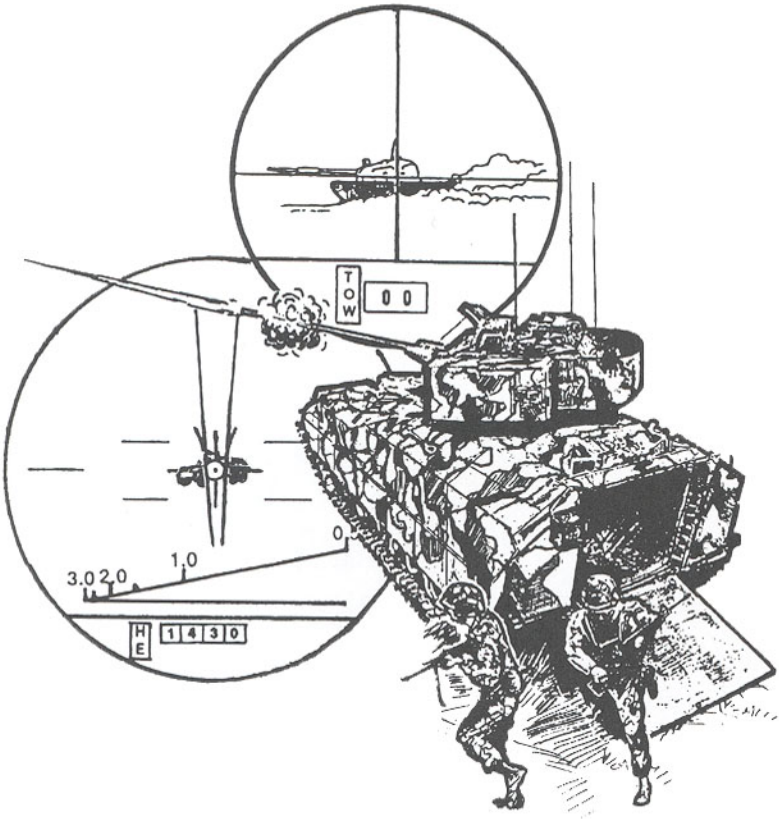
FIELD MANUAL
No. 23-1

BRADLEY GUNNERY



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HEADQUARTERS
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BRADLEY GUNNERY

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PREFACE

This manual provides Bradley-equipped units—

- M2/M3 Bradley gunnery theory, methods, and techniques.
- A description of system features and capabilities.
- A program to train and evaluate individual, crew, section, and platoon proficiency in Bradley gunnery.

Features of the Bradley system that do not affect gunnery doctrine and techniques are in the applicable operator's manuals. Because technical manuals (TMs) have priority updates, in all instances where the procedures in this manual conflict with TM procedures, the TM will be followed. All references to ARTEP 7-8-MTP should be replaced with ARTEP 7-7J-MTP when published.

All references to division commands and division master gunners include enhanced or separate brigade commands and brigade master gunners.

This manual consists of two parts: Part One is the Crew Member's Handbook containing specific information for the crew member; Part Two is the Training Manager's Handbook containing the information training managers and master gunners need to develop BFV training. This manual includes cavalry and air defense artillery BFV gunnery information specific to their missions.

This manual should receive widest dissemination. It should be used by commanders, staff, master gunners, and leaders at all levels to develop gunnery programs to sustain combat readiness.

The proponent of this publication is United States Amy Infantry School. Submit changes for improving this publication on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward to Commandant, United States Army Infantry School, ATTN: ATSH-IN-S3, Fort Benning, Georgia 31905-5594.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

Part One
Crew Member's Handbook

CHAPTER 1

SYSTEM CHARACTERISTICS AND CAPABILITIES

The Bradley fighting vehicle provides the infantry, cavalry, and air defense with firepower, armor protection, and battlefield agility and yet the infantry retains its traditional ability of fighting on foot. To effectively employ the Bradley, soldiers must know the characteristics and capabilities of the vehicle and its weapons systems. As the Bradley is upgraded and improved and as Army doctrine changes, soldiers must know how to capitalize on the Bradley's capabilities.

Section I
VEHICLE CHARACTERISTICS

The Bradley fighting vehicle consists of two models—the M2 infantry fighting vehicle and the M3 cavalry fighting vehicle. (ADA units have the M3.) Each model has three variants—the M2/M3, M2A2/M3A2, and M2A2ODS/M3A2ODS (Operation Desert Storm). These variants represent improvements in the vehicle's systems and capabilities (Table 1-1, page 1-3).

1-1. BRADLEY M2/M3 AND M2A2/M3A2

The M2/M3 is the original vehicle fielded in 1983. Since then, Bradleys have been upgraded to A1, then A2 variants. (In 1992, all A1 Bradleys began being remanufactured to A2s.) The A2 improvements consist of—

- 600-horsepower powertrain.
- 30-mm protection.
- Span liners.
- Equipped for armor tile.

1-2. BRADLEY M2A2ODS/M3A2ODS

The latest upgrade is the M2A2ODS/M3A2ODS. These improvements are a result of lessons learned from Operation Desert Storm.

a. **Bradley Eye-Safe Laser Range Finder.** This range finder enables the crew to determine target ranges from 200 to 9,990 meters within plus or minus 10 meters. It is integrated into the vehicle's integrated sight unit, and it applies automatic superelevation to the weapon system.

b. **Precision Lightweight Global Positioning System Receiver/Digital Compass System.** The PLGR gives the crew three-dimensional positioning (longitude/latitude, grid location, and elevation). Working with the DCS, the PLGR indicates hull and turret azimuth, direction, distance to way points, and way points with "steer-to" indication, all shown on independent commander and driver displays.

c. **Battlefield Combat Identification System.** The BCIS gives the crew a means of interrogating suspected vehicles to determine whether they are friendly or unknown. A series of visual and audible signals symbolizes friend, unknown, or friend-in-sector. The BCIS interrogator sends a millimeter wave signal to a suspected target. If the target has a BCIS transponder, the transponder will return a signal.

d. **Missile Countermeasure Device.** The MCD enables Bradleys to deter thermal-guided antitank missiles, thus improving crew survivability.

e. **Improved Vehicle Restowage.** Restowage consists of bench seats, mounted water ration heater, electric engine access door lift, outside stowage for personal gear, and three 25-mm ammunition boxes that contain 50 rounds each of linked ammunition (These boxes of linked ammunition are called hot boxes.)

f. **Driver's All-Weather Viewer.** The DAW provides the driver with improved day and night visibility in all weather and limited visibility conditions. In addition, its 40-degree field of view and its range allow the driver to detect potential targets at more than 1,200 meters.

CHARACTERISTIC	M2	M3	M2A2/ODS	M3A2/ODS
Weight (cbt-lbs):	50,259	49,945	63,982/66,401	64,204
Ground Pressure (psi:	7.7	7.7	9.5	9.5
Fuel Capacity (gal):	175	175	175	175
Cruising Range (mi/km):	300/483	300/483	265/441	265/441
Engine (cummins):	VTA-903T	VTA-903T	VTA-903T	VTA-903T
Gross Horsepower (HP):	500	500	600	600
Gross hp-to-wt (tons):	20.62	20.62	18.9	18.9
Transmission (GE HMPT-):	500	500	500-3EC	500-3EC
Speed (mph/kph) Land:	41/66	41/66	38/61	38/61
Speed (mph/kph) Water:	4.5/7	4.5/7	5/8	5/8
Slope Climb:	60%	60%	60%	60%
Side Slope:	40%	40%	40%	40%
Trench Crossing:	8'4"	8'4"	8'4"	8'4"
Vertical Wall Climb (inch):	36	36	36	36
Personnel Capacity (Mounted):	3-Man	3-Man	3-Man	3-Man
Personnel Capacity (Dismounted):	6-Man	2-Man	6-Man/7-Man	2-Man
Firing Ports:	6	0	2	0
TOW Missile Variant:	*All	*All	All	All
TOW Missile Ready:	2	2	2	2
TOW Missile Stowed:	5	10	5	10
25-mm AmmunitionReady:	300	300	300	300
25-mm AmmunitionStowed:	600	1200	600	1200
M240C Coax Ammunition Ready:	800	800	800	800
M240C Coax Ammunition Stowed:	1400	3600	1400	3400
M60 7.62 Ammunition Stowed:	2200	3200	2200	3400
M231 FPW 5.56 Ammunition Stowed:	4200	0	2520	0
M16 5.56 Ammunition Stowed:	2520	1680	2520	1680

* Firing the TOW 2, TOW 2A, and TOW 2B missiles from the basic TOW launcher is possible; however the missile will have a reduced probability of a hit.

Table 1-1. Bradley fighting vehicle data.

Section II
WEAPONS SYSTEMS CAPABILITIES

The BFV has several weapons systems: 25-mm automatic gun, 7.62-mm coaxial machine gun, TOW missile launcher, 5.56-mm firing port weapons (infantry vehicle only), and smoke grenade launchers. Each weapon has a specific capability for various types

of missions. Crews must be technical experts on each weapon system and its capabilities.

1-3. M242 25-MM AUTOMATIC GUN

The Bradley's main armament is the M242, 25-mm, fully automatic, externally powered gun (Figure 1-1). It is used to destroy lightly armored vehicles and aerial targets (helicopters and slow-flying aircraft). It is also used to suppress enemy positions (such as troops in the open, in dug-in positions, and in built-up areas).

a. The dual-feed system of the 25-mm uses two separate feed sprockets and a system of clutches so that either of the two sprockets can be engaged to feed a selected cartridge (AP or HE). The dual-feed system maintains positive round control through both sprocket handling and extractor groove engagement (Figure 1-2). This dual-feed system allows gunners to select AP or HE ammunition from two separate storage boxes—a 230-round box or 70-round box. Each box can hold either AP or HE ammunition. The 25-mm is externally powered by a 1.5-horsepower DC motor; this allows three rates of fire to be selected:

(1) *Single shot*— fast as the Bradley commander or gunner can squeeze the trigger.

(2) *Low rate*—100 rounds per minute, plus or minus 25 rounds.

(3) *High rate*— 200 rounds per minute, plus or minus 25 rounds.

DANGER

BEFORE FIRING THE 25-MM GUN, THE GUNNER MUST CHECK THE GUN COVER FOR SERVICEABILITY AND ZIP IT UP AND MUST ENSURE THE TURRET VENTILATION SYSTEM IS OPERATIONAL TO PREVENT POISONOUS GAS LEAKAGE IN THE TURRET

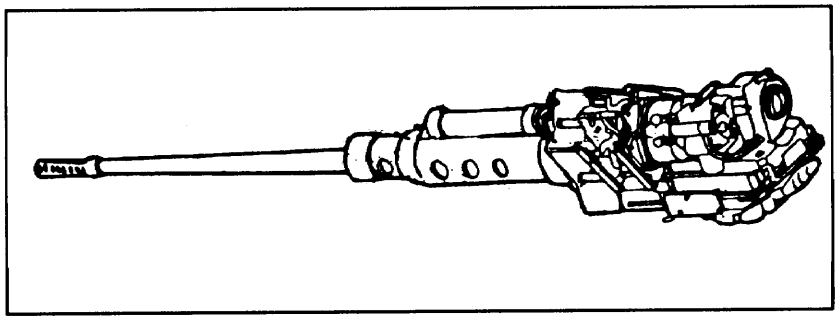


Figure 1-1. M242 25-mm automatic gun.

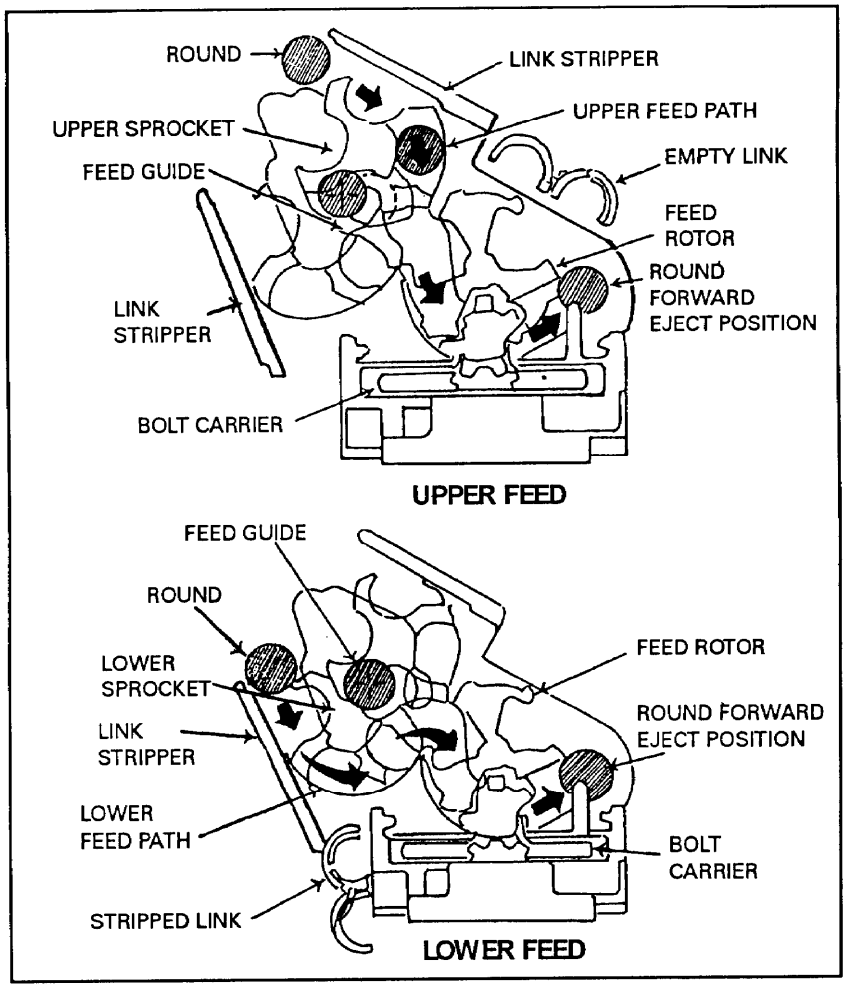


Figure 1-2. Dual-feed system.

b. The 25-mm automatic gun has eight cycles of function as related to the bolt position indicator (BPl) (Figure 1-3, page 1-7). The BPI acts as a guide providing the crew with the position of the bolt as the gun cycles through these functions. The eight cycles of function are as follows.

(1) *Sear/charge:* The bolt is 25 mm forward of its rearmost position. The master link is engaged by the sear. As a safety measure, the firing pin is not cocked. The position indicator arrow points to SEAR.

(2) *Feed:* Linked ammunition enters the 25-mm gun feeder. The feed sprockets strip the rounds from the links and move the rounds (one at a time)

to the round positioner. The round positioner pushes the round into the ready position. During the feed cycle, the bolt moves about 25 mm to the rear of sear position. The feeder rotor rotates one-third of a turn (the round positioner places a round into the rotor). The rotor places the round ink face of the bolt between the fixed T-slot extractors. The position indicator arrow points to FEED/DON'T REMOVE FEEDER. The absolute hang-fire protection is activated.

(3) *Chamber/Ram:* The rotor stops its counterclockwise movement once the round is positioned in the bolt face. The bolt, bolt carrier, and round move forward until the round is fully seated in the chamber. The position indicator arrow points to RAM.

(4) *Lock:* The bolt is in the full forward position. The bolt carrier is still moving forward. The cam pin moving in its channel causes the bolt to rotate counterclockwise, the lugs on the bolt engage the recesses in the breech making a solid lock. The position indicator arrow is pointing at the red zone prior to fire.

(5) *Fire:* Final rotation of the bolt pushes the firing pin tang off the firing pin pawl in the track assembly. At this time, the firing pin drives forward pushed by the firing pin spring. In the full forward position, the tip of the firing pin is protruding through the bolt face. The indicator arrow points to FIRE. Although the gun does not use gas in its operation, it uses about 12 mm of recoil to activate a mechanical interlock. If the breech does not recoil, the gun stops its cycle with the bolt still locked in the breech. The position indicator arrow will be pointing to MISFIRE.

(6) *Unlock:* The master link and slider start to the rear once past misfire position, the slider pulls the bolt carrier toward the rear, the cam pin causes the bolt to rotate clockwise and unlock from the recesses in the breech. The indicator arrow points to EXTRACT as the bolt unlocks.

(7) *Extract:* As the bolt moves to the rear, the fixed T-slot extractors remove the cartridge case from the chamber. The case remains positioned in the face of the bolt. The bolt continues to the rear until it locks in the sear position. The position indicator arrow is pointing to EXTRACT until this occurs, at which time it will point to SEAR.

(8) *Eject:* The expended case remains in the bolt face until the trigger is pulled to fire another round. Once the trigger is pulled, the bolt moves to feed position. The rotor rotates one-third of a turn to feed a round in the bolt face and sweeps the expended case into the feeder ejection chute. As the bolt moves forward to chamber the round, the eject arm on the bolt carrier pushes the expended case out of the receiver cartridge eject port.

Note: For more operator information, see TM 9-2350-252-10-2 or TM 9-2350-284-10-2.

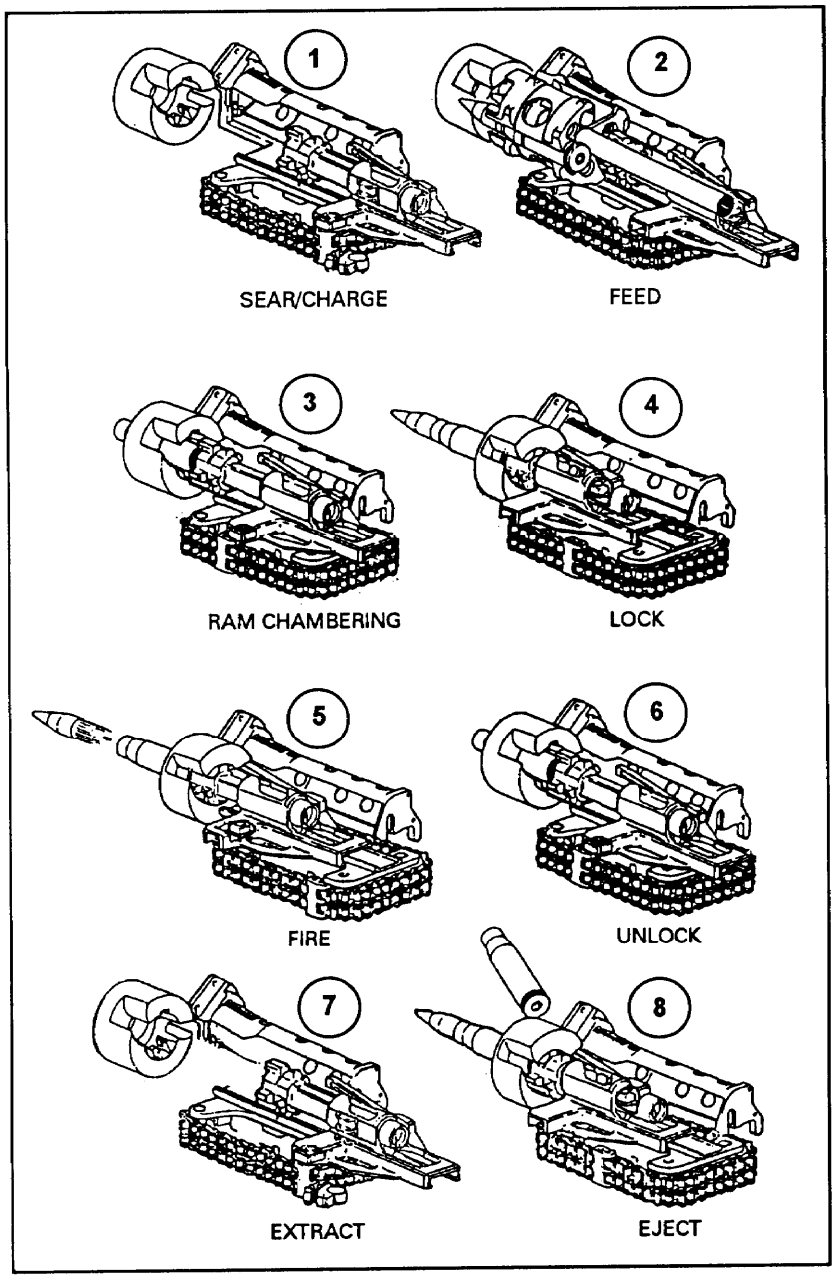


Figure 1-3. Eight cycles of function.

1-4. M240C 7.62-MM COAXIAL MACHINE GUN

The M240C 7.62-mm machine gun is used to engage dismounted infantry, crew-served weapons, antitank guided missile teams, and unarmored vehicles (Figure 1-4). The coax is a belt-fed, gas-operated, fully automatic weapon with a maximum effective range of 900 meters (tracer burnout). The coax is mounted on the right side of the turret, in front of the Bradley commander's position, and is easily accessible by opening the coax access doors. The coax has three rates of fire: cyclic, sustained, and rapid.

- Cyclic rate: 650 to 950 rounds per minute; barrel must be changed every minute.
- Sustained rate: 100 rounds per minute; 4 to 5 seconds between each burst; barrel must be changed every 10 minutes. (The gunner needs practice to achieve this rate.)
- Rapid rate: 200 rounds per minute; 2 to 3 seconds between each burst; barrel must be changed every 2 minutes. (The gunner needs practice to achieve this rate.)

DANGER

BEFORE FIRING THE COAXIAL MACHINE GUN, THE GUNNER INSPECTS THE SEALS ON THE ACCESS DOORS FOR SERVICEABILITY AND ENSURES THEY ARE CLOSED TO PREVENT POISONOUS GAS LEAKAGE IN THE TURRET.

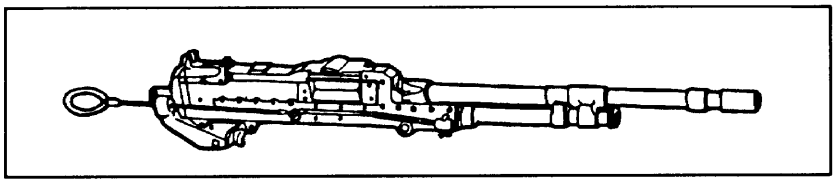


Figure 1-4. M240C 7.62-mm coaxial machinegun.

1-5. TUBE-LAUNCHED, OPTICALLY TRACKED, WIRE-GUIDED MISSILE SYSTEM

The TOW is a command-guided surface attack weapon that can destroy tanks, other armored vehicles, and helicopters. It may also be used against fortified bunkers, gun emplacements, and other protected positions. The TOW system destroys armored vehicles at ranges from 65 meters to 3,750 meters depending on the type of missile being used. While in a defilade position, the BC or guner locates, engages, and destroys enemy targets. The Bradley crew can reload the launcher without being exposed to hostile fire.

a. When the trigger is pulled, the TOW/TOW 2 subsystem starts a 1.5-second self-balance routine and the gyro that stabilizes the missile is activated. The crew must be aware of this delay when firing the TOW system to avoid accidental aborting of the missile. At launch, the CGE/DCGE sends a signal to ignite the missile launch motor. This propels the missile out of the launcher where the flight motor engages and takes over. When the missile enters the line of sight, infrared energy from the missile is received by the ISU. Components in the ISU then provide signals to the CGE/DCGE to position the missile with respect to the ISU line of sight. This operation continues until impact or abort. (Table 1-2.)

EVENTS	TIME (seconds)		RANGE (meters)		VELOCITY (FPS)	
	TOW/2/2A	TOW 2B	TOW/2/2A	TOW 2B	TOW/2/2A	TOW 2B
Trigger pull	-1.58	-1.58				
Launch sequence initiated	-1.48	-1.48				
Thermal beacon activated	-0.88	-0.88				
Fire signal enabled launcher fires launch motor squibs	-0.01	-0.01				
Missile clears launch tube	0.04	0.04				
Launch motor burn complete	0.04	0.04	1.12	1.12	181	173
Flight motor ignites	0.155	0.155	7.7	7.4		
Flight motorburn out	1.5 to 1.6	1.5 to 1.6	280-239	289-319	1025-1060	991-1005
3,000-meter target intercept	14.350	15.440	3,000	3,000	488-493	459
3,750-meter target intercept	20.01	21.400	3,750	3,750	387-396	367

Table 1-2. TOW missile launch and in-flight sequence.

b. The final operation of the TOW/TOW 2 subsystem is the automatic wire cut. This is completed by a timing sequence sent 23 seconds after launch. The wire may also be cut by using the TOW ABORT switch, by selecting another missile on the TOW control box, by the missile reaching the maximum range of the wire, by resetting the weapons control box, or by moving the magnification switch from HIGH to LOW while the missile is in flight.

c. The BC or gunner must lay the cross hairs on the center mass of the target, fire the rnissile, and keep the cross hairs on the target for the duration of the flight of the missile (for specific procedures, see TM 9-2350-252-10-2 or TM 9-2350-284-10-2). Once the BC relinquishes control to the gunner,

he cannot regain control of the missile until the sequence is completed. This prevents losing control of the missile.

d. Both ISU ballistic doors must be open when firing the TOW 2. (For more information, see TM 9-2350-252-10-2 or TM 9-2350-284-20-2.)

e. The vehicle must be level or on a slope less than 10 degrees to fire the TOW. For TOW muzzle clearance, there must be at least 18 inches of clearance at the end of the launcher. This is so that the wings and control surfaces will not be damaged when they extend after the missile clears the launcher. There must be at least 30 inches of clearance between the line of sight and any obstruction from 500 to 900 meters downrange. This is required because the missile may fly below the gunner's line of sight between 500 and 900 meters. A 30-inch line-of-sight clearance ensures a high chance that the missile will not hit the ground on its way to the target. There are conditions that may limit the firing and engagement capabilities of the TOW.

(1) *Limitations.* The following conditions or limitations should be considered before engaging targets.

(a) Firing over water. Firing across bodies of water wider than 1,100 meters can reduce the range of the TOW. Signals being sent through the command-link wires are shorted out when a large amount of wire is submerged in water. If the range is less than 1,100 meters, there is no effect on the missile's range. A TOW position should be as high above, and as far back from the water as the tactical situation will allow. The BC should analyze the sector as soon as the position is occupied to determine if water will affect the employment of the TOW. (See Chapter 2, paragraph 2-8g.)

(b) Firing over electrical wires. If the command-link wires contact a live high-voltage power line, personnel can be injured or control of the missile can be lost. The launcher electronics may also be damaged.

(c) Firing in windy conditions. Gusty, flanking, or quartering winds can move the missile around during flight, but as long as the cross hairs are kept on center-mass of the target, the weapon system will compemsate for wind effects.

(d) Firing through smoke and area fires. Smoke can obscure the line of sight and hide the target when using the optical sight. All TOW missiles have an xenon source for tracking by the daysight. The TOW 2, TOW 2A, and TOW 2B missiles also have a thermal beacon for tracking by the nightsight. This thermal beacon allows the gunner to track through most smoke obscuration, however, the target must be visible to maintain proper sight picture. A smooth tracking rate should be maintained as the target disappears into a smoke cloud so that the missile will still be on target or very close as the vehicle goes out the other side of the smoke cloud. A fire can burn through the command-link wire, causing loss of control of the missile. The gunner

should avoid firing through fire or over fires if there is the possibility that the wires will contact the fire before missile impact.

(2) *Precautions.* When firng the TOW, the crew uses the following precautions:

(a) Backblast precautions.

- The TOW weapon system has a backblast area that extends 75 meters to the rear of the vehicle in a 90-degree cone (Figure 1-5). This area is divided into a 50-meter danger zone and a 25-meter caution zone.
  - — Danger zone. All personnel and equipment are kept out of the backblast area. Serious injury or equipment damage could result from flying debris in the danger zone.
  - — Caution zone. THE CAUTION ZONE WILL BE KEPT CLEAR IN ALL TRAINING SITUATIONS.
- The Bradley must be positioned so that there are not dismounted soldiers, unarmored vehicles, or obstructions (such as walls, embankments, or large trees) in the missile backblast area.

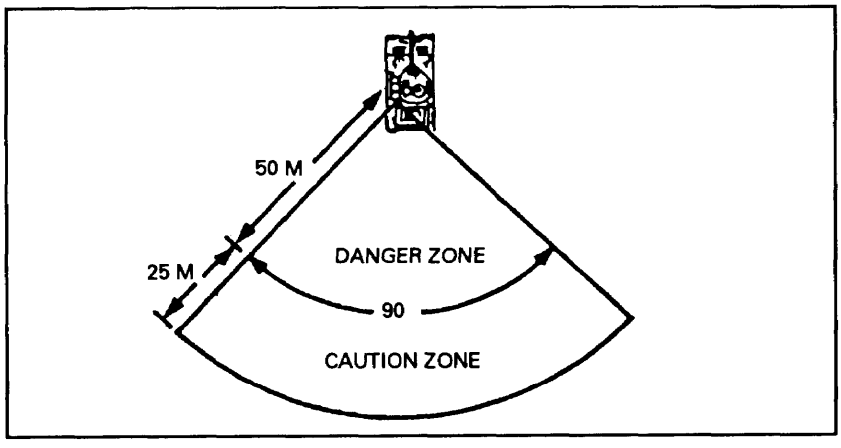


Figure 1-5. TOW backblast area.

(b) Firing precautions.

- A damaged encased missile, such as one with large dents or cracks in the launch container, should not be fired. Minor bending of the end rings is not serious and the missile can be fired without danger.
- The humidity indicator color should be blue. If the color is pink, the missile may be degraded. In a training environment, the missile should be returned to the supply point. During combat, the missiles may be fired.

(c) Other precautions.

- The electrolyte in the emergency battery assembly is highly corrosive and can cause serious injury (especially to the eyes) if the battery is damaged and the electrolyte leaks out.
- All duds or defective missiles should be reported to an explosive ordnance disposal team.
- Duds or defective missiles are not mvved nor handled other than to remove a misfire from the launcher and place it a safe distance from the vehicle.
- The command-link wires are strong. Soldiers must be careful moving through areas where missiles have been fired.
- In training, a 30-minute waiting period is required before a missile misfire can be removed from the launcher.

1-6. M231 5.56-MM FIRING PORT WEAPON

The M231 5.56-mm firing port weapon (FPW) is used to engage dismounted infantry, crew-served weapons, and ATGM teams; and to suppress suspected close-in enemy positions (Figure 1-6). The maximum effective range is 300 meters (tracer burnout). There are six firing port mounts on the M2 models—two on each side and two in the ramp. On the M2A2 and M2A2ODS model, there are two FPWs in the ramp.

DANGER

BEFORE FIRING THE FPW, THE SOLDIER MUST CHECK THE EXHAUST HOSE AND EXHAUST FANS FOR SERVICEABILITY AND OPERATION TO EXHAUST POISONOUS GASES FROM THE TROOP COMPARTMENT.

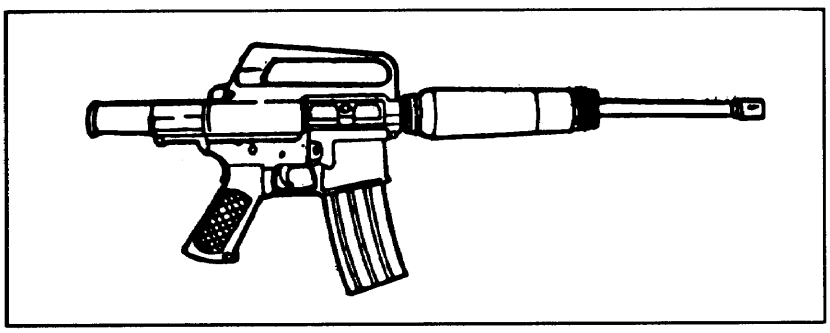


Figure 1-6. M231 5.56-mm firing port weapon.

1-7. M257 SMOKE GRENADE LAUNCHER

There are two 4-tube electrically fired smoke grenade launchers—one on each side of the 25-mm gun (Figure 1-7). Each launcher fires four smoke grenades simultaneously. Upon activation, the smoke grenades create enough smoke to screen the Bradley within three seconds. The launchers cannot be fired independently. The BC or gunner fires the launchers from inside the turret.

DANGER

ELECTRICAL TROUBLE COULD CAUSE SMOKE GRENADES TO FIRE AND KILL OR INJURE SOLDIERS. BEFORE LOADING SMOKE GRENADES, THE GUNNER ENSURES THE TURRET POWER AND GRENADE LAUNCHER SWITCHES ARE OFF.

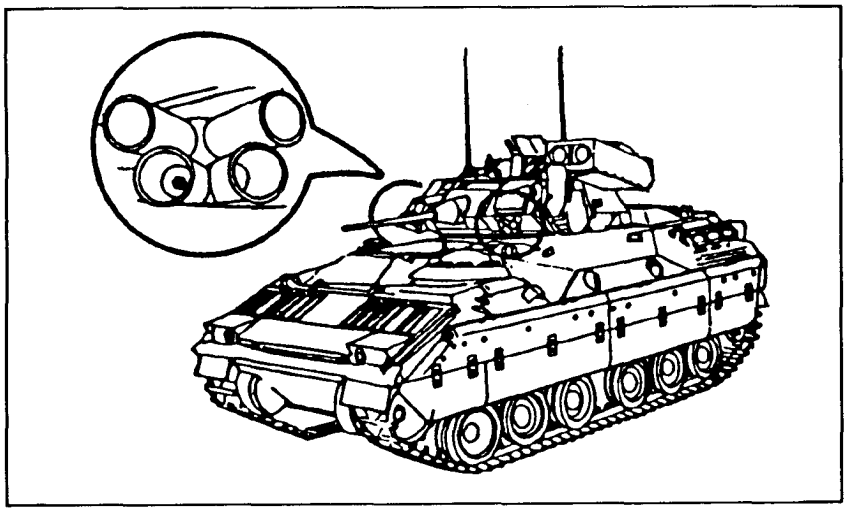


Figure 1-7. M257 smoke grenade launchers.

Section III
AMMUNITION CAPABILITIES

Each of the Bradley's five organic weapon systems have ammunition specifically designed to support the vehicle's missions. As mission requirements and threat capabilities change, these munitions will improve to counter the threat. Along with service ammunition the 25-mm has training ammunition that replicates service ammunition to provide more realistic training.

1-8. M242 25-MM AUTOMATIC GUN AMMUNITION

There are six basic rounds used with the 25-mm gun M791, M919, M792, M910, M910A1, and M793.

DANGER

BEFORE FIRING ANY DISCARDING SABOT AMMUNITION, SAFETY OF THE SOLDIERS ON THE GROUND MUST BE CONSIDERED. SOLDIERS COULD BE KILLED OR INJURED.

a. M791 Armor-Piercing Spin-Stabilized Discarding Sabot With Tracer. The APDS-T (Figure 1-8) penetrates lightly armored vehicles self-propelled artillery, and aerial targets (helicopters and slow-moving fixed-wing aircraft).

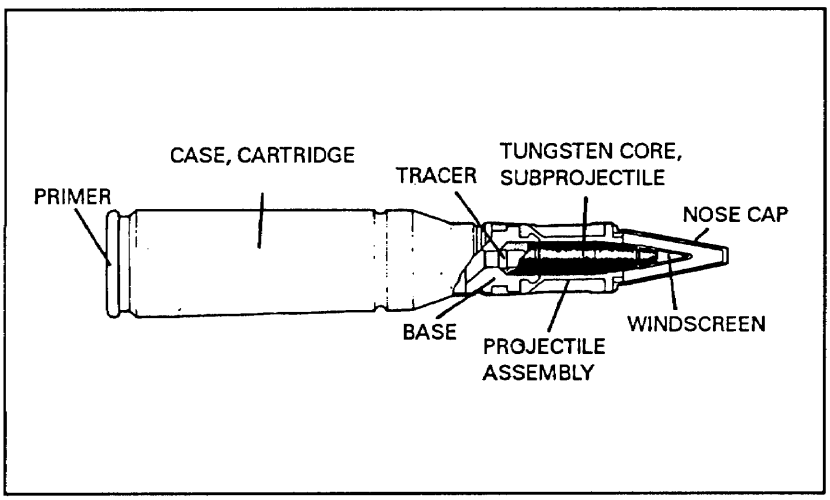


Figure 1-8. M791 APDS-T.

(1) The APDS-T is a fixed-type, percussion primed round. It consists of a sabot encapsulated projectile body crimped to a steel cartridge case. The projectile body consists of a solid tungsten alloy penetrator pressed-on aluminum windscreen, pressed-in tracer pellets, molded discarding-type nylon sabot, staked aluminum base, and welded or pressed-on nylon nose cap. The projectile sabot and nose cap are black with white markings.

(2) Gases produced by the burning propellant propel the projectile from the gun at 1,345 meters per second (plus or minus 20 meters per second) and ignite the tracer. Setback, centrifugal and aerodynamic forces cause the sabot and nose cap to discard on leaving the gun barrel. The discarding sabot leaves

the barrel at a 30-degree angle on both sides of the gun-target line for 200 meters. The tungsten penetrator (core) is spin-stabilized and penetrates the target solely by kinetic energy.

(3) The maximum effiective range is 2,000 meters. This is based on tracer burnout. However, in some environments, the ability to observe and adjust rounds extends well beyond tracer burnout, since the impact of the rounds can be observed. Although tracer burnout is 2,000 meters, APDS-T ammunition maintains its accuracy out to 2,200 meters. As range increases, the APDS-T penetration decreases, especially when these vehicles have applique armor (additional armor layer).

b. **M919 Armor-Piercing, Fin-Stabilized Discarding Sabot With Tracer.** The APFSDS-T (Figure 1-9) penetrates lightly armored vehicles, self-propelled artillery, and aerial targets (helicopters and slow-moving fixed-wing aircraft).

DANGER

M919 APFSDS-T AMMUNITION IS USED IN COMBAT ONLY IF THIS AMMUNITION IS DAMAGED, THE HANDLING PROCEDURES IN TM 9-2350-252-10-1 OR TM 9-2350-284-10-1 MUST BE USED.

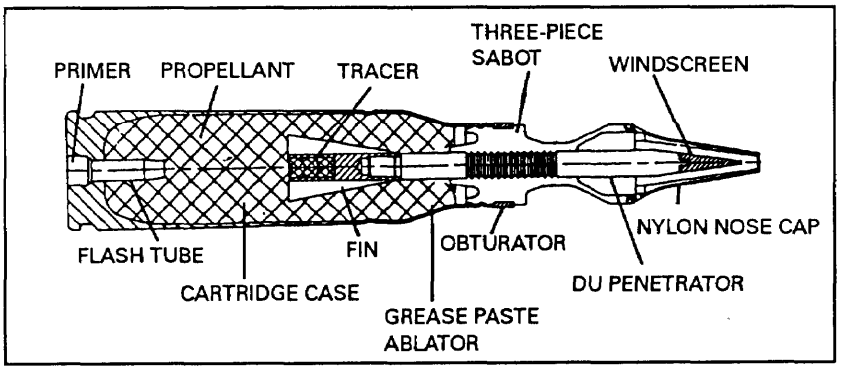


Figure 1-9. M919 APFSDS-T.

(1) The APFSDS-T is a fixed-type, percussion primed round. It consists of a sabot encapsulated projectile crimped to a steel cartridge case. The projectile body consists of a depleted uranium penetrator; screw-on fins with pressed-in tracer pellets; a white paste ablator inside the case (reduces barrel wear); three-piece segmented, discarding aluminum sabot; and snapped-on polyethylene nose cap. The projectile sabot and nose-cap are black with white obturator.

(2) Basic operation of this kinetic energy round is the same as APDS-T (M791) with an increase in velocity to 1,385 meters per second and increased effective range, penetration capabilities as well as tracer burn time.

c. **M792 High-Explosive Incendiary With Tracer.** The HEI-T (Figure 1-10) is used to destroy unarmored vehicles and helicopters and to suppress antiarmor guided missile positions, crew-served weapons, dismounted infantry, and likely enemy positions past coax range out to a distance of 3,000 meters.

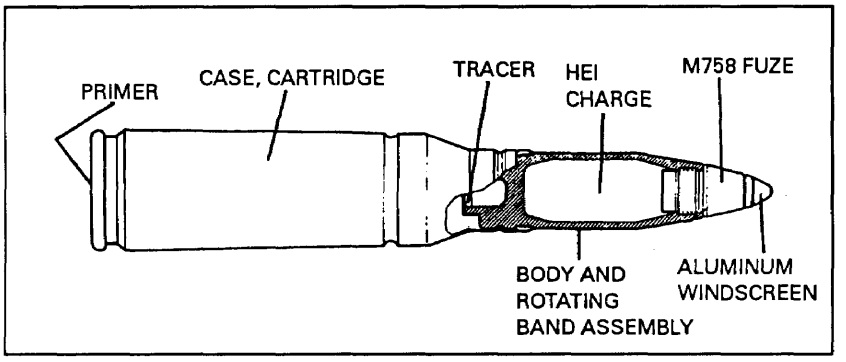


Figure 1-10. M792 HEI-T.

(1) The HEI-T cartridge is a fixed-type, percussion primed round (Figure 1-11). The cartridge consists of an HEI-filled, one-piece projectile body, crimped to a steel cartridge case. The projectile body consists of a hollow-steel body, M758 fuze, 32 grams of an HEI-mix, and pressed-in tracer. The projectile is yellow to orange with a red band, with black markings and a gold tip.

(2) Gases produced by the burning propellant propel the projectile from the gun at 1,100 meters per second (plus or minus 20 meters per second). On impact, the fuze (M758) functions and the HEI filler detonates, projecting steel fragments (body and rotating band assembly) and incendiary filler over a 5-meter radius.

(3) The maximum effective range for HEI-T is 3,000 meters. This is based on the following factors:

(a) The round self-detonates at 3,000 meters by means of a mechanical fuze (M758).

(b) Tracer burnout is 2,000 meters, but the round can be sensed beyond this range by observing the impact of the rounds.

(c) Though accuracy decreases beyond 1,600 meters, the 5-meter bursting radius and rate of fire allow both point and area targets to be engaged out to 3,000 meters.

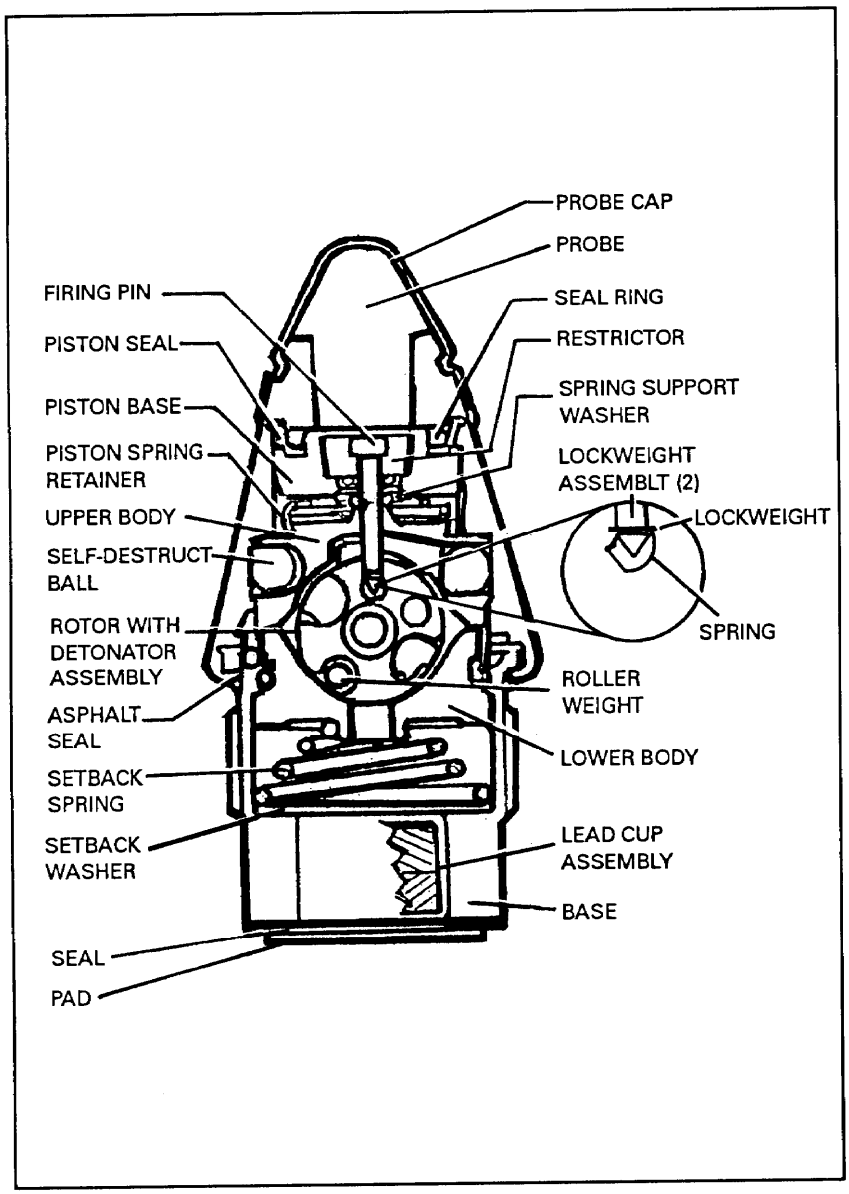


Figure 1-11. M758 HEI-T fuze.

(4) The M792 HEI-T projectile has three types of detonation: direct impact, grazing impact, and self-destruct. (Figure 1-12, page 1-18.)

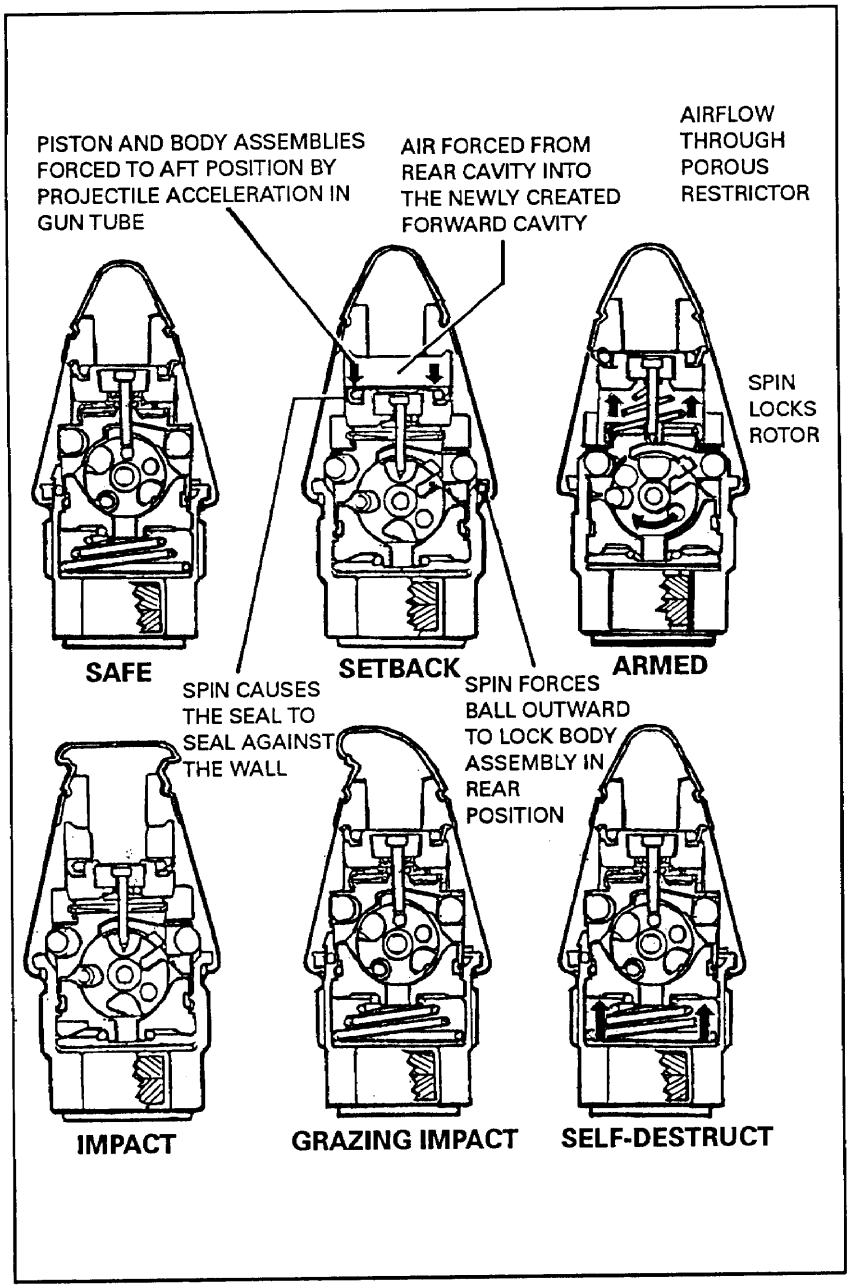


Figure 1-12. M758 operational sequence.

(a) A direct-impact detonation occurs when the projectile strikes the target, crushing the probe cap. As the probe cap is crushed the probe moves rearward, thrusting the firing pin into the detonator, detonating the HEI mixture.

(b) On grazing impact, the projectile may detonate one of two ways. If impact is sufficient enough a direct-impact detonation occurs. However, if impact is insufficient, spin decay (loss of forward velocity) allows the setback spring to overcome centrifugal force and force the body assembly forward, thrusting the detonator into the firing pin.

(c) Self-destruct generally occurs at 3,000 meters. However, headwinds and tail winds, depending on their severity, will affect self-destruct. Self-destruct occurs in the same manner as a grazing impact (spin decay). However, the projectile does not need to strike a target.

d. **M910 Target Practice Discarding Sabot With Tracer.** The TPDS-T (Figure 1-13) allows units to practice sabot engagements on limited distance ranges. Instead of the 14,572-meter maximum range for the APDS-T, the maximum range is 8,000 meters.

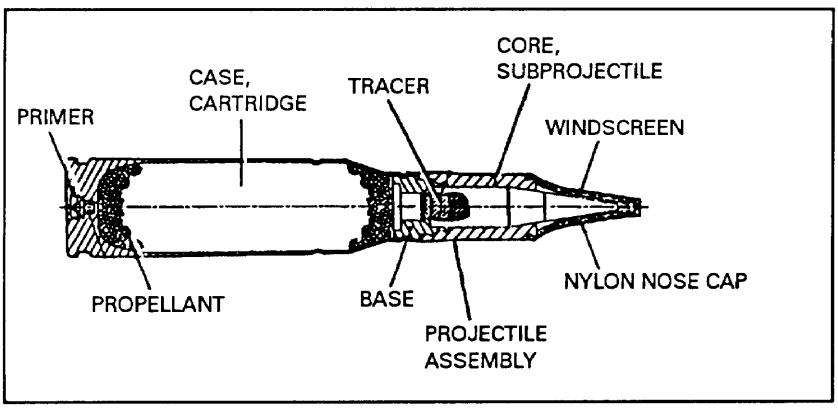


Figure 1-13. M910 TPDS-T.

(1) The TPDS-T cartridge is a freed-type, percussion primed round. It consists of an encapsulated projectile body crimped to a steel cartridge case. The projectile body is steel. It has a pressed-on aluminum windshield, pressed-in tracer pellets, molded discarding-type nylon sabot, staked aluminum base, and pressed-on polyethylene nose cap. The projectile sabot and nose cap are blue with white markings.

(2) The TPDS-T cartridge trajectory is ballistically matched to plus or minus 1 mil of the APDS-T to a range of 2,000 meters with an increase in muzzle velocity (200 meters per second).

(3) Tracer burnout is 2,000 meters. This round is used to replicate APDS-T.

e. **M910A1 Target Practice Discarding Sabot With Tracer.** TPDS-T is used to replicate M919 APFSDS-T. The TPDS-T (Figure 1-14) allows units to practice sabot engagements on limited distance ranges. The maximum range is 8,000 meters.

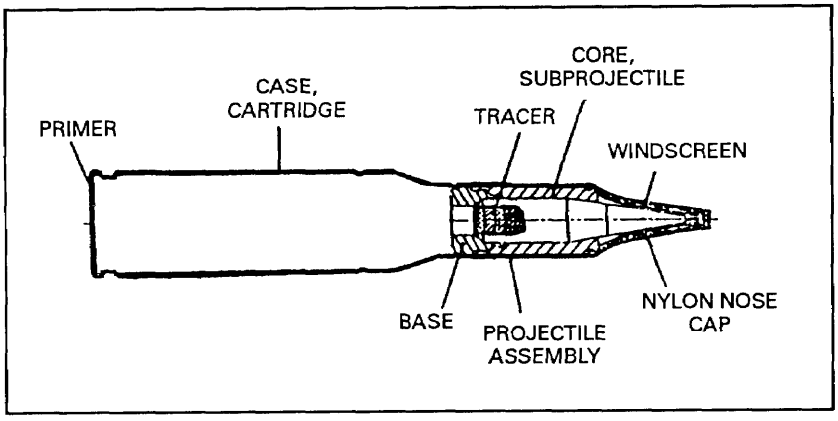


Figure 1-14. M910A1 TPDS-T.

(1) The TPDS-T cartridge is a freed-type, percussion primed round. It consists of an encapsulated projectile body crimped to a steel cartridge case. The projectile body is steel. It has a pressed-on aluminum windshield, pressed-in tracer pellets, molded discarding-type nylon sabot, staked aluminum base, and pressed-on polyethylene nose cap. The projectile sabot and nose cap are blue with white markings.

(2) The TPDS-T cartridge trajectory is ballistically matched to plus or minus 1 mil of the APFSDS-T to a range of 2,000 meters.

(3) Tracer burnout is 2,500 meters.

f. **M793 Target Practice With Tracer.** The TP-T cartridge (Figure 1-15) is a fixed-type, percussion primed training round that is used to replicate the HEI-T round. The projectile consists of a hollow steel body and is blue with white markings.

(1) It is ballistically matched to the HEI-T round. The maximum effective range for point targets is 1,600 meters; area targets 3,000 meters.

(2) The tracer is visible out to 2,000 meters, minimum; however, accuracy is greatly reduced if engaging point targets. Training with the round beyond tracer burnout should only be done to simulate HEI-T area engagements and only as long as the impact of the round is visible.

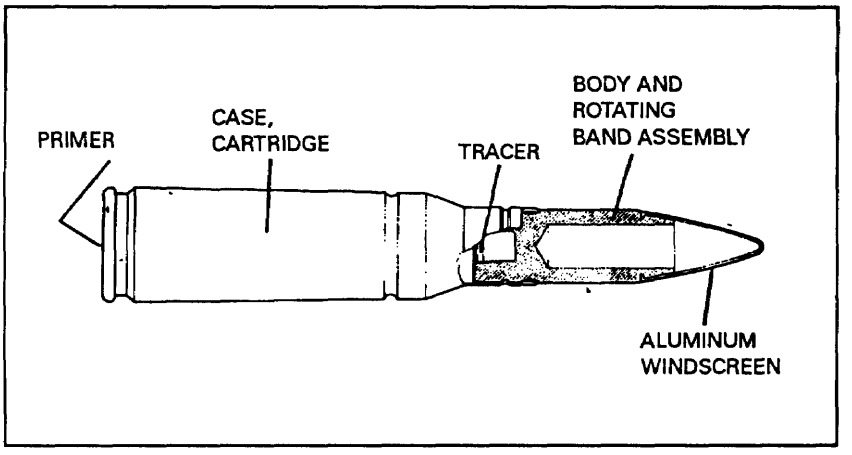


Figure 1-15. M793 TP-T.

A quick reference comparison of all six types of 25-mm gun ammunition is in Table 1-3.

CHARACTERISTICS	M791 APDS-T	M919 APFSDS-T	M792 HEI-T	M910 TPDS-T	M910A1* TPDST	M793 TP-T
Muzzle Velocity	MPS 1345	MPS 1385	MPS 1100	MPS 1525	MPS* 1550	MPS 1100
Time of Flight 1,000 Meters 1,500 Meters 2,000 Meters 2,500 Meters	Seconds 0.8 1.2 1.7 2.2	Seconds 0.8 1.2 1.6 2.1	Seconds 1.2 2.2 3.6 5.3	Seconds 0.7 1.2 1.8 2.5	Seconds* 0.7 1.2 1.7 2.4	Seconds 1.2 2.2 3.5 5.2
Cartridge Weight	Grams 458	Grams 454	Grams 501	Grams 420	Grams* 420	Grams 501
Projectile Weight	Grams 134	Grams 96	Grams 185	Grams 95	Grams 95	Grams 182
Tracer Burn Time	Seconds 1.4	Seconds Classified	Seconds >3.5	Seconds >1.8	Seconds* >2.4	Seconds > 3.5
Bursting Radius/ Arming Distance	NA	NA	5 Meters 10 to 200 Meters	NA	NA	NA
Maximum Effective Range	Meters 2,000	Meters Classified	Meters 3,000	Meters 2,000	Meters* 2,500	Meters 2,000
Tracer Burn Range	Meters >2,000	Meters Classified	Meters >2,000	Meters >2,000	Meters* >2,500	Meters >2,000

*These specifications are estimated pending final testing.

Table 1-3. 25-mm gun ammunition comparison.

1-9. M240C 7.62-MM COAXIAL MACHINE GUN AMMUNITION

The preferred ammunition for the coax is a four-ball-and-one-tracer mix (A141). There are other variations of 7.62-mm ammunition available; however, the four-and-one mix allows the Bradley commander and gunner to use the tracer-on-target method of adjusting fire to achieve target kill or suppression. (For more operator information, see TM 9-1005-3 13-10.)

1-10. TOW AMMUNITION

The development and improvements of the TOW missile family follow the developments and improvements of tank armor. The five primary missiles of the TOW family are each an improvement of the previous missile (Table 1-4, page 1-27). Penetration, maximum range, use during adverse firing conditions and against jammers, and attack profiles are the areas of improvement.

a. The basic TOW (BGM-71A) has a range of 3,000 meters and has a 5-inch high-explosive, shaped-charge warhead. The basic TOW's maximum range was improved to 3,750 meters (BGM-71A1). (Figure 1-16.)

b. The improved TOW (BGM-7lC) has an improved 5-inch warhead with an extensible probe to provide detonation at a greater standoff distance from the target and greater penetration effectiveness. The TOW has a maximum effective range of 3,750 meters. (Figure 1-16.)

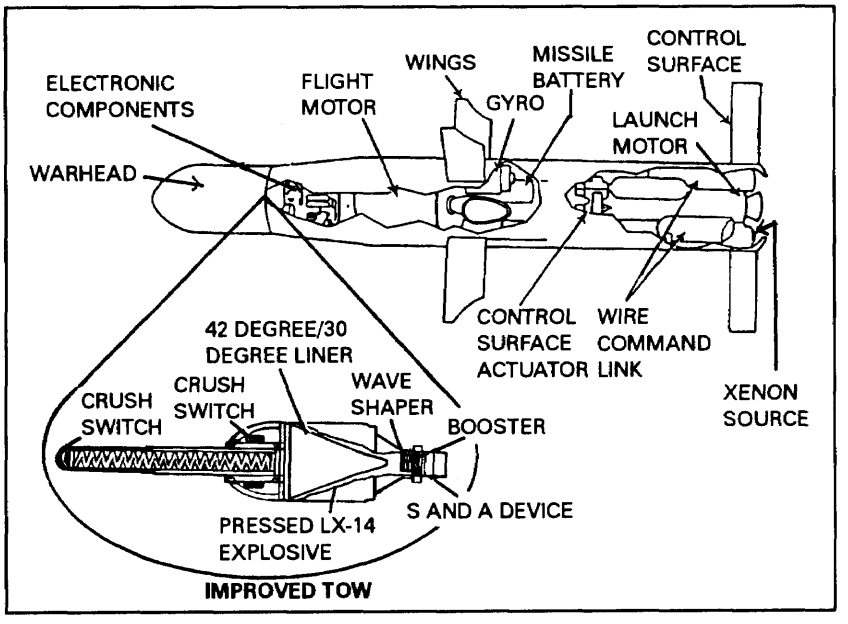


Figure 1-16. Basic and improved TOW missile.

c. The TOW 2 (BGM-71D) has a 6-inch full-caliber warhead with an extensible probe. In addition to the xenon beacon on the basic and ITOWs, TOW 2 has a thermal beacon. The thermal beacon improves missile performance when firing through battlefield smoke and obscurants and against missile counter measures devices (jammers). The thermal beacon provides tracking link compatibility with the electro-optical infrared nightsight, which is part of the TOW 2 subsystem TOW 2 also has a more powerful flight motor than previous types. The maximum range is 3,750 meters. (Figure 1-17, page 1-24.)

Note: TOW 2 missiles and above can be fired from the basic Bradleys; however, the missiIe will have a reduced probability of hit.

d. The TOW 2A (BGM-71E) has the same characteristics as the TOW 2. However, the extensible probe has been equipped with a precursor charge. The precursor charge discharges reactive armor before main charge impact. (Figure 1-17, page 1-24.)

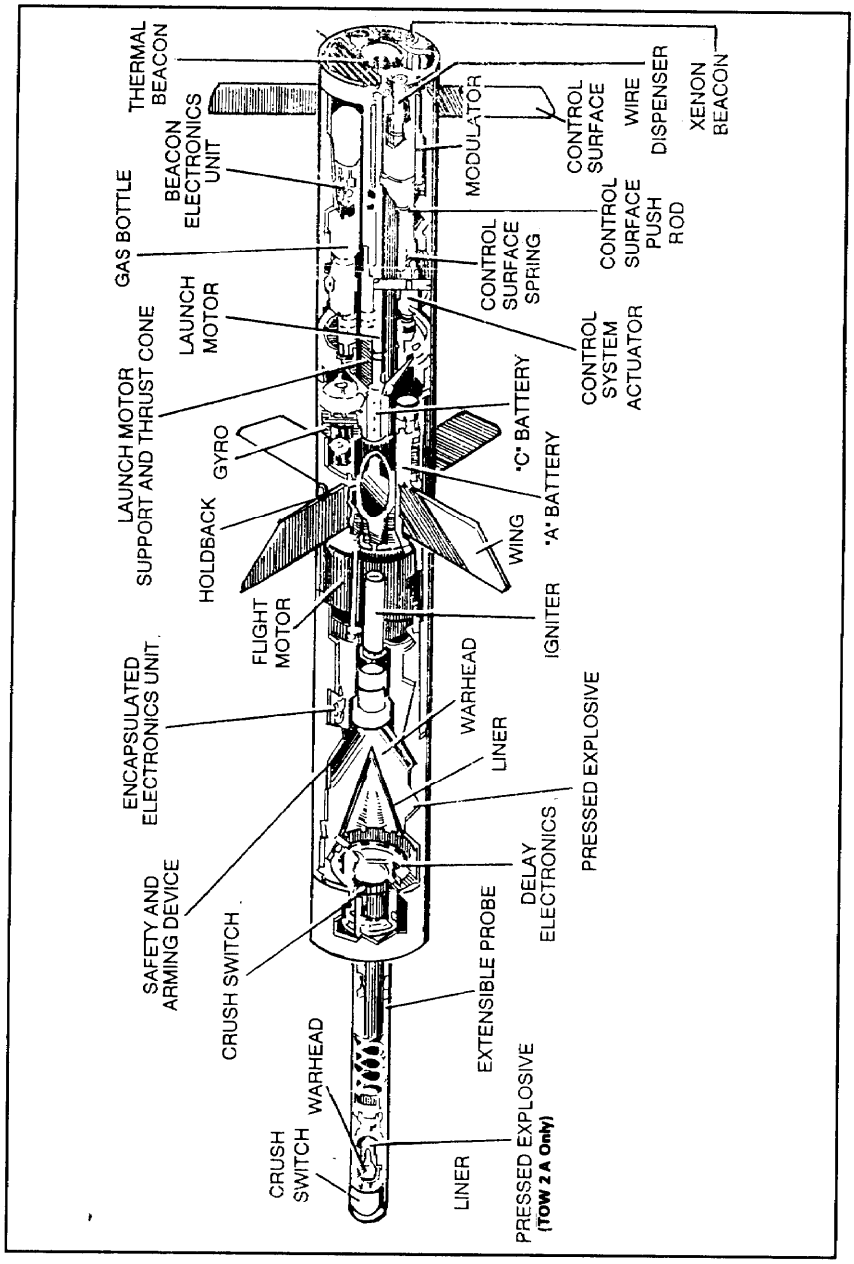


Figure 1-17. TOW 2 and TOW 2A missile.

e. The TOW 2B(BGM-71F) is a top attack missile (Figure 1-18, page 1-26.) The missile is programmed to fly about 2.25 meters above the gunner's line of sight (the gunner aims center mass of the target). The missile detects, recognizes, and identifies the target by magnetic signature and optical (laser) profile. However, the missile's sensors cannot differentiate between friendly or enemy nor destroyed or intact vehicles. This requires crews to ensure that their line of sight is clear of friendly and destroyed vehicles to prevent premature detonation of the warheads. TOW 2B is equipped with two 5-inch warheads that when detonated, explosively form two high-density tantalum penetrators.

DANGER

TOW 2B MISSILES SHOULD NOT BE FIRED OVER FRIENDLY OR DESTROYED VEHICLES.

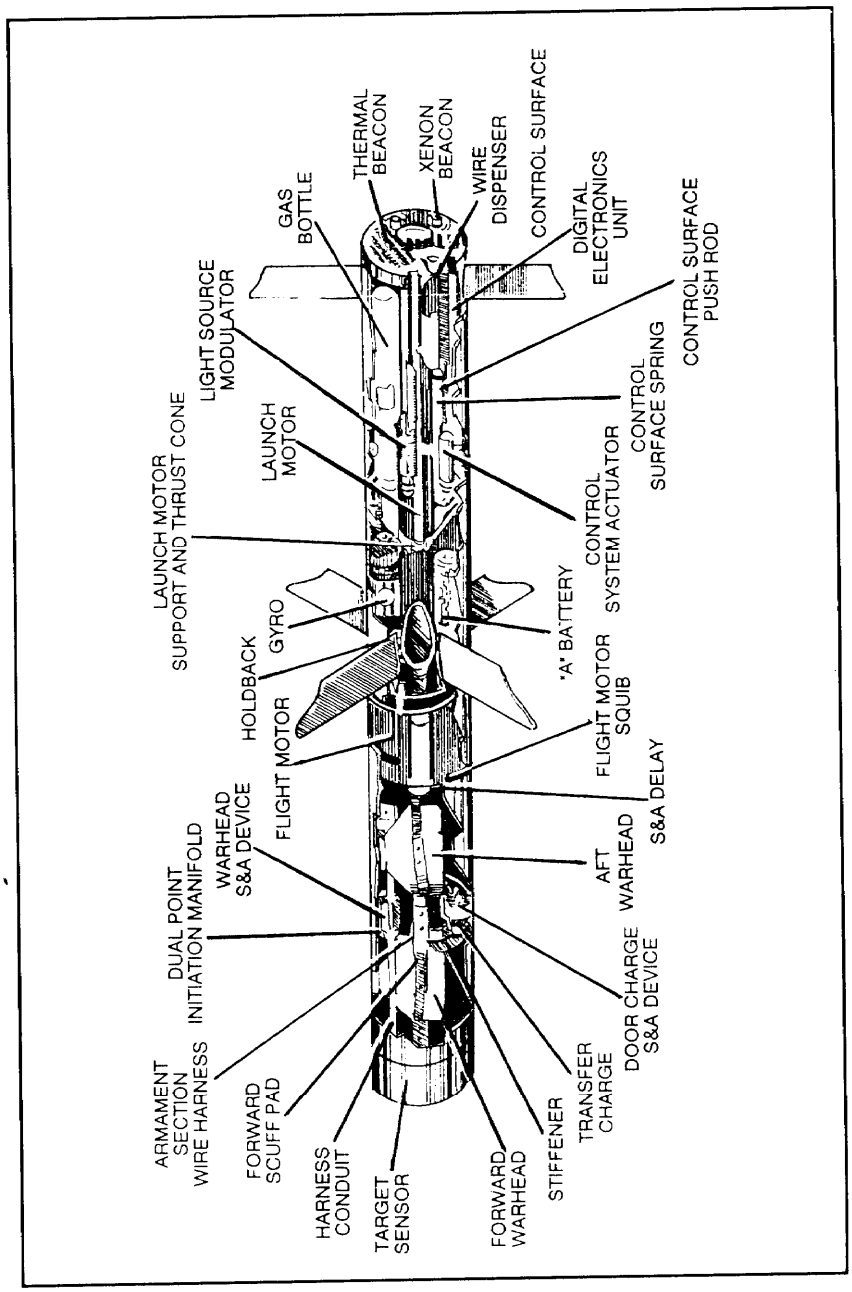


Figure 1-18. TOW 2B missile.

MISSILE CHARACTERISTICS	TOW (BGM-71A/A1)	ITOW (BGM-71C)	TOW 2 (BGM-71D)	TOW 2A (BGM-71E)	TOW 2B (BGM-71F)
Missile Weight (out of tube)	40.7 Lbs	41.9 Lbs	47.2 Lbs	49.9 Lbs	49.8 Lbs
Missile Weight (in tube)	54.8 Lbs	56.0 Lbs	61.3 Lbs	64.0 Lbs	63.9 Lbs
Missile Length (out of tube)	45.8 In	45.6 In	46.2 In	46.1 In	46.2 In
Missile Tube Diameter	8.6 In	8.6 In	8.6 In	8.6 In	8.6 In
Maximum Range (meters)	3,000/3,750	3,750	3,750	3,750	3,750
Reliability Operating Temperature	95.4 -25 to +125F	95.4 -25 to +125F	95.4 -25 to +125F	95.4 -25 to +125F	95.4 -25 to +125F
Vehicle Compatibility	All Variants	All Variants	*All Variants	*All Variants	*All Variants
Warhead Size	5-inch HE	5-inch HE	6-inch HE	6-inch HE	Two 5-inch explosively formed peneteators
Arming Distance Minimum	30 meters	30 meters	30 meters	30 meters	110 meters
Optimum	NA	NA	NA	NA	150 meters
Maximum	65 meters	65 meters	65 meters	65 meters	200 meters

*TOW 2 missiles and above can be fired from the basic TOW launcher; however, the missile will have a reduced probability of hit.

Table 1-4. TOW missile characteristics.

1-11. M231 5.56-MM FPW (M2, ONLY) AMMUNITION

The ammunition for the FPW is M196 tracer. Because of the rapid rate of free, this ammunition allows the crew members to use the tracer-on-target method of adjusting fire to achieve target suppression. When training, the crew uses the M200 blank round along with the M22 blank firing device. (For more operator information, see TM 9-1005-309-10.)

Note: M193, M855 ball, or M856 ammunition is not compatible with the firing port weapon. (This ammunition is for the M249 or M16A2 weapons.)

1-12. M257 SMOKE GRENADE LAUNCHER AMMUNITION

M257 smoke grenade launcher frees the L8A1/A3 red phosphorus smoke grenade and the M76 infrared screening grenade.

a. L8A1/A3 red phosphorus smoke grenades are filled with a red phosphorus and butyl rubber mix (Figure 1-19). The burst is in the direction in which the turret is pointed. The bursting radius is a 105-degree fan, 10 meters high and 20 to 50 meters to the front. The smoke cloud lasts from 1 to 3 minutes,

depending on wind speed and other weather conditions. (For more operator information, see TM 9-2350-252-10-2 or TM 9-2350-284-10-2.)

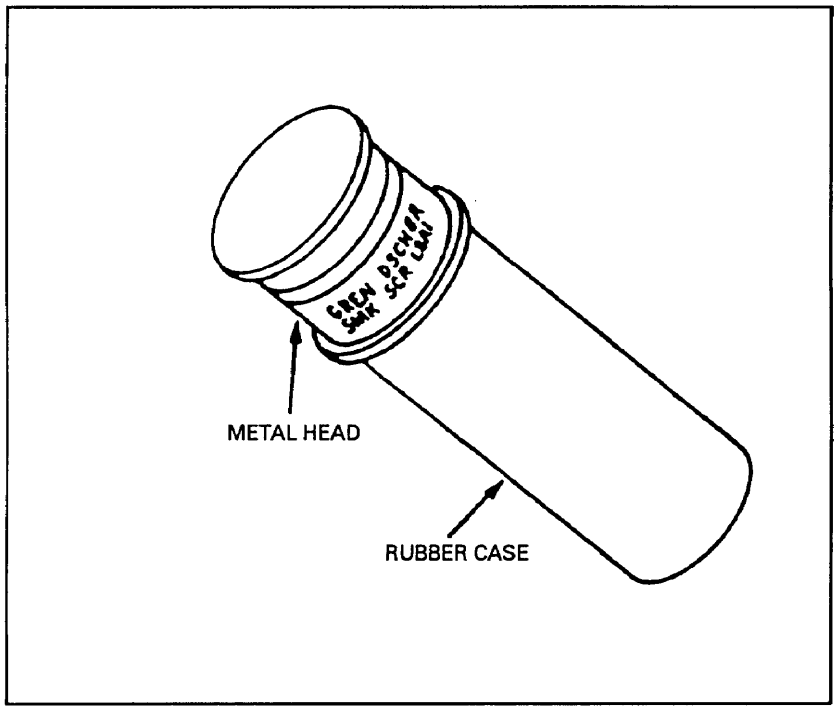


Figure 1-19. L8A1/A3 red phosphorus smoke grenade.

b. The M76 infrared screening grenade is 9.5 inches by 2.5 inches and weighs about 4.5 pounds. (Figure 1-20.) When launched, the grenades travel about 30 meters from the vehicle and explode at a height of 2.5 meters. The grenade uses a central burster to explosively disseminate 3 pounds of brass powder. The smoke cloud covers 60 meters by 7 meters by 4 meters. The smoke cloud obscures the long-wave infrared viewer for about 30 to 60 seconds depending on wind speed and other weather conditions.

CAUTION

When using the M76 grenade, day and thermal visibility will be obscured for the duration of the cloud.

DANGER

TO PREVENT DEATH OR INJURIES, THE TURRET POWER AND SMOKE GRENADE LAUNCHER SWITCHES MUST BE *OFF* BEFORE SMOKE GRENADES ARE LOADED. WHILE LOADING, NO PART OF THE LOADER'S BODY SHOULD BE IN FRONT OF SMOKE GRENADE LAUNCHERS. ALL SOLDIERS MUST BE CLEAR OF FIRING LINES WHEN LOADING GRENADES. IF A MISFIRE OCCURS, THE VEHICLE MUST BE MOVED AT LEAST 125 METERS FROM OTHER VEHICLES, BUILDINGS, PERSONNEL, AND EQUIPMENT AFTER REMOVING MISFIRED GRENADES, THE SMOKE GRENADES ARE MOVED TO A WELL-MARKED SPOT 200 METERS FROM VEHICLES, BUILDINGS, PERSONNEL, OR EQUIPMENT. (See TM 9-2350 -252-10-2 and TM 9-2350-284-10-2.)

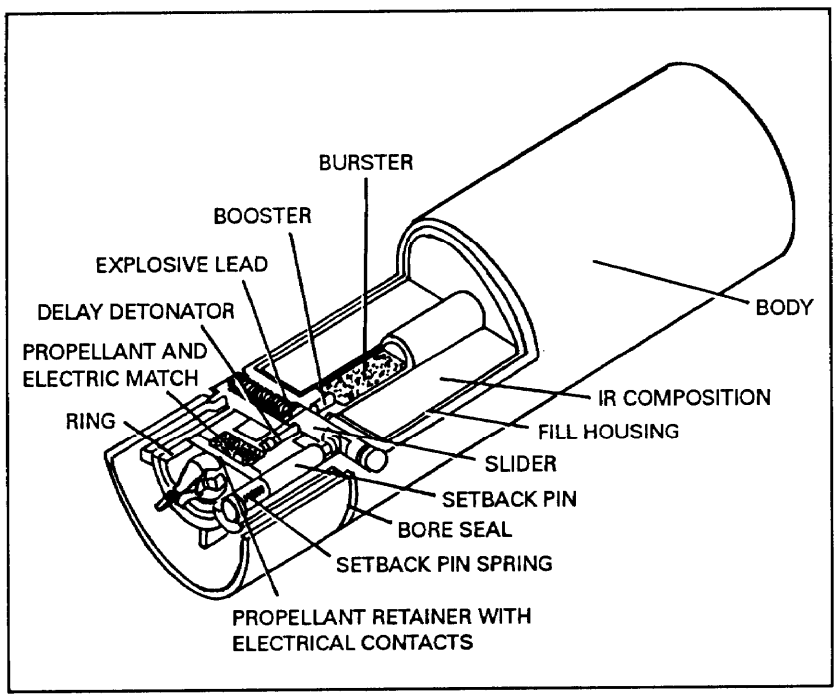


Figure 1-20. M76 infrared screening grenade.

CHAPTER 2

ENGAGEMENT PROCESS

On future battlefields, Bradley crews must rapidly engage multiple targets, while operating within irregular battle lines. Depending on the tacticaI situation and the area of operations, enemy targets maybe intermingled with friendly coalition and neutral vehicles. Survival depends on the crew's ability to detect, locate, identify, and rapidly engage and destroy the enemy. Fire commands are the language used to organize and execute the engagement process to kill the enemy and continue the mission.

Bradley crews must be proficient in the techniques and procedures ofthe acquisition process, engagement decision, engagement execution and fire commands to successfully engage the enemy. Figure 2-1 shows the relationship of the steps in each process to each other.

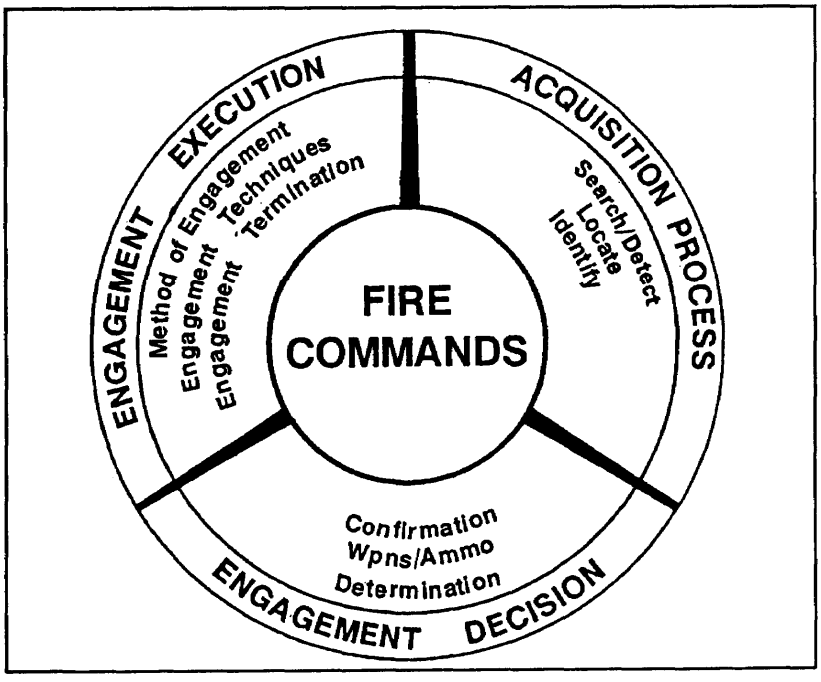


Figure 2-1. Engagement process.

Section I
ACQUISITION PROCESS

The acquisition process is a series of progressive and interdependent steps (or actions): detection, location, identification. Effective target acquisition for a Bradley crew requires a constant combined effort from each crew member and fire team member.

2-1. TARGET SEARCH AND DETECTION

Crew and squad search (observation) is the act of carefully watching designated areas. Sectors of observation are assigned by the BC to each crew member and fire team member for target acquisition. If the Bradley is in a hide position and the fire team does not dismount the BC positions an observer (or two) forward of the vehicle (Figure 2-2). The observers will be equipped with optics (binoculars PVS-7s) and communication equipment. Soldiers use the naked eye and vehicle optics to search or scan their assigned sectors of observation. Detection is the discovery of any target such as personnel, vehicles, equipment, or objects of potential military significance on the battlefield. Target detection occurs during crew and squad search as a direct result of observation.

Figure 2-2. Dismounted observer.

a. **Crew and Squad Target Search Techniques.** Crew and squad target search techniques include ground and air search.

(1) *Ground search techniques.* Crew and squad members scan their sectors at all times to detect targets or possible target locations. Crew members can quickly locate targets by using ground search techniques: rapid scan, slow (50-meter) scan detailed search and off-center vision method. All four methods may be used by all crew and squad members, using the naked eye, binoculars, or vehicle optics, during good and limited visibility conditions.

(a) Rapid scan. The rapid-scan method is used to quickly detect obvious signs of enemy activity (Figure 2-3). It is usually the first method used, whether moving or not. The BC may use binoculars, naked eye, or PVS-7. The gunner may use the ISU (in day or thermal mode) in low magnification, the unity window, or the naked eye.

- Crew and squad members start scanning in the center of the sector and rapidly scan from the nearest to the the farthest point.
- Then, they orient left or right and conduct a rapid scan, near to far. This sweep must overlap the center of the previously scanned sector.
- Once one side of center is completed, they scan the remaining side in the same manner.

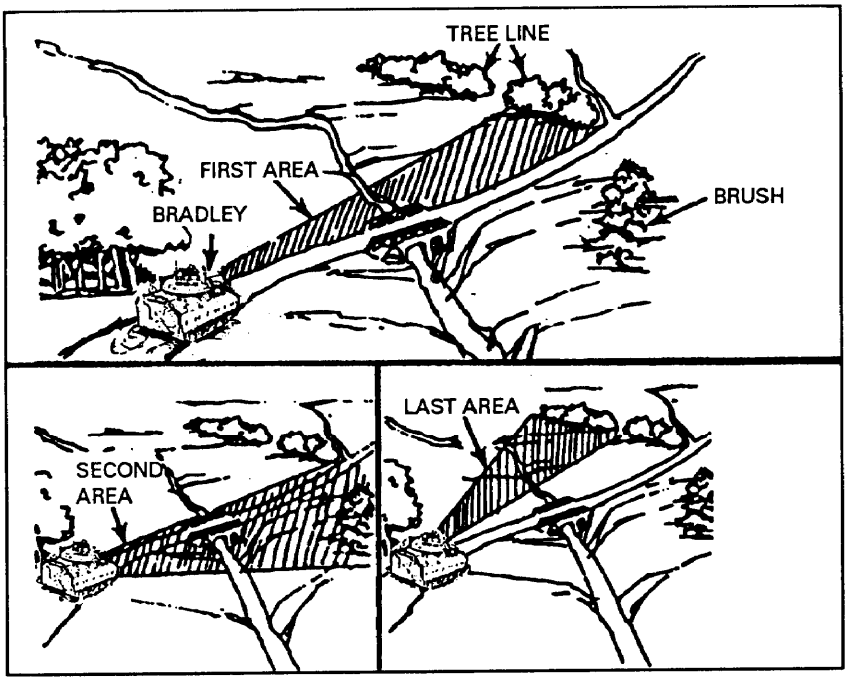


Figure 2-3. Rapid scan.

(b) Slow (50-meter) scan. If no targets are detected in the rapid scan, crew and squad members conduct a more deliberate scan of the terrain by using the ISU (day or thermal mode) or binoculars (Figure 2-4, page 2-4). The slow scan is best used by the BC or gunner when in a defensive position or from a short halt.

- The BC or gunner pausing at short intervals to give his eyes time to focus, searches a strip of the target area 50 meters deep from right to left.
- Then, he searches a strip farther out from left to right, overlapping the first area scanned.
- He continues this method until the entire assigned sector has been searched.
- When a suspicious area or possible target signature is detected, he stops and searches the immediate area thoroughly, using the detailed search method. If the ISU is being used, the gunner switches to high magnification (12X) for an intensive observation of potential targets.

Figure 2-4. Slow (50-meter) scan.

(c) Detailed search. If no targets are detected using the rapid or slow scan methods, crews should use the optics (day and night) to make a careful, deliberate search while stationary or moving (Figure 2-5). This method is also used to search in detail, small areas or locations with likely or suspected avenues of approach.

- The crew concentrates on one specific area or location and studies that area intensely.
- They look for direct or indirect target signatures in a clockwise tier around the focal point (terrain feature) of the area. (See paragraph 2-3a for examples of target signature.)

(d) Off-center vision method. At night, without optics and using off-center vision method, crew and squad members move their eyes in short, abrupt, irregular movements. At each likely target area, they pause a few

seconds to detect a target or any movement. If an object is detected, they use off-center vision to observe it. To prevent object fade-out, they move their eyes frequently They cup their hands around their eyes to increase night vision

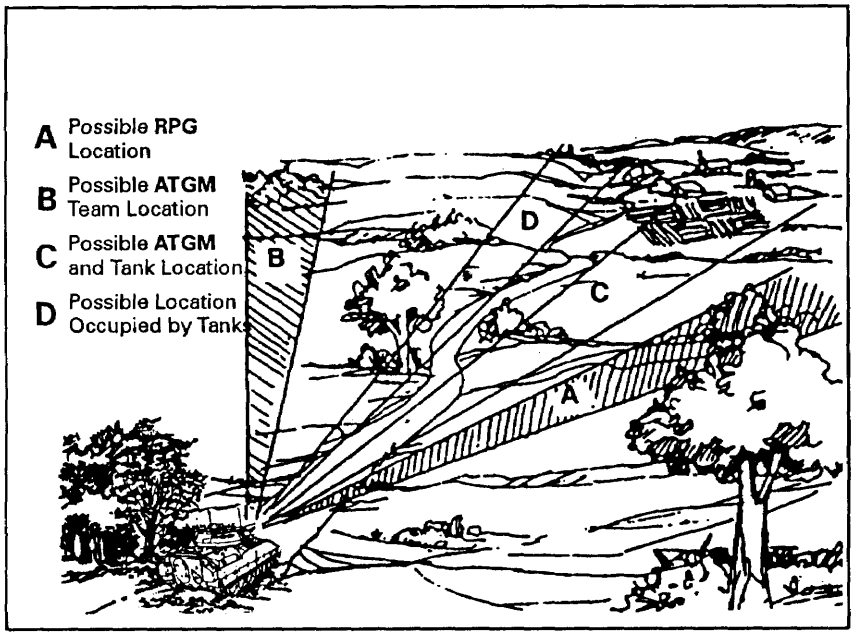


Figure 2-5. Detailed search.

(2) *Air search techniques.* Flat terrain scan and hilly terrain scan methods are used to quickly detect aerial targets.

(a) Both of these methods are based on the slow (50-meter) scanning method. While using a ground search technique, crew and squad members should always search near to far for possible targets. When using an air search technique, crew and squad members should always search far to near.

- Flat terrain scan (air search). In flat terrain, crew and squad members search the horizon by moving their eyes in short movements from object to object (Figure 2-6, page 2-6). More detail is seen this way than with a continuous scan of the horizon.
- Hilly terrain scan (air search), In hilly terrain, crew and squad members search the sky beginning just below the horizon and move upward (Figure 2-6, page 2-6). Crew and squad members use prominent terrain features as points of reference to ensure overlapping the areas of the search.

(b) When using the air search technique crew and squad members concentrate their search just below the tops of trees or vegetation to detect helicopters in hide positions. Air search at night is similar to searching for ground targets at night Ground and air search techniques maybe combined. This allows crew and squad members to scan for targets in the air and on the ground at the same time. Combinations used depend on the area of operations and METT-T.

Note: Enemy aircraft operate in pairs. If a pair of aircraft are acquired, a second set of aircraft should be expected. There maybe one to four pairs of aircraft conducting an attack mission.

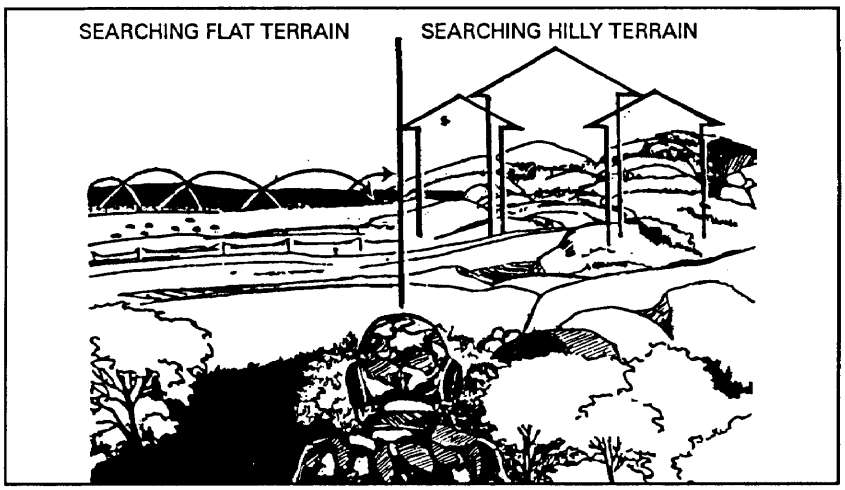


Figure 2-6. Searching terrain.

(3) *Ground and air search tips.* All of the optical devices on the Bradley can be used to acquire targets. These devices include binoculars, night vision goggles, starlight scopes the ISU in either the day or thermal mode, and the driver's AN/WS-2 or driver's all-weather viewer on the ODS models.

(a) Initial scanning is always done without optics. The BC, driver, and fire team members should scan different locations.

(b) Target search is continuous. Any possible target(s) missed on the first or second scan maybe seen on the third or fourth scan.

(c) The crew and fire team must look for targets and target locations using proper scanning methods within their assigned sectors. Night observation devices (NODs) can be used through the periscopes.

(d) While on the move, the gunner should use the rapid scan method, constantly scanning his sector from the right limit to the left limit.

(e) The gunner should adjust the reticle brightness until the reticle is barely visible. The turret dome lights should be off or in the filtered position, and the panel light dimmer knob should be adjusted to dim. Soldiers should do the same with the dome lights in the troop compartment. This aids the acquisition process.

(f) The BC's sight extension should be covered when not in use. It enhances the gunner's sight picture by reducing the amount of ambient light being reflected through the ISU optics from the CSE.

(g) Operations during NBC conditions limit the crew and squad members' abilities to acquire and locate targets. Scanning must be continuous. The crew and squad members' fields of view are greatly narrowed while wearing protective masks.

(h) The crew and squad members must search in areas where targets are more likely to appear, such as avenues of approach, wood lines, and reverse-slope firing positions.

b. **Target Detection.** Target detection is the discovery of any target such as personnel, vehicles, equipment, or objects of potential military significance on the battlefield. Target detection occurs during crew search as a direct result of observation.

(1) *Target signatures.* Target signatures are indicators or clues that aid an observer in detecting potential targets.

(a) Most weapons and vehicles have identifiable signatures. These signatures may be the result of the design or the environment in which the equipment is operating, for example firing a vehicle's main weapon system could produce blast, flash, noise, smoke, and dust. The movement of vehicles through a built-up area causes more noise than the movement of the same vehicle in an open field. Different types of aircraft have different signatures; for example the signature of a hovering helicopter is not the same as that of a fixed-wing aircraft. Factors that affect target signatures are visibility, temperature, and weather conditions.

(b) Tracked vehicle signatures are most likely to be detected in open areas and rolling terrain. Threat antitank positions visually cover primary avenues of approach where tanks and APCs are likely to be used. Helicopters are most likely on the backside of wood lines, ridge lines, and significant folds in the terrain. Soldiers must be familiar with these as well as other possibilities. Sight, hearing and smell can all assist in detecting signatures that will lead to target location and identification. Examples of target signatures are—

- Soldier signatures.
  - Foxholes.
  - Broken vegetation.

- Footprints (weather conditions permitting).
- New and old fires.
- Trash.
- Small-arms weapons noise and flash.

• Tracked vehicle signatures.
- Vehicle tracks on the ground (weather conditions permitting).
- (Using thermal sights) hot spots from road wheels, engine compartments, tracks, or weapon barrels.
- Engine noise.
- Exhaust plume and smoke.
- Dust clouds from movement.
- Disturbed areas of vegetation.
- Weapon's firing report and smoke from weapon.
- A bright flash at night.
- Open hatch silhouettes.

• Antitank signatures.
- Sharp crack of the ATGM being fried.
- Missile launch "swish" sound.
- Fast traveling hot spot with a vapor trail (during thermal operations).
- Long thin wires from fired ATGMs.
- Destroyed armored vehicles.

• Artillery signatures.
- Loud, dull Sound.
- Grayish-white smoke cloud.
- Bright, orange flash and black smoke from airbursts.
- Rushing noise several seconds before round impacts.
- Self-propelled artillery have the same thermal infrared signatures as tracked vehicles.
- Towed artillery signatures vary according to the towing vehicle.

• Aircraft signatures.
- Glare of the sun reflecting off aircraft canopies, wings, fuselages of fixed-wing aircraft, and windows and rotor blades of helicopters.
- Aircraft engine noise.

- Vapor trails from engine exhaust and fired missiles.
- Dust and movement of foliage from hovering helicopter.

• Obstacles and mine signatures.
- Loose or disturbed dirt in a regular pattern.
- A destroyed or disabled vehicle that appears to have struck a mine.

(2) *Detection challenges.* Some targets are more difficult to detect than others. Soldiers must be well trained to detect and locate targets. Some examples of these more difficult targets and challenges are—

• Peripheral targets (targets on the edge of the field of view).

• Targets that are camouflaged or in shadows.

• Targets that can be heard but not seen.

• Targets under less than ideal indirect fire illumination. If the illumination is in front of the target, the resulting shadow will be darker than the target. If the illumination is behind the target (and not in position to "wash out" the crew's optics), the target should stand out distinctly from the background. Soldiers should always keep one eye closed during illumination search, and never look directly into the illumination source.

• Mirage effects caused by high temperatures and heat waves near the ground.

• Small, single targets such as lone, dismounted ATGM or RPG positions.

• Natural and man-made obstacles.

• Behavioral or physical deficiencies (fatigue, eye reaction to gun flashes).

(a) Thermal sights. During winter, there are more hours of darkness. The threat makes the most of this condition by moving their forces during darkness. The threat also digs in or continues the attack during the night. During the day, the threat uses every means possible to cover their intentions. Some camouflaged targets are difficult to acquire with the day optics, but can be detected with the thermal sight. For example, a vehicle in a wood line will be seen as an irregular shape compared to the surrounding vegetation and will show up well in WHITE HOT. A camouflaged vehicle moving across an open area will stand out in BLACK HOT. The BC and his gunner must use the thermal sight to acquire targets during limited and good visibility. The ISU, in the thermal mode, and DAWV (ODS models) operate on the principle of

sensing heat radiation or temperature differences. This heat is displayed as an electronic image. Any source of heat that is 1 degree above the surrounding temperature can be detected by the thermal sight. There are five primary heat sources that are detected by the thermal sight.

- Solar heat. Objects absorb heat from the sun at different rates depending on the material. The amount of heat absorbed by an object determines the duration the object can be seen using the thermal sight. Target signatures vary if heated only by solar heat. As the sun begins to set, the gunner must notice how the object's form changes.
- Fuel combustion. Heat is created by the operation of a vehicle engine. Most vehicles create one or more images. Vehicles have a plume of heat from the exhaust and another around the engine compartment. Location of the engine and the direction of the exhaust differs between vehicles. The signature produced from the engine being used varies with the duration of use and engine location.
- Friction. Moving parts of a vehicle cause friction. These areas then appear as images in the sight: tracks, road wheels, drive sprockets, and support rollers are examples. Vehicles being driven through mud or snow do not create as sharp an image. Vehicle track shrouding materials can hide the signature of the road wheels and the track shoes. The longer a vehicle has operated, the more intense the heated areas become. A vehicle looks much different after a 12-kilometer road march than it does in a defensive position.
- Thermal reflections. Glossary, smooth surfaces, such as the windshield of a vehicle, can reflect radiated heat.
- Body heat. Body heat is also detected by the thermal sight.

(b) Thermal advantage. Use of thermal imaging systems provides US forces with a definite advantage over the enemy to conduct night operations. Night operations can bean advantage if BFV crews can maneuver and engage targets using the thermal sighting system. During day operations, crews may use thermal sights to increase their ability to detect targets behind foliage or in shadows.

2-2. TARGET LOCATION

Target location is the determination of where a target is on the battlefield. Locating a target occurs as a result of observation and detection during crew search.

a. Target Direction Technique. Once a target is located, the target location must be communicated to all personnel. Methods used to announce a located target depend on the individual's specific position, unit SOP, and

time available. When the BC locates a target, he may lay the gun and issue a fire command, which fixes the location of the target for the gunner. The five most common target location methods are described below.

(1) *Clock method.* The clock method is commonly used to locate the target for the BC or gunner. Twelve o'clock is based on the direction of vehicle movement while traveling and hull orientation (front of vehicle) when stationary. (Example: "BMP, nine o'clock.") The BC or gunner can use the turret position indicator (or range finder on ODS models) to assist in accurately announcing target location.

(2) *Sector method.* The sector method is similar to the clock method; it is quick and easy to use. It is best used to indicate a direction from the direction of movement (moving) or hull orientation (stationary) using the terms center, left, right, rear. Center sector is always to the front. (Example: "Three tanks, left rear.")

(3) *Traverse method.* The traverse method is also a relatively quick method primarily used by the BC to locate the target for the gunner. It can be used when the BC's handstation is inoperable to guide the gunner on target. (Example: "Traverse left (or right), steady, on.")

(4) *Reference point method.* The reference point method is used in conjunction with the vehicle optics. The BC uses his binoculars to determine the rnil value from a terrain feature or known position. He then announces the mil value to the gunner. The gunner uses the mil reticle relationship to traverse onto the target. The key to this location method is the BC's and gunner's knowledge of the mil sight relationship. (Example: "ATGM, TRP one four, right five mils.")

(a) The quick target reference point method is used by all personnel to identify targets near a TRP. (Example: "Two PCs TRP one four.")

(b) The precise reference point method is used to locate targets accurately in relation to a known TRP.

(5) *Grid method.* The grid method is the least desired technique because of the length of time it takes to guide the gunner on target. The BC receives the location of a target by map grid (usually from an observation post). The BC then uses his map to orient the turret to the target area for the gunner.

b. **Range Estimation.** (Table 2-1, page 2-12.) At times, because of the tactical situation, the BC or gunner must estimate range. There are two methods that may be used to estimate range. These methods are used only to estimate range. Proficiency in both methods requires constant practice.

(1) *100-meter unit-of-measure method.* To use this method, the BC or gunner must be able to visualize a distance of 100 meters on the ground. For ranges up to 500 meters, he estimates the number of 100-meter increments between the two objects he wishes to measure. Beyond 500 meters, the BC or

gunner must select a point halfway to the object(s) and determine the number of 100-meter increments to the halfway point, then double it to find the range to the object(s).

(2) *Flash-to-bang method.* To use this method to determine range to an explosion or enemy fire, the BC or gunner begins to count when he sees the flash He counts the seconds until he hears the weapon fire. This time interval may be measured with a stopwatch or by using a steady count, such as one-thousand-one, one-thousand-two, for a three-second estimated count. If he must count higher than 10 seconds, he starts over with one. He multiplies the number of seconds by 350 meters to get the approximate range.

FACTORS AFFECTING RANGE ESTIMATION	FACTOR CAUSING UNDERESTIMATION OF RANGE	FACTOR CAUSING OVERESTIMATION OF RANGE
The clearness of outline and details of the object.	When most of the object is visible and offers a clear outline.	When only a small part of the object can be seen or the object is small in relation to its surroundings.
Nature of terrain or position of the observer.	When looking across a depression that is mostly hidden from view.When looking downward from high ground. When looking down a straight, open road or along a railroad. When looking over uniform surfaces like water, snow, desert, or grain fields. In bright light or when the sun is shining from behind the observer.	When looking across a depression that is totally visible. When vision is confined, as in streets, draws, or forest trails. When looking from low ground toward high ground. In poor light, such as dawn and dusk; in rain, snow, fog; or when the sun is in the observer's eyes.
Light and atmosphere.	When the object is in sharp contrast with the background or is silhouetted because of its size, shape, or color. When seen in the clear air of high altitudes.	When object blends into the background or terrain.

Table 2-1. Factors of range estimation.

c. **Range Determination.** Range determination significantly affects target engagement. Errors in range determination cause more first round misses than errors in deflection. Range errors that cause the first round to go

over the target are particularly serious because observing and adjusting from that round is difficult. The BC is primarily responsible for determining range. He has more options available for determining range and a knowledge of the terrain, as well as the tactical situation. The gunner and driver have limited means of determining range. This section details range determination techniques available to each crew member.

(1) *Bradley commander.* The BC is primarily responsible for navigation and command and control. He uses his knowledge of the terrain, the tactical situation, the friendly control measures on the map and on the ground; and his experience to determine range. He has the following methods available to him for range determination, which can be used separately or in combination.

- Binoculars (using mil-relation formula).
- Reference materials (maps range cards).
- ISU (using the commander's sight extension).
- Laser range finder (AN/GVS-5) (if available).
- Bradley eye-safe laser range finder (BELRF) (ODS models).
- Ml tank laser range finder (if available).

(a) Binoculars (using mil-relation formula). The binoculars and the mil relation are used in range determination. To use this method, the BC must know the width, height, and length of the target. He determines the known width, height, or length with the binoculars mil scale, substitutes the mil relation, and computes the range. When measuring frontal width, he measures only the vehicle's front slope (from left front corner to right front corner). When measuring flank width, he measures the entire vehicle (Figure 2-7). Accuracy of this method depends on knowing the target dimensions and the BC's ability to make precise measurements with the binoculars.

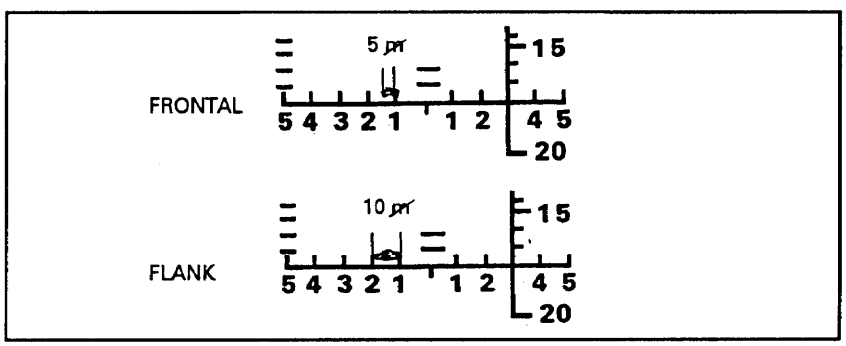


Figure 2-7. Target measurement using binoculars reticle.

- The mil is a unit of angular measurement equal to 1/6400 of a circle. There are about 18 mils in 1 degree.
  - One mil equals the width, height, or length of 1 meter at a range of 1,000 meters.
  - This relationship remains constant as the angle or range changes. 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.
- Since the relationship of the target width in mils (m) and meters (W) is constant at varying distances, accurate range determination is possible (Figure 2-8.)

The BMP is 6.75 meters long (W). Using binoculars, the BC determines that the BMP measures 5 mils in length.

$$\frac{W}{m} = R$$

Substitute the two known values for W and m

$$\frac{W}{m} = \frac{6.75}{5} = 1.35$$

Since R is expressed in thousands of meters, multiply by 1,000; and round off to the nearst tenth, for example: 35=.4; .31=.30. 1.40 x 1,000=1,400 meters, the range to the BMP.

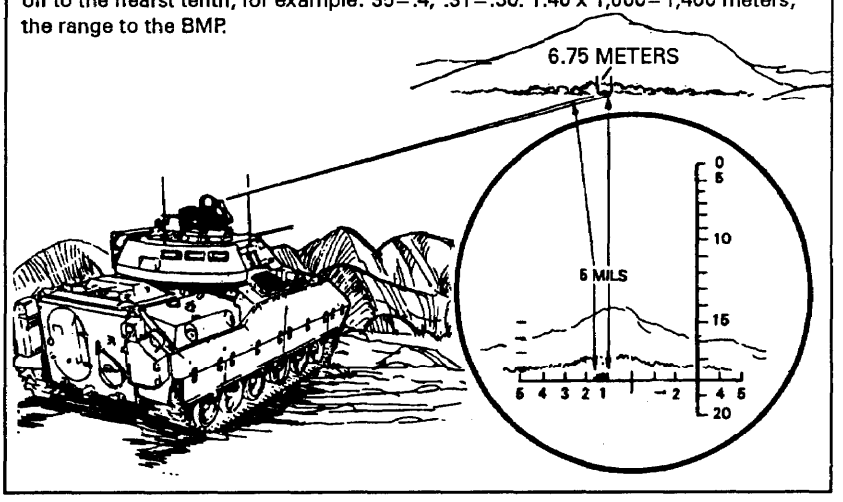


Figure 2-8. Range determination using binoculars.

- 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. Also, target height is used to determine "battlecarry" (the pre-indexed range and ammunition) used during offensive operations. (See Section III.)

- To determine the range, the (m) and W measurements must be known. The (m) comes from reading the target measurement on the mil scale in the binoculars.
- The known target measurement (W) is then divided by the mil measurement (m). This equals the range factor (R). Multiply R by 1,000 to determine the target range.

Note: The distance between tick marks on the horizontal scale is 10 mils.

(b) Maps. The BC must have a map to navigate. He must constantly know where he is and where he is going. (The precision lightweight global positioning system receiver [PLGR] will not eliminate the need for maps.)

- The BC can also use the map to determine range.
  - Both in offense and defense, the BC must be continually assessing the likely enemy locations, engagement areas, and engagement ranges. This information gives the BC the capability to rapidly determine range when contact is made.
  - TRPs are used as both direct and indirect fire control measures (see Chapter 3). These are entered in the sector sketch for the BC to control his fires and ensure that his reports of enemy sightings are accurate. Since the range to each TRP is known, this will assist in range determination.
- A map also allows him to determine the best battlecarry setting for the terrain and enemy situation and to adjust the battlecarry when the situation changes.

(c) Range cards. The primary use of the range card is to assist the crew in engaging targets during limited visibility. The BC may also use the range card to assist in determining range, since range data is recorded on the range card (see Appendix E).

(d) ISU (using the commander's sight extension). The BC can use the ISU horizontal ranging stadia or reticle lead lines methods already available to the gunner (see paragraph 2-2c (2), page 2-16). Use of the commander's sight extension does limit the BC's field of view.

(e) Laser range finder (AN/GVS-5). Using the laser range finder, the BC can quickly and accurately determine the range for the gunner. Currently, these laser range finders are not organic to an infantry company, but they are organic to the scout platoon.

(f) Bradley eye-safe laser range finder. BELRFs (ODS models) allow the commander or gunner to determine rapidly and accurately the target range. Range, in 5-meter increment is displayed as four digits.

(g) Ml tank laser range finder. Task force organization may allowBFV crews and squads to determine target ranges from their positions by requesting these ranges from Ml crews.

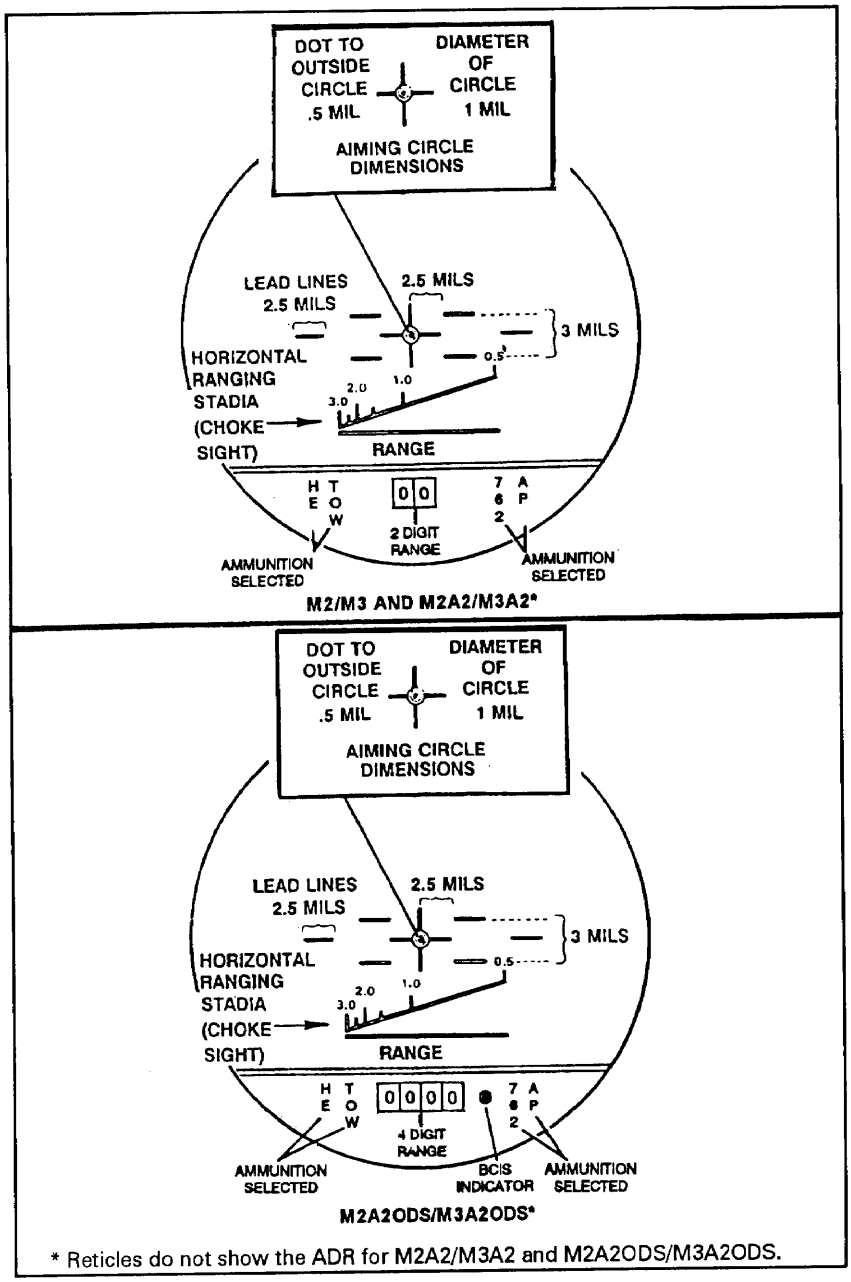
(2) *Gunner*. The gunner has the following methods available to him for range determination:

- ISU reticle lead lines (Figure 2-9).
- ISU horizontal ranging stadia (Figure 2- 10, page 2-18).
- Auxiliary sight.
- Range card. (See Appendix E.)
- Bradley eye-safe laser range finder (ODS models only).

(a) Horizontal ranging stadia (choke sight). This range determination method should be used only when firing from a defensive position.

- The reticle within the ISU has a choke sight used to estimate the range to BMP-type targets. The choke sight is used for a 1.8-meter-high target. Since the hull of a BMP is a standard hull that is used on various vehicles throughout the world, the ranging stadia can be used for accurately ranging to these different vehicles (Figure 2-10, page 2-18).
- To use the choke sight, the gunner moves the turret until the ranging stadia lines appear to touch the vehicle in the following manner:
  - Aligns the horizontal line to the bottom (track) of the target vehicle.
  - Moves the turret horizontally along the target until the top of the hull appears to touch the stadia line. (The range is read from the stadia line at the point where the top of the hull touches. If this point is between the tick marks, an estimation must be made, and the range is then indexed into the ISU. Then, the gunner or commander should re-lay the reticle on the target.)
- The choke sight can be used to range to targets in defilade. A technique in ranging to a hull-down target is to choke the target. The gunner aligns the bottom horizontal line to the bottom of the target and aligns the stadia line until the top of the target appears to touch the lines (Figure 2-11, page 2-18). He reads this range and divides that number in half. This technique is less accurate than ranging a fullyexposed target.

Note: Choke only the hull, not the whole vehicle. Do not range to weapons or lights mounted on top of the turret.



* Reticles do not show the ADR for M2A2/M3A2 and M2A2ODS/M3A2ODS.

Figure 2-9. 25-mm sight reticle.

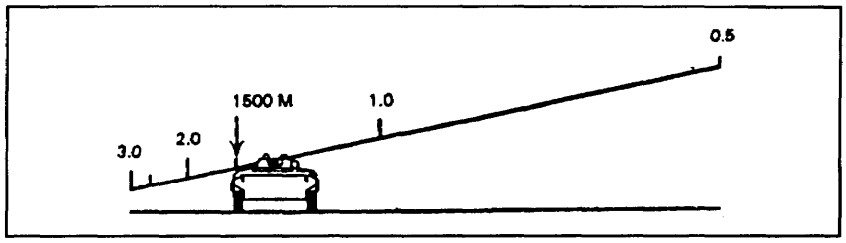


Figure 2-10. Choke the hull.

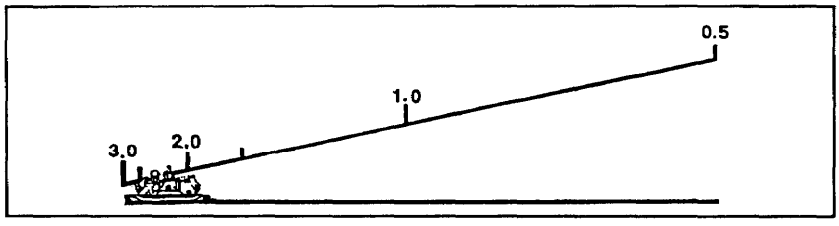


Figure 2-11. Choking a hull-down vehicle.

(b) Reticle lead line and mil relation. Lead lines of the reticle can be used to determine the range to a target, since each lead line is 2.5 mils from the center of the reticle. The width of the vehicle, either the front or flank, is used to determine the range. Use of this technique requires the target to be classified as either a frontal or a flank view (Figure 2-12). This can be done by comparing the appearance of the front and side of the vehicle. A target is considered a frontal view if its front appears larger than its side. A flank view is one in which the side appears larger than the front. Figure 2-13 illustrates the relative amount of front and side that can be seen as a BMP rotates from a full front view (0 degrees) to a full flank view (90 degrees).

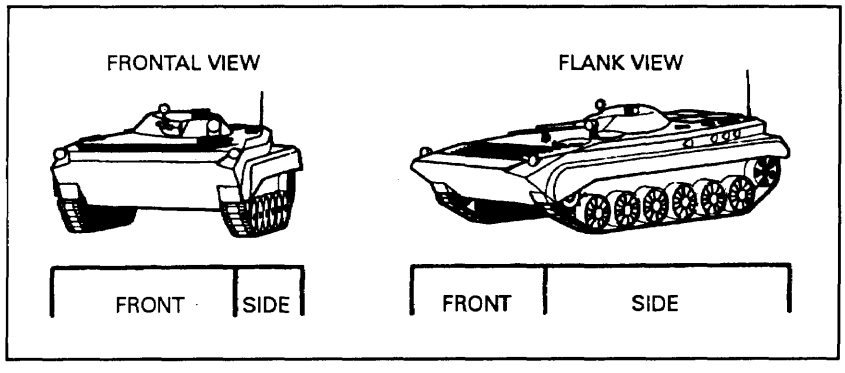


Figure 2-12. Frontal and flank views of a BMP.

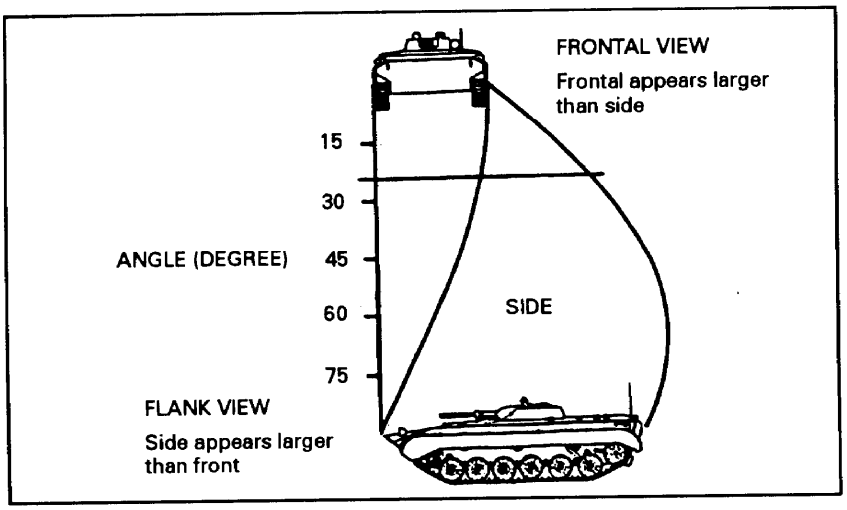


Figure 2-13. Full frontal and full flank views of a BMP.

- Accurate measurement of a vehicle width in mils is required when determining range with the 25-mm gun reticle. The reticle provides greater magnification smaller graduated markings on the reticle compared to the reticle of binoculars, and has a steadier platform. The gunner can use the 25-mm gun reticle for ranging by using the reference markings on the center cross. The reference marks measure 2, 2.5, 3, and 5 mils (Figures 2-14 and 2-15, page 2-20). The readings are taken from either end of the cross lead lines.

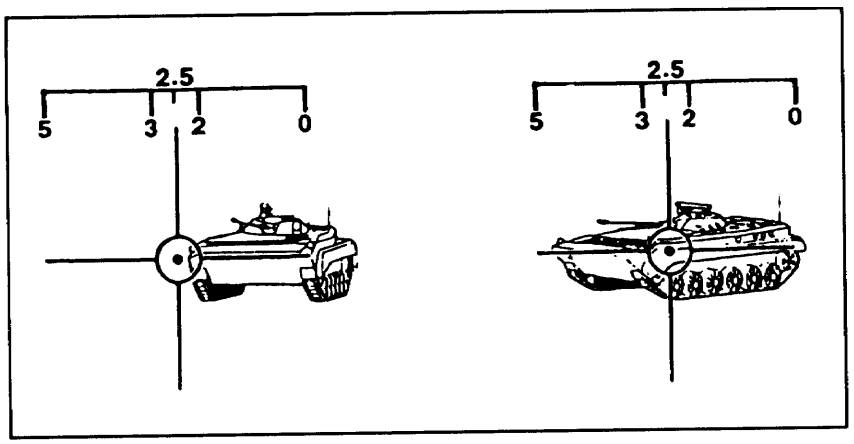


Figure 2-14. Determine range for a BMP at 1,400 meters.

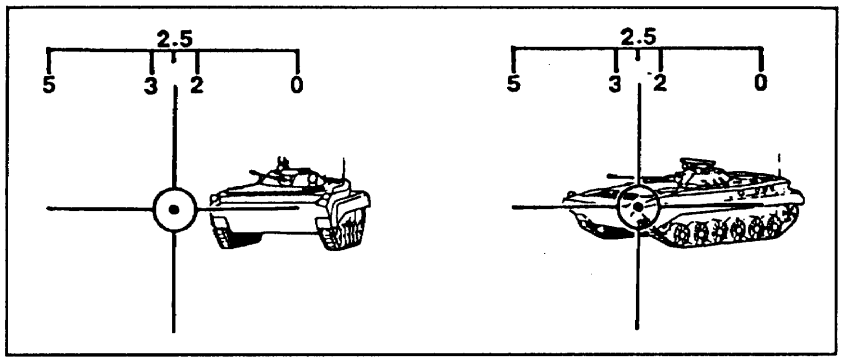


Figure 2-15. Determine range for a BMP at 1,800 meters.

- Determining the critical target range is based on the size of the target. The size of the target is estimated using the roil-relation formula. (See paragraph 2-2c (1) (a), page 2-13.)
- The size of the target on the reticle can be used to determine when the target is within critical target range.
  - When firing APDS-T, a range of 1,400 meters is the maximum range for an index setting of 12. When a target is at 1,400 meters, the reticle is positioned as shown in Figure 2-14.
  - The recommended maximum engagement range for APDS-T is 2,000 meters. The sight picture of a frontal view and flank view of a BMP beyond this range is as shown in Figure 2-15.
  - Maximum engagement range determination for the TOW is critical. A buddy vehicle can provide the range or the 25-mm or coax reticle can be used. Using the 25-mm reticle, the sight picture for TOW when the target is at the maximum engagement range (3,750 meters) is as shown in Figure 2-16.

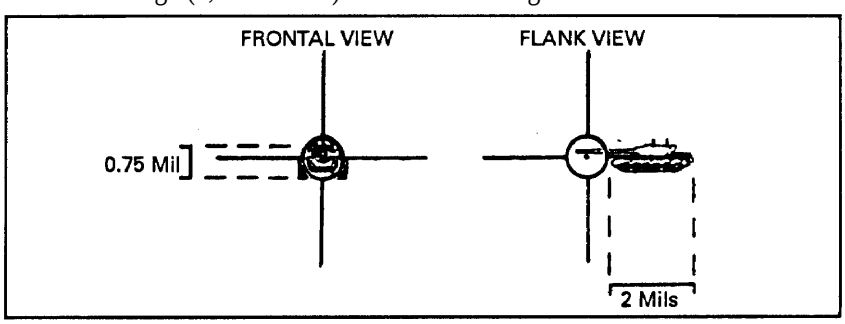


Figure 2-16. Determine TOW maximum engagement range.

Note: On ODS vehicles, the BELRF cannot be used with the TOW selected. If the BELRF must be used to determine range to the TOW target, the crew uses the BELRF with 25-mm or 7.62-mm selected. After determining the range, the crew selects the TOW.

(c) Backup sight. The backup sight, known as the auxiliary (or aux) sight, is used when the ISU is not operational or turret power has failed. The auxiliary sight has stadia lines for range determination and application of the correct superelevation based on range. There are stadia lines for APDS-T and HEI-T ammunition. This system is used to determine the range and to engage the frontal or flank view of a BMP.

- The auxiliary sight has two range scales. The HE scale represented by broken lines extends to 3,200 meters. The AP scale represented by a solid line goes to 3,400 meters. (Figures 2-17 and 2-18, the numbers 4 and 6 represent 400 meters and 600 meters. The HE range scale continues to 32 which is not shown.)
- The range to a flank target is determined by elevating the gun until both the front and rear of the target appear to be touching the AP stadia lines as shown in Figure 2-17. The range to a flank HE target is choked in the same manner, using the HE lines.
- To determine the range to a frontal target the gunner uses the half-stadia method of aligning the center vertical ranging lines with one side of the target, and aligns the appropriate ammunition stadia line on the other side of the target (Figure 2-18).
- Coax firing is conducted using the same method as HEI-T, using the HE stadia lines.

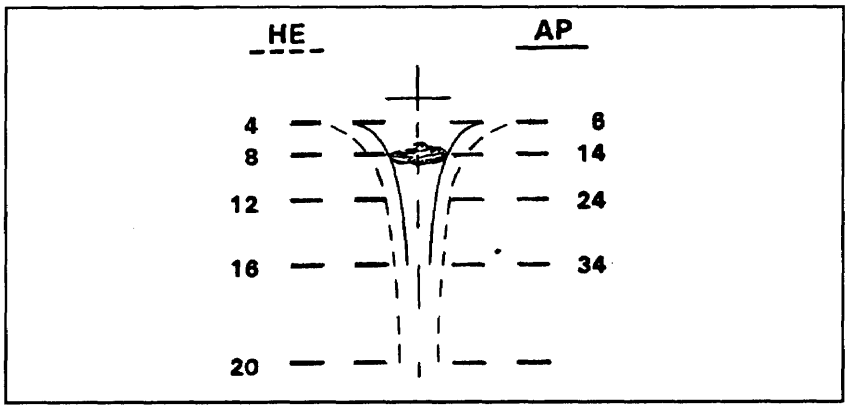


Figure 2-17. Determine range to a flank view of a BMP.

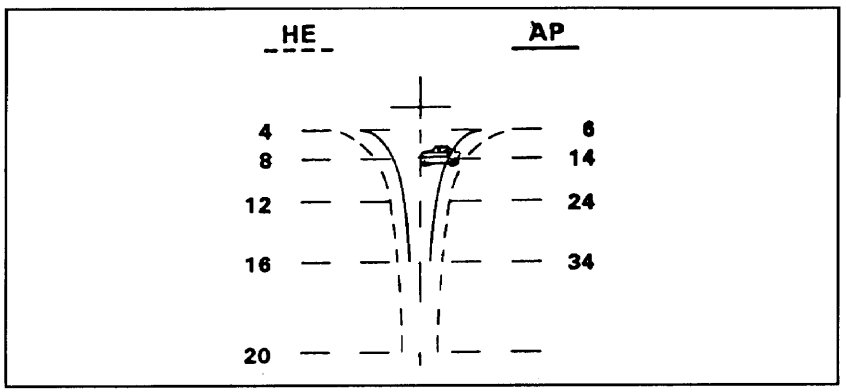


Figure 2-18. Determine range to a frontal view of a BMP.

(3) *Driver.* The driver has a limited capability to determine range, especially in the closed hatch posture. The driver can use the football field method to estimate range to close-in targets. However, when the driver is using the night vision sight AN/VVS-2, the sight's inherent depth perception problem prevents accurate range determination.

(4) *Fire team.* The fire team members in the troop compartment have a limited capability to determine location, range, and conditions on the battlefield. The BC must constantly update the fire team leader and squad leader on their location and battlefield conditions. This information facilitates the rapid transition from mounted to dismounted operations. The fire team leader and squad leader must monitor the BC and platoon frequency, using CVCs or headsets, to maintain situational awareness.

2-3. TARGET IDENTIFICATION

Target identification is the recognition of a potential target by type. This identification must determine the target as friendly or enemy.

a. **Classification.** Classification is the process of categorizing targets by types (truck, tank, IFV). Soldiers quickly scan the target's key recognition features, and then categorize it accordingly. Classification is the first step toward identification.

b. **Identification.** Once a target has been classified, it must be identified. Identification is the positive determination of a target by nomenclature or series (T-80, Scorpion series). Since the target has been classified, the crewman then looks at the target for key recognition features to positively identify, the target. For example: The gunner classified the target as a tank because of the low silhouette, large gun tube, and tracks. He then looked at the target from top down. He noted that the turret was smooth and rounded,

that the gun tube's bore evacuator was at the end of the tube and the suspension system had no support rollers. He identified the target as a T-55 tank.

Note: Identification does not determine whether or not a target is friendly or threat.

c. **Discrimination.** Discrimination is the determination that a target is either friend or threat. Although Russian equipment has been sold in large numbers worldwide, soldiers could find themselves facing British French, and American-made equipment. Soldiers must identify and discriminate a target before pulling the trigger. There are some techniques soldiers have available to them to assist in target discrimination.

(1) *Combat identification panel.* CIPs (battleboards) allow a soldier looking through a thermal sight to identify a friendly vehicle up to 4,000 meters away. CIPs are bolted onto combat vehicles and provide a "cold" image on a "hot" background.

(2) *BCIS* (ODS models). BCIS gives the Bradley crew a means of interrogating vehicles to determine if they are also equipped with BCIS. The crew lays the gun reticle on target and presses the laze/BCIS switch on the handstation. A series of visual and audible signals symbolize friend, friend-in-sector, or unknown.

(3) *Unit markings.* Unit markings are set in the unit SOP. (Unit markings are only limited by imagination and resources.) They must distinctly identify a vehicle as friendly, and soldiers must be well-trained to identify those markings. There are several items units can use to mark vehicles.

(a) VS-17 panels provide a bright recognition feature that allows crews to identify friendly vehicles through the daysight.

(b) Chemical lights provide a means of marking vehicles at night. However, soldiers must know that chemical lights are not visible through a thermal sight.

(c) Unit symbols may also be used to mark friendly vehicles. An inverted V painted on the flanks, rear, and fronts of vehicles aids in identifying a target as friendly.

Section II
ENGAGEMENT DECISION

The engagement decision process is a series of progressive and interdependent steps (or actions): determining threat levels, selecting weapon or ammunition, and making confirmation. The Bradley commander is solely responsible for making these decisions.

2-4. TARGET DETERMINATION

Targets are categorized by the threat level that they represent. To defeat multiple targets on the battlefield the *most-dangerous targets* must be engaged first. Commanders determine target threat levels based on threat analysis of the mission area. All soldiers must know the engagement priorities of their unit; However, the BC is responsible for determining the immediate target threat level, based on the threat posture at the time.

a. **Target Threat Levels.** The threat levels are most dangerous, dangerous and least dangerous.

(1) *Most dangerous.* When the crew observes an enemy target with armor-defeating capabilities that appears to be preparing to engage them the target threat level is most dangerous. This type of target is the greatest threat and must be engaged immediately.

(2) *Dangerous.* When the crew observes an armor-defeating target that is not preparing to engage them, the target threat level is dangerous. This type of target must be engaged after all most dangerous targets have been destroyed

(3) *Least dangerous.* When the crew observes a target that does not have an armor-defeating weapon system the target threat level is least-dangerous target. This type of target is engaged after all most-dangerous and dangerous targets have been destroyed, unless it has a high priority of engagement (command and control vehicles).

b. **Determining Factors.** When multiple targets of the same threat level are encountered, the targets must be prioritized according to the threat they represent. The determining factors used to prioritize these targets are—

(1) Engage close-range targets before engaging long-range targets.

(2) Engage stationary targets before engaging moving targets.

(3) Engage frontal targets before engaging flank or rear targets.

2-5. WEAPON/AMMUNITION SELECTION

Weapon/ammunition selection is the logical selection of a weapon or ammunition that is appropriate for a given target, and it is a direct result of the acquisition process. Probability of hit and kill, as determined by threat type and range, determines which weapon and or ammunition to engage the enemy. (Table 2-2.)

THREAT TYPE	RANGE (METERS) BFV WEAPONS		RANGE (METERS) DISMOUNTED WEAPONS	
Armored vehicle	65-3,000	basicTOW	10-300	AT4
	[1]65-3,750	all other TOWs	65-1,000	Dragon
			65-2,000	Javelin
Light-armored vehicle	[2]0-2,000	AP	10-300	AT4
	65-3,000	basic TOW	65-1,000	Dragon
	[1]65-3,750	all other TOWs	65-2,000	Javelin
Unarmored vehicle	0-900	coax	0-900	M249
	300-3,000	HE	0-300	AT4
			31-150	M203 (point target)
			0-550	M16A2 (point target)
			0-150	M18A1 mine
Reinforced position	300-3,000	HE	10-300	AT4
	65-3,000	basic TOW	65-1,000	Dragon
	[1]65-3,750	all other TOWs	65-2,000	Javelin
	0-900	coax (suppression)	31-150	M203 (point target)
			0-600	M249 (point target)
	0-1,800	TP-T (punch holes in cinder-block)	0-550	M16A2 (point target)
			0-10	hand grenade
Troops	0-900	coax	0-600	M249 (point target)
	300-3,000	HE	0-900	M249 (area target)
	0-300	FPW	0-200	M16A2 (moving man)
			0-300	M16A2 (stationary man)
			0-150	M203 (point target)
			31-350	M203 (area target)
			0-100	M18A1 mine
			5-35	hand grenade
Aerial	1,200-2,000	AP	[3]1,000-5,000	Stinger
	0-1,200	HE	SAAD	M249
	2,000-3,000	basic TOW	SAAD	M16A2 (burst)
	2,000-3,750	all other TOWs		

[1]Minimum arming distance for TOW 2B is 110 meters; maximum is 200 meters.
[2]Planning effective range for APDS-T is 2,000 meters. APFSDS-T ranges are greater.
[3]Maximum planning range for Stinger is 5,000 meters.

Table 2-2. Weapon for threat.

2-6. TARGET CONFIRMATION

Target confirmation is the rapid verification of the initial identification and discrimination of the target. Confirmation is the final step in the target acquisition process, and it is completed during conduct of fire. Confirnation takes place after the BC has initiated the fire command but before the execution element and as the gunner is completing his precise lay. Gunners also go through a confirmation step. As the gunner makes his final precise lay, he

assures himself that the target is hostile More announcing "Identified." On vehicles equipped with BCIS, the gunner interrogates the target to determine if the return signal is friend, unknown, or friend in sector.

a. The BC completes his evaluation on the nature of the target based on the target's identification and the tactical situation.

b. If the gunner confirms that the target is hostile, he completes his final lay and engages the target on order. If the gunner determines that the target is friendly or neutral, he announces his confirmation to the BC ("friendly" or "neutral"). If he cannot determine the nature of the target, he announces "Doubtful." On BCIS-equipped vehicles, the gunner announces "friendly or friend in sector." The BC then determines whether to continue or terminate the engagement.

c. The BC must be kept informed of the tactical situation to assist in target confirmation. For example, he must be aware of any friendly element movement within or between battle positions, the forward passage of lines, the status of the withdrawal of any covering force, or the movement of civilian traffic in the area of operations.

Section III
ENGAGEMENT EXECUTION

The weapons systems on the Bradley are used to engage and destroy targets using direct precision and area fires. In order for crews to take advantage of the BFV's weapons systems to quickly lay, engage, and destroy threat targets, crews must be experts in the methods and techniques of engagement execution.

2-7. METHODS OF ENGAGEMENT

Once a target is acquired and discriminated the BC must determine which method to use to engage the target. There are two methods of engagement for 25-mm and coax—battlesight and precision gunnery. Each method has its own fire command (Section IV). Battlesight gunnery is the most rapid method of engagement, but it is not as accurate as precision. The BC selects the method of engagement based on his estimation of the situation.

Note: Because range selection and ammunition choices for the TOW system are not required, battlesight and precision methods of engagements do not apply.

a. **Battlesight Gunnery.** Battlesight gunnery is the fastest method of engaging a target because it uses preselected ammunition and range settings. The pre-indexed inforrnation is the battlecarry and allows the gunner or BC to aim, shoot, and BOT (if necessary) to kill targets. This method does not require the gunner to select ammunition or range.

(1) *Battlecarry selection.* During fire planning several factors must be considered in selecting battlecarry. Ammunition is selected for the most frequently expected enemy target. Next, expected engagement distances are determined and a range setting is selected for engagements at those ranges.

(2) *Battlecarry options.* The BC has two options for selecting a battlecarry—ballistic and extended. All are based on target height, ammunition characteristics and capabilities available, and expected engagement range bards.

(a) Ballistic battlecarry. This option is based on the ballistic capabilities of each type of ammunition on the Bradley. The BC uses the ballistic firing tables (FT 25-A-2) to obtain the necessary ammunition information. As stated, the anticipated target is selected. This gives the BC the exact height of the target. The gunner aims at half the height of the target, regardless of the target's motion. The BC must choose a range that will prevent the highest path of the selected ammunition from passing over the target. For example, the expected target is a BMP 2, so the desired ammunition is M791. The height of the target is 2.45 meters. Dividing the target in half equals 1.225 meters. The BC locates the maximum ordinate column in the firing table (FT 25-A-2). (Maximum ordinate is the highest measurement the round will travel above the line of sight.) Checking the maximum ordinate coloumn the BC sees that 1.1 is the largest number, without exceeding 1.2. Reading right, or left, to the range column, he sees 1200 is the corresponding range for a maximum ordinate of 1.1. The BC instructs the gunner to index 1200 and select AP for the battlecarry. When the target is engaged between 0 and 1,400 meters, there is a high probability of a first round hit. (Table 2-3.)

(b) Extended battlecarry. This technique is used when expected targets must be engaged beyond the ballistic battlecarry of the selected ammunition. (See Table 2-3 and Chapter 1, Table 1-3.)

AMMO	SUPERELEVATION (meters)							
	600	800	1,000	1,200	1,400	1,600	1,800	2,000
M919				0-1,400	1,062-1,613	1,340-1,787	1,589-1,965	1,820-2,146
M791				0-1,400	1,118-1,602	1,364-1,771	1,620-1,948	1,868-2,141
M792		0-945	842-1,101	1,102-1,277	1,344-1,450	1,554-1,648	1,766-1,831	1,978-2,021
COAX	0-900							

BALLISTIC BATTLESIGHT EXTENDED BATTLESIGHT

Table 2-3. Ballistic and extended battlecarry.

b. **Precision Gunnery.** Precision gunnery is the most accurate method of engagement. Precision gunnery requires both ammunition selection and range determination at the time of engagement. The BC uses precision gunnery when—

- Time is available to determine precise range (defense).
- Range to the target is already known.
- The target appears to be outside of the battlesight range band for the type of ammunition needed to destroy it.
- The engagement requires a change in selected ammunition or range.

(1) Precision gunnery is the usual method of engagement for HEI-T and coax, due to the limited ballistic battlecarry range of HEI-T and the high trajectory of coax.

(2) Range determination is the key to precision gunnery. Though the techniques for determining range vary widely in their preciseness, precision gunnery is defined by the decision to determine and index range, not by the accuracy of the determination. The techniques for range determination are discussed in Section I.

c. **Multiple Targets.** When engaging multiple targets in different range bands, the BC may choose precision or battlesight gunnery, adjusting the method to match battlesight in the offense and precision in the defense. The BC balances the speed and accuracy requirements when selecting the engagement method.

2-8. ENGAGEMENT TECHNIQUES (Weapon/Ammunition)

The Bradley crew's goal is to engage and destroy or suppress targets as fast as possible. This section discusses the various techniques and terms used for direct fire and effective adjustments of fire. This section discusses techniques for 25-mm point and area target engagements, coax machine gun engagement TOW missile engagements, firing port weapons engagements, and smoke employment. Basic engagement procedures used for all engagements are—

- The BC may be required to lay the gun for direction if the gunner's scan is away from the target. The BC will release control to the gunner (target handoff) and issue the fire command.
- On acquiring the target, the gunner discriminates the target (friendly, friend in sector, neutral, or doubtful) (see paragraph 2-6). He announces "Identified," centers the target in his field of view, and switches to high magnification. Depending on the situation (range, visibility, experience), the gunner may have to

switch to high magnification before discriminating the target and announcing "Identified."

- The BC then confirms the target and gives the command FIRE, observes the target, and provides corrections to the gunner or searches for other targets.
- The gunner completes his switch checks by—
  - — selecting the announced range, if other than the battlecarry in the ISU or on the auxiliary sight.
  - — Selecting the ammunition/weapon.
  - — Arming the system.
  - — Establishing the correct sight picture (depending on target type, ammunition, target, or BFV motion).
  - — Announcing ON THE WAY and fires.

a. **Observations.** An observation is an oral notation by the BC or gunner of where the round strikes in relation to the target. If the first round fails to hit the target, observations enable the BC or gunner to adjust subsequent rounds.

(1) TARGET, LOST, OVER, SHORT, and DOUBTFUL are all observations announced by the BC or gunner (Figure 2-19, page 2-30).

(a) Target. Any portion of the target is hit by direct fire.

(b) Lost. Neither the round nor its effects are observed in relation to the target.

(c) Over. The round, tracer, or effects are observed above the target.

(d) Short. The round, tracer, or effects are between the firing vehicle and the target.

(e) Doubtful. The round or its effects are seen to the left or right of the target, but appear to be at the correct range. With the observation of "doubtful," range correction may not be required, but a deflection shift is necessary. When "doubtful" is used, it is announced as DOUBTFUL, LEFT or RIGHT.

(2) The gunner is responsible for observations and adjustments. He should announce every observation and adjustment as be makes it. Constant practice is necessary to obtain and maintain this skill. This tells the BC that the gunner has control of the engagement and does not require a subsequent fire command. The BC is then free to acquire additional targets, control the driver, navigate, or communicate with other leaders.

(a) If the gunner fails to observe the strike of the sensing round (reports a "lost" or "doubtful" observation) the BC announces his observation.

(b) If the BC also fails to observe, the driver should automatically report an observation if he has made one.

Note: By crew SOP, the gunner may announce both observation and adjustments or simply announce adjustments.

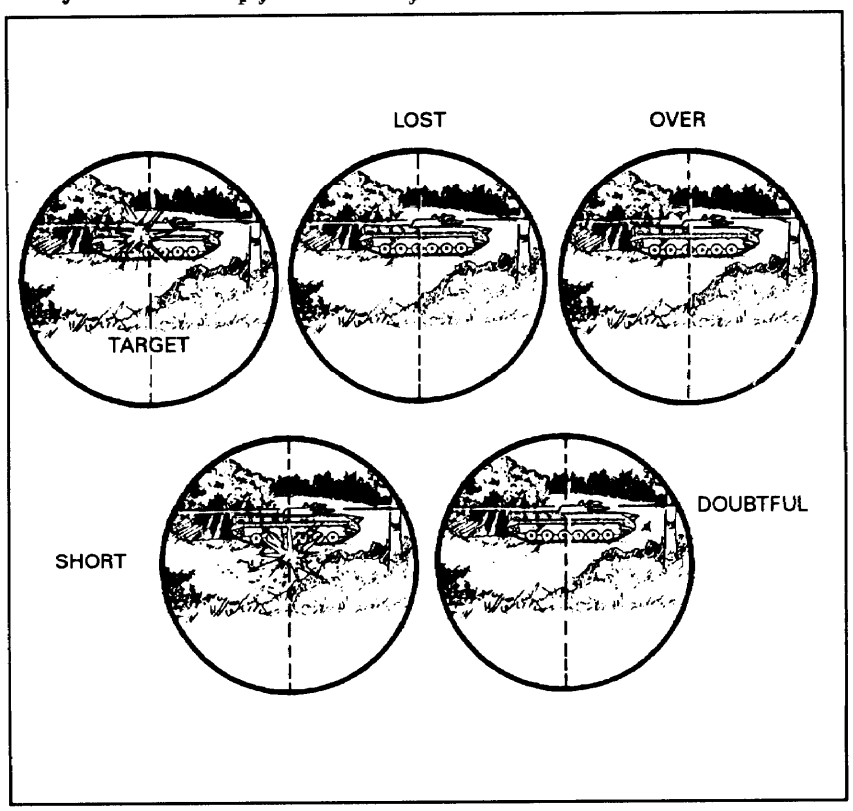


Figure 2-19. Target observations.

b. **Target Lead.** When engaging a moving target the gunner must lead (aim in front of) the target to compensate for the movement. The amount of lead depends on the velocity of the ammunition target speed, and target angle, but a standard lead is used to begin the engagement.

(1) When using AP ammunition, the gunner uses a 5-mil lead from center mass of target (called gap lead). This rule is called the gap lead because the

target is centered in the gap of the gun reticle. Figure 2-20 shows a BMP given a gap lead (note that the lead lines are 2.5 mils in length).

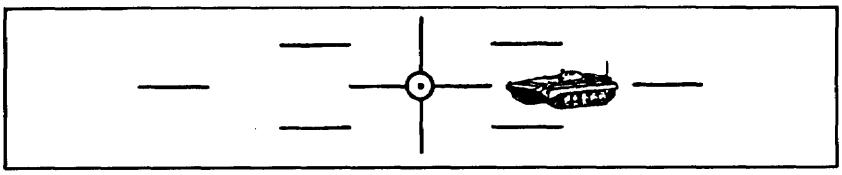


Figure 2-20. Gap lead applied to a moving BMP.

(2) When using HEI-T and 7.62-mm ammunition, the gunner uses far lead, because the farthest lead line of the ISU is centered on the target. Figure 2-21 shows applying far lead to a truck

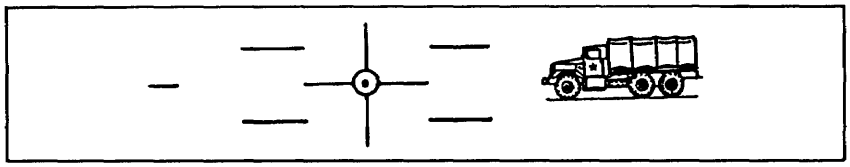


Figure 2-21. Far lead applied to a moving truck.

(3) When engaging targets moving toward or away from the position, the gunner may need to make small vertical adjustments (Figure 2-22). If the target is approaching he aims at the center base of visible mass; if fleeing he aims at the top center of visible mass. This aim point must be carefully adjusted as the range changes.

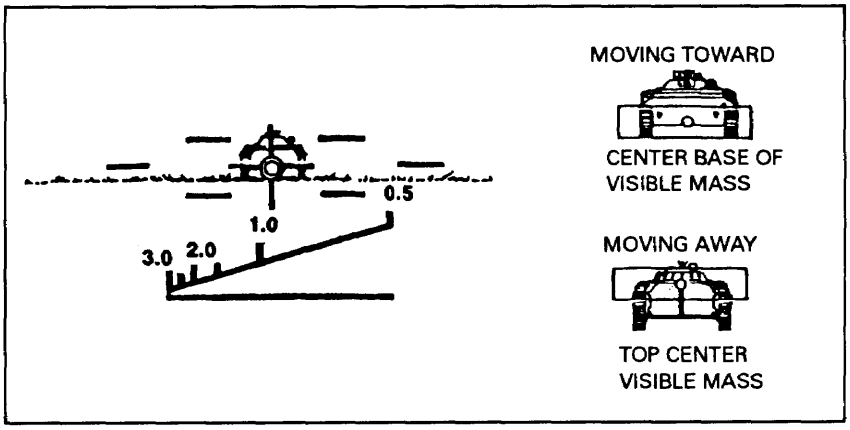


Figure 2-22. Target moving toward or away from Bradley position.

(4) When a moving Bradley is firing over its flank (side) at a stationary target, the standard lead rules apply. The gunner leads the target, in the direction the BFV is traveling (Figure 2-23).

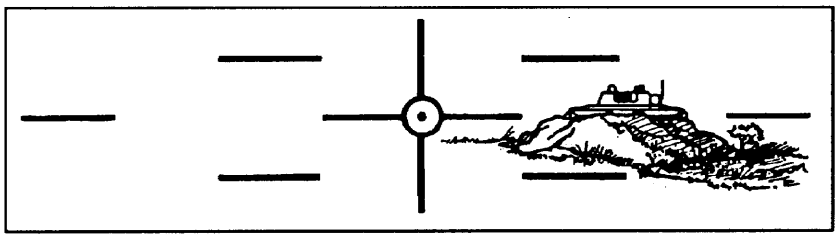


Figure 2-23. Gap lead applied to a stationary BMP when a Bradley fires over its left flank.

(5) If the Bradley and target are parallel and moving in the same direction, no lead is required. The lateral motion of both vehicles eliminates any lead requirement.

(6) If the Bradley and target are parallel but moving in the opposite direction, the initial lead must be doubled. (Figure 2-24.) This lead with HE ammunition may cause the gunner to run out of lead lines and require changing to AP ammunition for that specific situation.

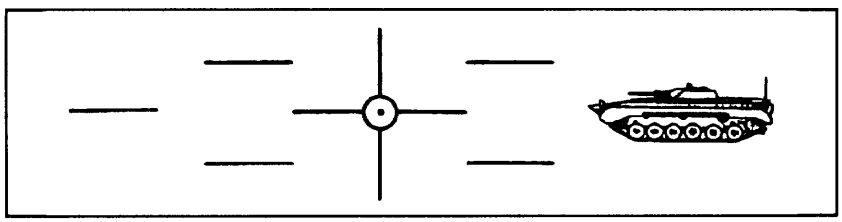


Figure 2-24. Far lead applied when a target and a Bradley are parallel and moving in opposite directions.

c. **Direct-Fire Adjustment.** There are multiple techniques of direct-fire adjustment: burst on target, tracer on target, and techniques using measurements.

(1) *Burst on target.* Burst on target, the fastest method of adjustment, moves the strike of the round, impacting on the ground, onto the target.

(a) After the gunner has made his initial reticle lay on the target and fired, to apply BOT, he must—

- Concentrate on the target, noting the point on the sight reticle where the round appears as it hits or misses the target.
- Announce his observation and BOT.

- Immediately adjust the reticle aiming point based on his observation, to bring the next round or burst on target. He must adjust quickly and accurately. This makes additional adjustments or subsequent fire commands unnecessary.
- Announce ON THE WAY and fire a burst of three to five rounds.

(b) The gunner continues to fire, adjusting each burst onto the center of mass until the target is destroyed and the BC orders CEASE FIRE.

(c) When the gunner applies BOT, the BC can act as an observer, observing the first round fired and subsequent burst of fire for deflection and range.

(d) Accuracy of the BOT method of adjustment depends on the ability of the gunner to maintain correct sight pictures and make precise observations. To engage moving targets accurately using BOT, the gunner must continuously track before, during, and after the engagement.

(2) *Tracer on target.* TOT is similar to BOT. As the name implies, the gunner or BC firing the 25-mm or coax machine gun, or the squad member firing the firing port weapon adjusts the strike of the rounds onto the target area based on the tracers.

(3) *Adjustment techniques.* The gunner and BC can announce adjustments using any of the following methods:

(a) Target form adjustment. Target form is the simplest method of adjustment. One form is the visible height or width of the target. Range adjustments (up or down) refer to the height of the target and azimuth adjustments refer to the target's width. Target form adjustment can be used with the ISU or the auxiliary sights. The word "form" may be added after the announced change or the change may stand alone if target form is the standard adjustment technique in the unit's SOP. Form changes are always given in full or half-form increments.

(b) Mil change. This method is simple and accurate at all ranges but it requires the gunner to know the mil measurements of his reticle. Mil changes are given when using a nonballistic reticle in the ISU.

(c) Meter. This method is used with the auxiliary sight, because the sight is marked in meters. The gunner must know how to read the ballistic reticles, AP and HE, in this sight. This technique can be used with the ISU, but converting meters to mils may cause confusion.

d. **25-mm Point Target Engagement.** The 25-mm gun is primarily an offensive weapon. Types of point targets likely to be encountered on the battlefield are unarmored vehicles, lightly armored vehicles, bunkers, RPG teams, and helicopters. When firing 25-mm point target engagements, the gunner fires a sensing round, two if the ammunition has changed. He announces his observation and adjusts rounds by BOT (Figure 2-25, page 2-34). The gunner

then fires a 3- to 5-round burst on the target. He continues firing bursts until the target is destroyed and the BC commands CEASE FIRE.

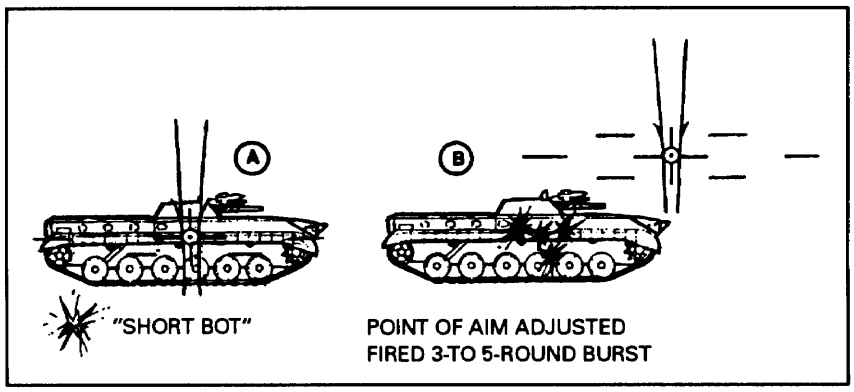


Figure 2-25. Burst on target against point target.

e. **25-mm Area Target Engagements.** One of the Bradley's primary missions is suppression of enemy positions in support of dismounted movement. The HEI-T ammunition, with its 5-meter bursting radius, supports this capability beyond coax range (900 meters) out to 3,000 meters.

(1) Suppressive fire is direct fire used on known or likely target locations to degrade one or more of the enemy's basic combat functions of moving shooting, observing, or communicating. Success is based on suppression—denying the enemy the terrain or observation, and the opportunity to engage. Suppressive fire is repeated as often as needed to keep the enemy from establishing a strong fire base or until the area is cleared of activity. Sustained suppression may require a section to alternate suppressive fire. This parents one vehicle from using all of its ammunition. Area targets may be terrain features, man-made objects, deployed soldiers, or a location defined by enemy fire. The specific enemy units and weapons systems mayor may not be identifiable. Area targets include targets too large for a point engagement or targets that have considerable width and depth requiring extensive traversing of the turet. For example, enemy positions in a tree line or troops on a hilltop dispersed over an area greater than 10 meters.

(2) Accurate range estimation ensures the effectiveness of area free. A sensing round is needed due to the wide engagement band between 900 to 3,000 meters. Beyond 2,000 meters (tracer burnout), the round's slow flight and high angle of fire require the gunner to check his sight picture by firing a sensing round (two if the ammunition has changed) and not move the reticle until the round impacts. This verifies the correct range and aiming point for

the specific engagement. As the range increases, the aiming point on the reticle and round impact will be separated during firing.

(3) To engage an area target with HEI-T, a Z pattern is used (Figure 2-26). After correcting the range by indexing a different range or adjusting the reticle, the gunner lays the reticle on one edge of the target area and commences firing using the standard Z pattern. Once the opposite edge has been reached, a second burst is fired diagonally across the target area to the other corner of the area. Finally, a burst is fired across the far depth of the target covering the entire width. The number of rounds in a burst depends on the size of the target and degree of success (one round for every 10 to 25 meters). Practice is required to engage targets at extended ranges (1,800 to 3,000 meters).

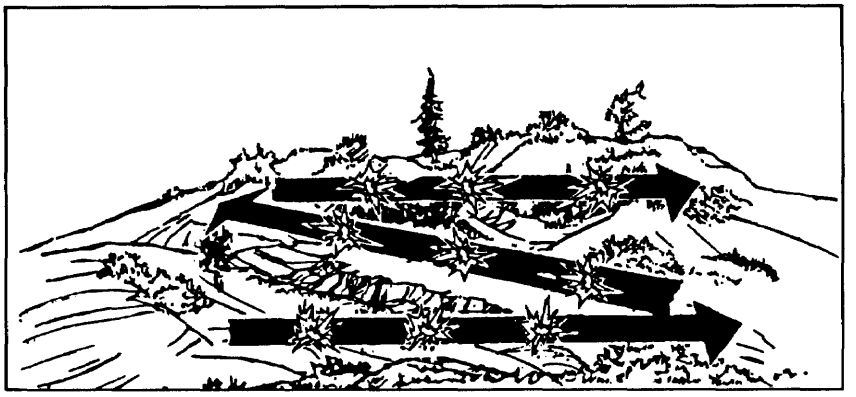


Figure 2-26. HE against area target.

(4) This technique is continued until the BC commands CEASE FIRE.

(5) Additionally, the 25-mm using HEI-T can be used like the coax for designating area or point targets, for causing incendiary fires, or for reconnaissance by fire at ranges from 900 to 3,000 meters (see paragraph 2-8f, below).

f. **Coax Machine Gun Engagements.** The coax machine gun is primarily an offensive weapon. It should be used to destroy unarmored point targets, to suppress area targets, and to conduct reconnaissance by fire. The technique for using coax suppressive fire is similar to that used with the 25-mm weapon system.

(1) *Suppressive fire.* When possible, BFV suppressive fire is accomplished using the coax machine gun at ranges under 900 meters to conserve 25-mm ammunition. Machine gun suppressive fire is usually effective in bursts of 10 to 15 rounds.

(2) *Engagement techniques.* Engagement techniques include point and area target techniques.

(a) Point target technique. Targets such as jeeps, trucks, RPG teams, and ATGMs may be engaged from either a moving or stationary vehicle. For personnel consolidated in a small area (1 to 10 meters), the point target engagement technique is used.

- To engage a point target, the gunner indexes range, does a precise lay on target, and fires an initial burst of 10 to 15 rounds (Figure 2-27). An initial burst should hit as much of the target as possible. The gunner fires additional bursts until the target is destroyed and the BC commands CEASE FIRE.
- If the initial burst is short or long of the target, the gunner adjusts the tracers onto the target. Once on target, the gunner continues to fire bursts until he is commanded to CEASE FIRE.

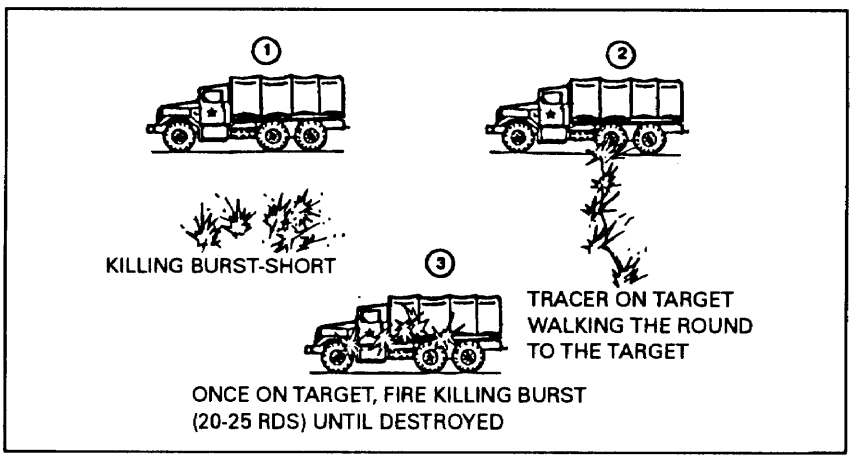


Figure 2-27. Point target technique.

(b) Area target technique. Area targets (see paragraph 2-8) can be engaged from either a moving or a stationary vehicle. For personnel dispersed over a large area (over 10 meters), the area target engagement technique is used (Figure 2-28).

- To engage an area target after correcting the range by adjusting the reticle, the gunner lays the reticle on center mass of the target area and commences firing with an initial burst. Once the range to the target has been confirmed, a second burst is fired horizontally across the front of the target area. The third burst is fired diagonally across the target area. The fourth burst is fired horizontally across the rear of the target area. Upon suppression, the BC will command CEASE FIRE.

Note: During the entire firing sequence, the gunner should be firing 10- to 15-round bursts.

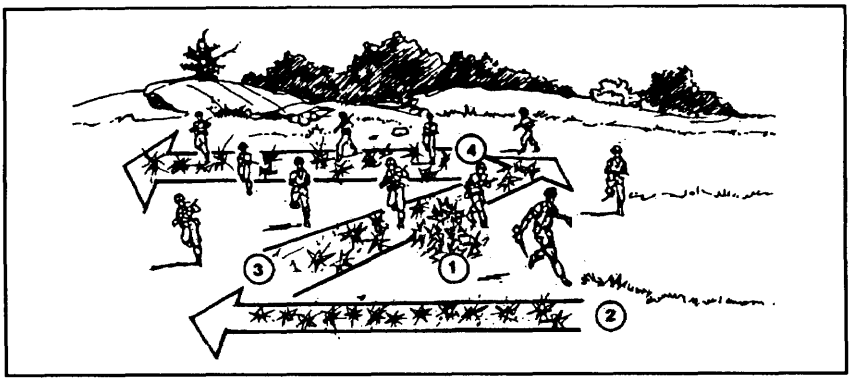


Figure 2-28. Area target technique.

- Movement of the turret and vehicle carries the burst through the target when a narrow frontal area target is presented (Figure 2-29). Round dispersion also helps cover the target width.
- From a stationary vehicle, the gunner must traverse the turret to form the Z pattern.

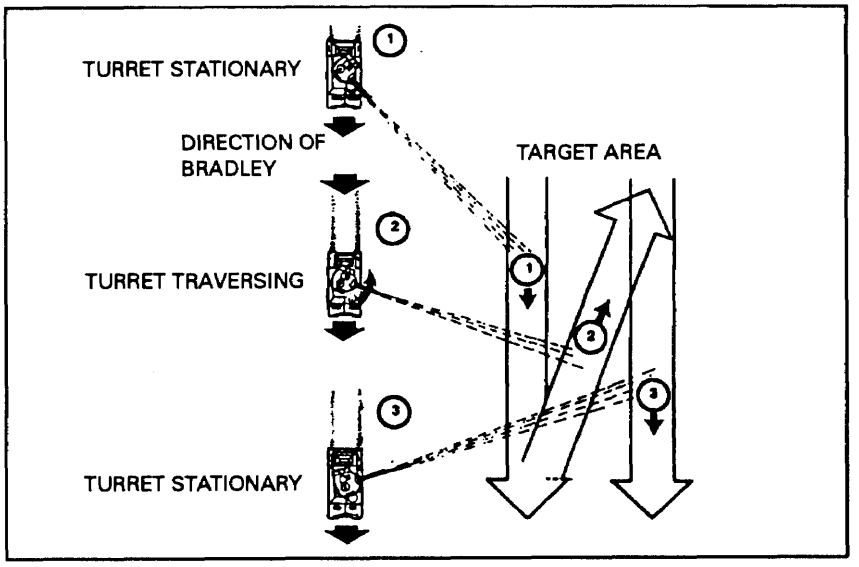


Figure 2-29. Z pattern from a moving Bradley.

(3) *Special uses of machine gun fire.* The coax machine gun can also be used for other purposes, as discussed below.

(a) Reconnaissance by fire. Reconnaissance by fire is used to cause a hidden enemy to react. The gunner fires a single burst while constantly observing for possible enemy movement or return fire. A sensing vehicle and/or dismounted observer must be present to detect any enemy movement or actions. (Figure 2-30.)

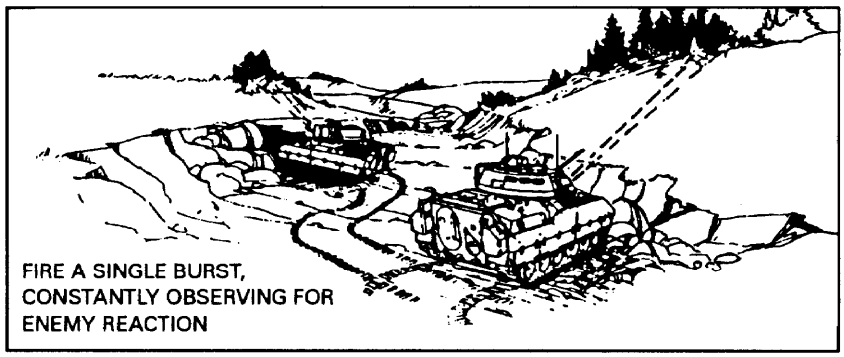


Figure 2-30. Reconnaissance by fire.

(b) Firing through concealment. The coax machine gun can be used to penetrate most concealment used by dismounted personnel—trees, hasty barricades, or lightly constructed buildings. Treat such concealment as a point target. (Figure 2-31.)

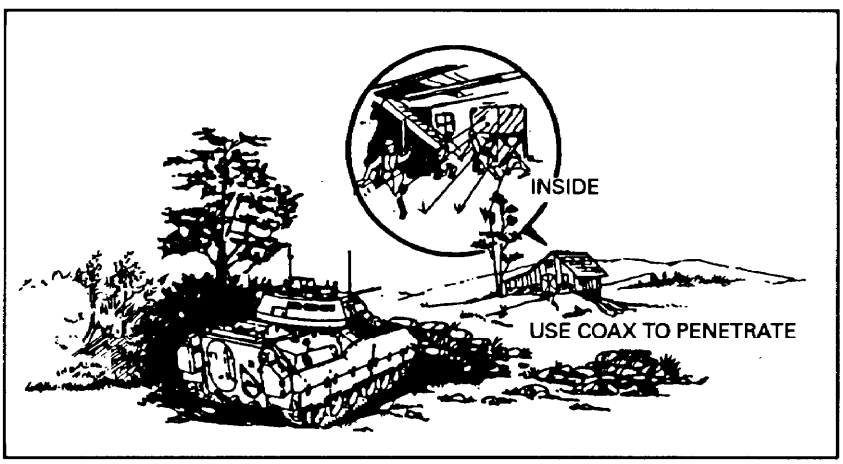


Figure 2-31. Firing through concealment.

(c) Incendiary fire. Machine gun tracer ammunition, particularly armor-piercing incendiary tracer, can set fire to any readily combustible material, such as dry grass, grain, dried brush, or wood. Fire denies a particular area to the enemy, and smoke from a burning field can be used to screen movements (Figure 2-32).

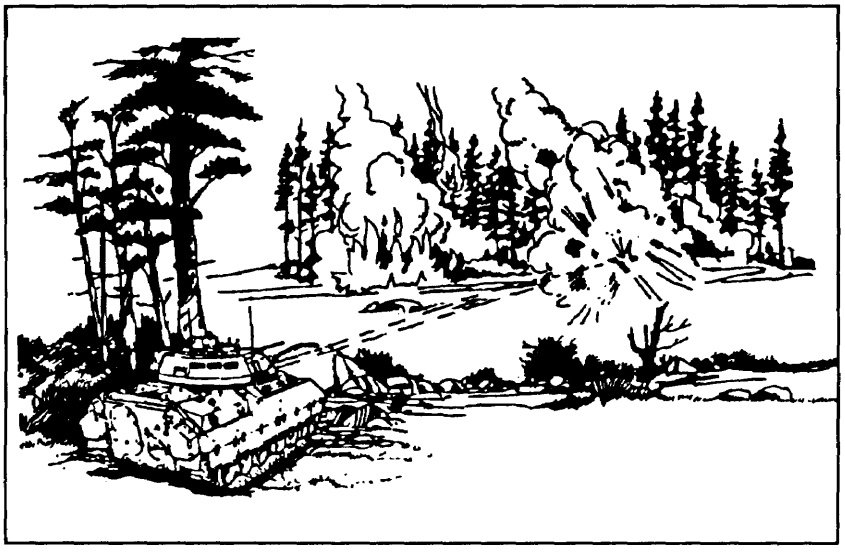


Figure 2-32. Incendiary fire.

g. **TOW Engagements.** The TOW is used against armored and lightly armored vehicles beyond 25-mm capability, at ranges up to 3,000 meters for the basic and 3,750 meters for all other TOW missiles. The Bradley must be stationary when engaging targets with the TOW. The driver and cargo hatches must be closed. The crew must check the vehicle slope indicators to be sure that the vehicle does not exceed the 10-degree slope warning. The gunner must ensure that both ballistic doors of the ISU are open.

(1) Before firing the TOW, the gunner must determine if there are any obstacles between the vehicle and the target that might interfere with the missile. If the target is moving, the gunner must determine if the target will be in sight long enough for the missile to reach it.

(2) The gunner uses the sight to determine if the target is engageable (Figure 2-33, page 2-40). He places the cross hairs on the center-of-target visible mass. If on high manification, the area between the vertical cross hair and the edge of the sight, in the direction of travel, is clear of obstructions, the target is engageable.

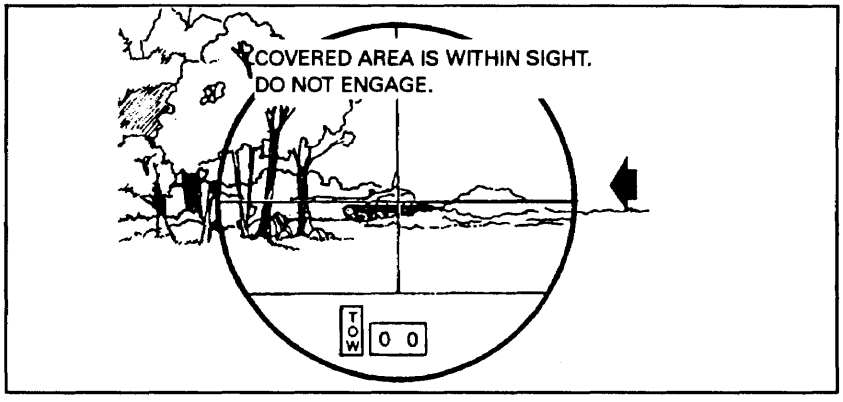


Figure 2-33. Obscured target.

(3) When engaging with the TOW, the gunner's sight picture is as shown in Figure 2-34. The word "TOW" is displayed on the status indicator at the bottom of the FOV.

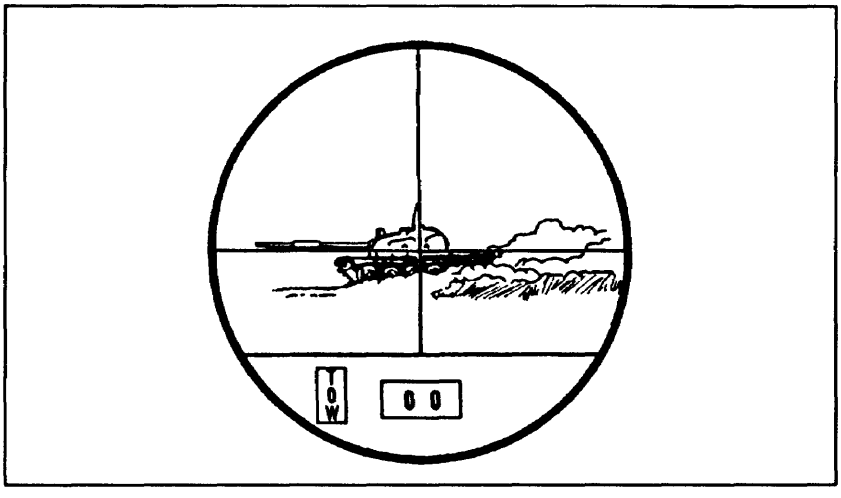


Figure 2-34. TOW sight picture.

(4) When engaging a moving target with a TOW, the gunner must continuously track the target, keeping the reticle cross hairs on the center of mass. GUNNERS DO NOT ATTEMPT TO GUIDE THE MISSILE WHEN IT ENTERS THE SIGHT PICTURE. The TOW 2B flies above the target to kill. Gunners must not change the center-of-mass aim point to guide the missile to the target. A depiction of the missile tracking concept is shown in Figure 2-35.

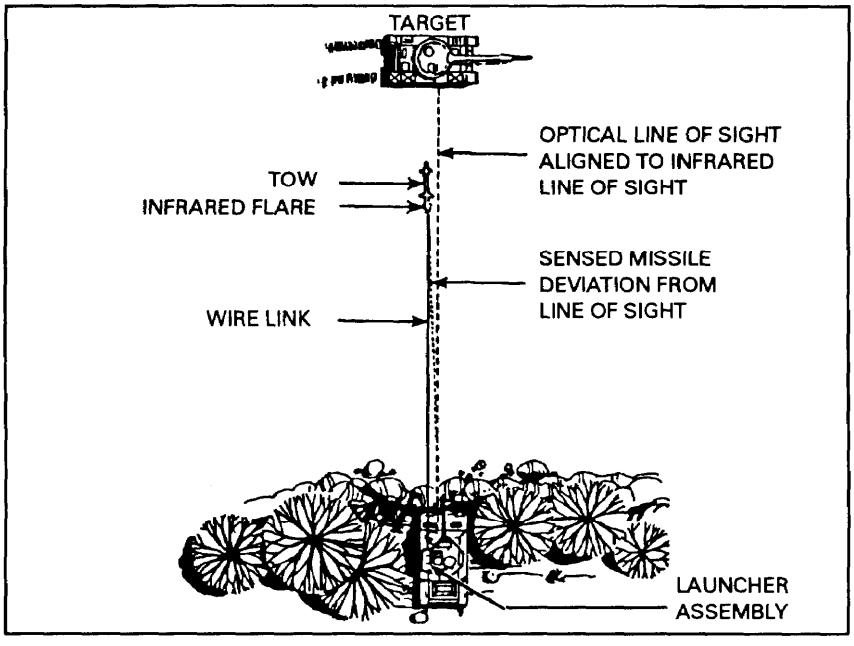


Figure 2-35. Missile tracking concept.

(5) Night engagements require a coordinated crew effort and more detailed planning than day engagements.

(6) When firing over water, the BC should analyze the sector as soon as the position is occupied to determine if water will affect the employment of the TOW.

(a) The various types of TOWs maybe fired over water to a *maximum range* as shown in Figure 2-36, page 2-42, and a *minimum range* as shown in Figure 2-37, page 2-42 (TOW launcher and target at water surface level).

(b) The BC uses Table 2-4, page 2-43, to determine the extended range of missiles when firing overwater (when TOW launcher or target is above the surface level of water).

- He determines the type of missile being used.
- He determines the height above the water surface of the TOW launcher and places a tick mark at the corresponding height in the left-hand column of the table.
- He determines the height above the water surface of the target and places a tick mark at the corresponding height in the right-hand column of the table.

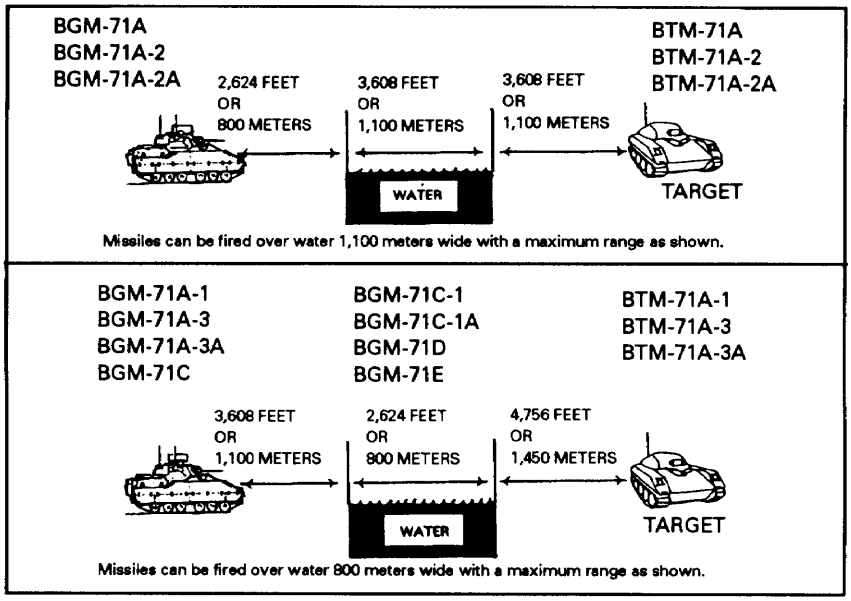


Figure 2-36. Maximum TOW missile range.

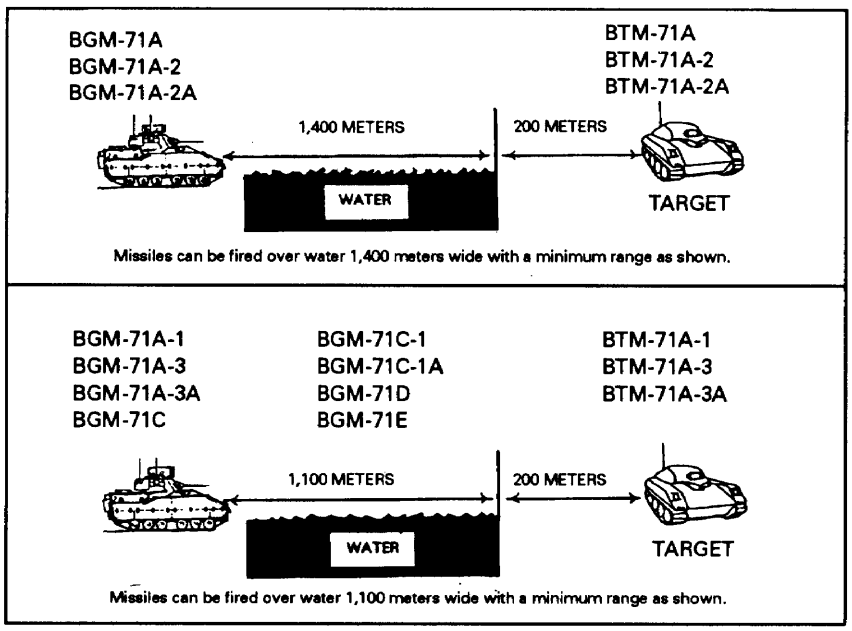


Figure 2-37. Minimum TOW missile range.

- He then connects the two tick marks with a straight line. The point where the lines intersect the center column is the maximum range the missile can travel without getting too close to the water.

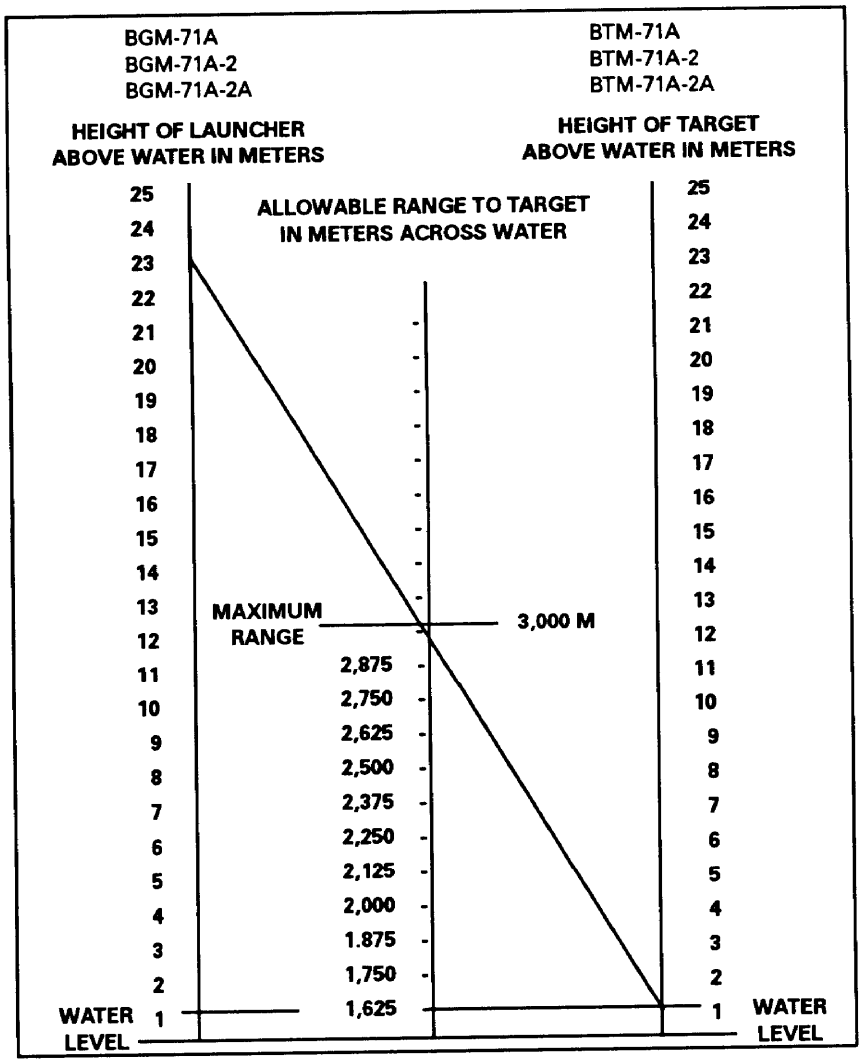


Table 2-4. Extended range over water.

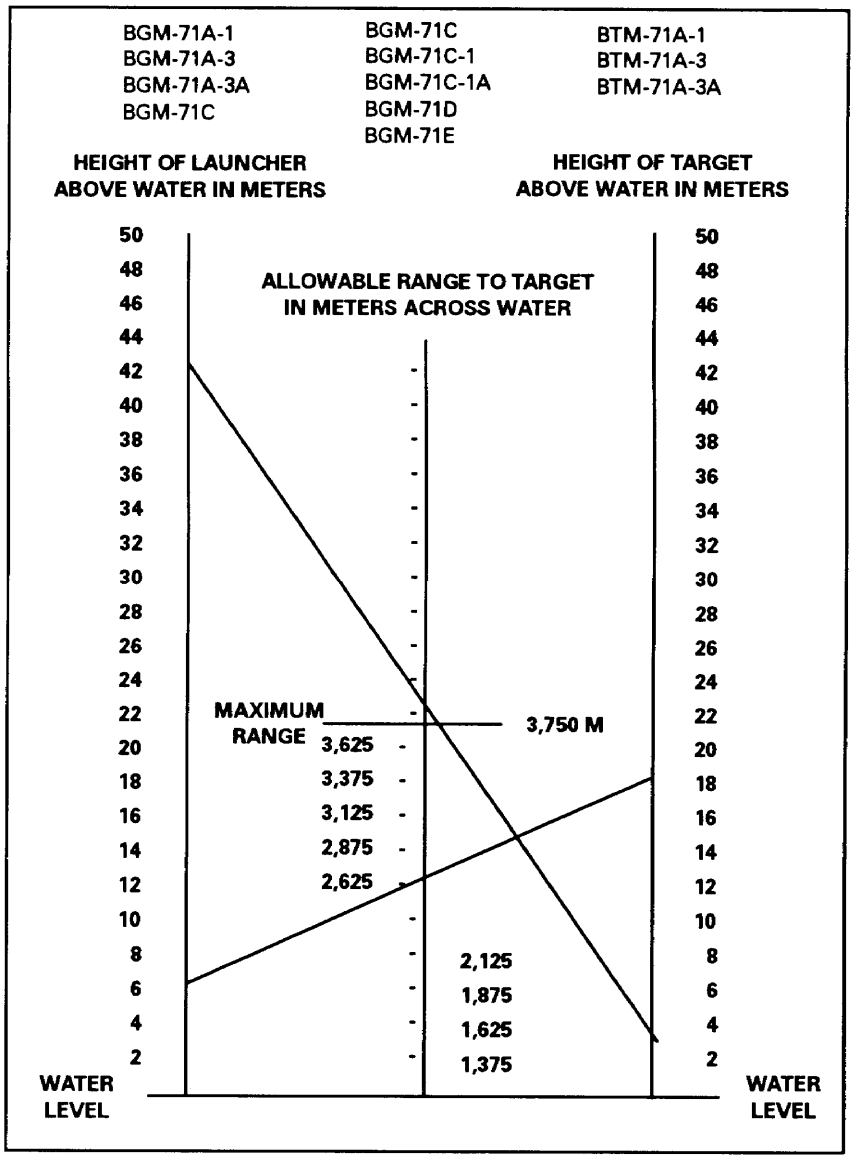


Table 2-4. Extended range over water (continued).

h. **M257 Smoke Grenade launcher Engagement.** To coordinate crew actions when firing the M257 smoke grenade launcher, the following fire command is used in conjunction with specific duties.

(1) While traversing the turret toward the area where the smoke screen is desired, the BC commands GRENADE LAUNCHER to alert the crew that the grenade launcher is to be used.

(2) The BC, after laying the turret, verifies that all hatches and the combat door are closed.

(3) The BC or gunner moves the grenade launcher ON-OFF switch to the ON position; the BC commands either FIRE or FROM MY POSITION and fires the grenades. After the grenades have been fired, he announces GRENADES LAUNCHED. He then issues driving commands appropriate to the tactical situation. The BC can then return to open hatch position to resume target acquisition.

(4) The crew should reload the grenade launchers when they can safely do so. The Bradley should be in an area where no enemy contact is likely before reloading launchers.

i. **Firing Port Weapon (M2 Only) Engagement.** The FPW is primarily an offensive weapon that gives the M2 close-in suppressive fire.

- The FPW is fully automatic.
- The FPW gunner engages targets by guiding tracers into the target area.
- The FPW gunner can engage targets out to 300 meters (tracer burnout).
- The FPW gunner uses TOT adjustment techniques followed by a suppressive burst.

j. **Aerial Engagement.** Proper weapon and ammunition selection for the range and target is the key to success. Table 2-5 shows the weapons and the type of aerial targets that they can destroy.

	FIXED WING		HELICOPTER		
	SLOW	FAST	ARMORED	UNARMORED	PARATROOPER
COAX	YES	YES	NO	YES	YES
HEI-T	YES	YES*	YES	YES	YES
APDS-T	YES	YES*	YES	YES	YES
APFSDS-T	YES	YES*	YES	YES	NO
TOW	YES	NO	YES	YES	NO

*Secondary source if coax is not available or if out of coax range.

Table 2-5. Ammunition employed against aerial targets.

(1) The 25mm gun is effective against slow-moving fixed-wing aircraft and helicopters (Figure 2-38 and Figure 2-39). When using the ADR sight, the gunner indexes 1,800 meters. The APDS-T, APFSDS-T, or HEI-T can be used against slow-moving, fixed-wing aircraft and helicopters. A COntinUOUS burst of 20- to 25-rounds (high rate), using TOT to adjust rounds on target will sustain the volume of fire and kill the target. The APDS-T/APFSDS-T has a higher probability of hit than HEI-T; however, HEI-T has a higher probability of kill. At ranges beyond 1,200 meters, the APDS-T is more effective on helicopters. At ranges less than 1,200 meters, HEI-T is more effective on helicopters.

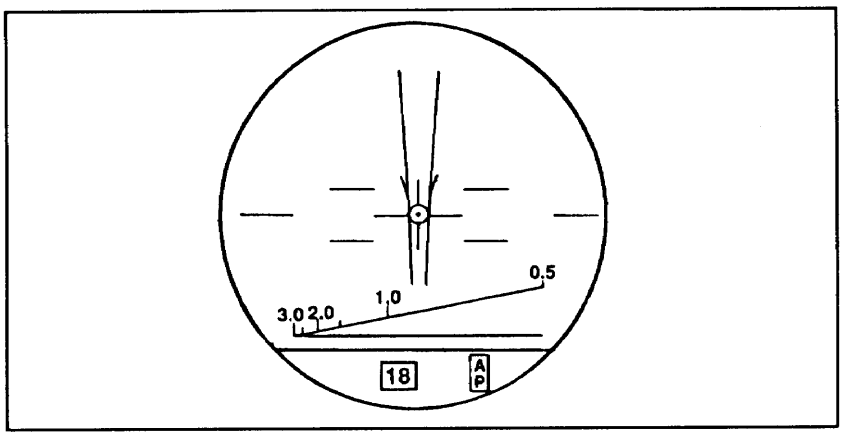


Figure 2-38. Air defense reticle.

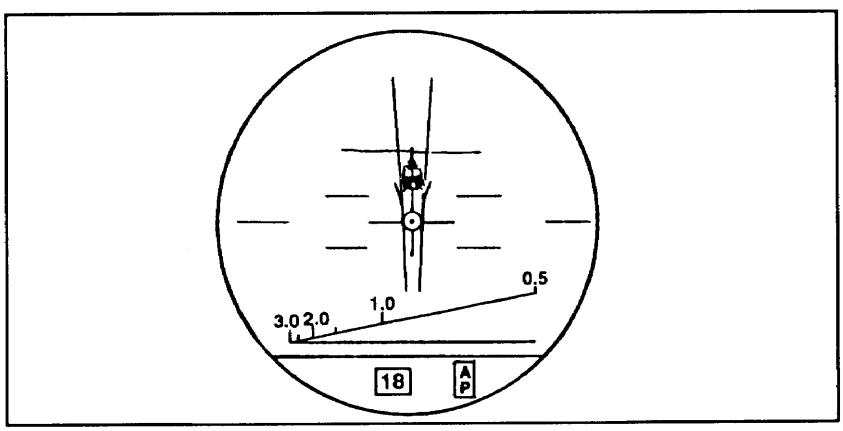


Figure 2-39. Choking a helicopter with the ADR.

(2) The coaxial machine gun is used against fixed-wing aircraft, unarmored helicopters, and airborne troops. It is ineffective against heavily armored helicopters such as the Hind-D. A continuousburnt (50 to 100 rounds) at the aiming point is required and TOT is used to bring rounds on target. As in ground engagements, the coax is effective out to 900 meters.

(3) The TOW weapon system should be used against stationary and slow-moving (up to 80 kilometers per hour) aerial targets beyond 1,700 meters. Beyond 2,000 meters, the 25-mm uses too much ammunition per kill. The TOW should be used against helicopters only when necessary.

(4) The best technique for engaging high-speed aircraft is a controlled burst of coax and small-arms weapons fire from mounted and dismounted elements at a designated point. This can be done by the platoon leader or platoon sergeant with a predetermined command or by the leader initiating fire so that other elements can fire on his tracers. The platoon leader or platoon sergeant needs to apply a 200-meter lead on the approaching aircraft. Fire is directed in front of the aircraft, so that the aircraft flies through the platoon's cone of fire. Gunners DO NOT try to track the aircraft; it flies too fast (Figure 2-40).

(a) If the aircraft is flying directly toward the vehicle, the gunner uses a controlled burst of 50 to 100 rounds. He selects an aiming point slightly above the nose of the aircraft. Thus, the aircraft flies into the cone of fire.

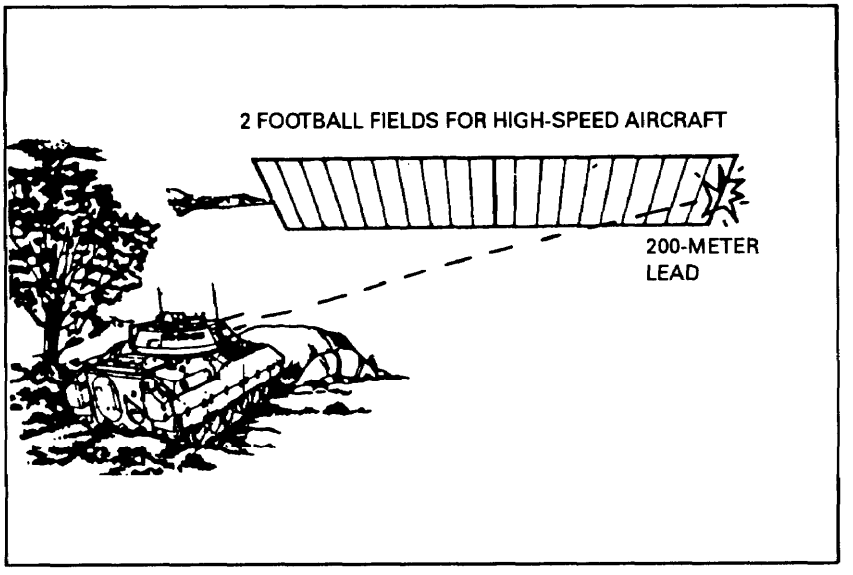


Figure 2-40. Football field technique.

(b) Another technique to engage high-speed aircraft is to pick a reference point or a series of reference points (Figure 2-41). For example, the platoon leader alerts the platoon and as the aircraft nears a reference point, he orders ENEMY AIR, REFERENCE POINT TWO, FIRE. All weapons of Bradleys and dismounted soldiers are fired at a 45-degree angle above the referece point.

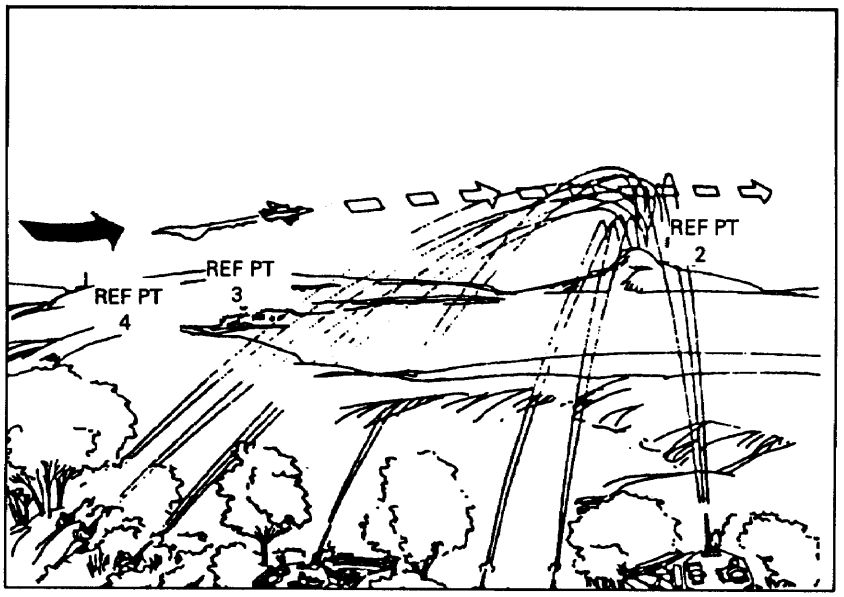


Figure 2-41. Reference point technique.

(5) The rapid rate of fall of paratroopers makes them hard to engage (Figure 2-42). To engage the paratrooper, gunners—

- Use the ISU as the primary sight.
- Use the coax machine gun at ranges under 900 meters. Use the 25-mm (HEI-T) at ranges beyond 900 meters.
- Fire a burst with a lead of two man heights beneath the dropping paratrooper.

If troop—carrying helicopters are sighted, they should be engaged and not the parachuting or rappelling troops.

Note: The helicopter is a better target. The Geneva Convention prohibits the engaging of the aircraft crews if they are parachuting out of damaged aircraft. Paratroopers jumping from a damaged aircraft are not protected while in the air.

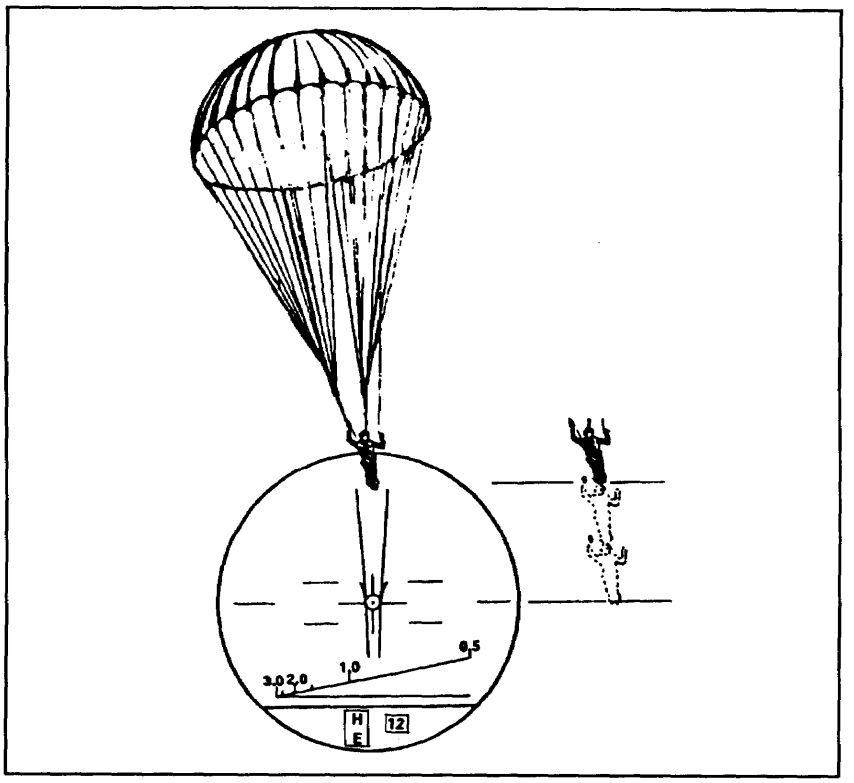


Figure 2-42. Engaging paratroopers.

k. **Engagement Problem Areas.** When a crew misses a target, commanders should consider the following:

- Had boresight and zero been conducted correctly or had the boresight knobs been moved?
- Did the crew get confused trying to engage or during the engagement?
- Was the ammunition dispersion erratic?
- What range was indexed by the gunner?
- On target engagements requiring lead, was it too much or not enough lead?
- Did the gunner and BC know how to use BOT and engagement techniques?
- Was the thermal display adequate or did it look insufficient for normal operation?

2-9. ENGAGEMENT TERMINATION

The BC must determine when to cease fire against a target, when to shift fire against multiple targets, and when to shift from one firing position to another. Target effect may not always be clear and require the BC to make that decision based on indicators of target effects.

a. **Kill Standards.** Kill standards are classified as mobility, firepower, mobility and firepower, and catastrophic.

(1) A mobility kill hinders a vehicle's ability to move under its own power.

(2) A firepower kill hinders a vehicle's ability to use its weapon systems.

(3) A combined mobility and firepower kill hinders a vehicle's ability to move under its own power and hinders a vehicle's ability to use its weapons systems.

(4) A catastrophic kill is a total loss of weapons systems, vehicle mobility, and all on-board equipment.

b. **Armored Vehicles.**

(1) *Kill standard.* Most armored vehicle losses are repairable; nonrepairable losses are the exception. Based on the ammunition and time required to achieve destruction, the minimum standard is to achieve a mobility or firepower kill.

(2) *Kill indicators.* During an engagement, the following indicators may cause the gunner or BC to cease or shift fire to a different target:

- The vehicle stops moving.
- The vehicle stops firing.
- The vehicle is smoking from what appears to be internal damage.
- The vehicle explodes.
- The crew abandons the vehicle.

Note: When an armored vehicle is hit by a 25-mm round (AP or HE) or a TOW missile, an observable explosion with flash occurs. This is the effect of the round impacting on the target, not necessarily an indication of damage to the target.

c. **Unarmored Vehicles.**

(1) *Kill standard.* Threat unarmored vehicles are multiwheeled, which allows them to continue operating with one or more tires punctured. The goal against an unarmored vehicle is to cause a mobility kill or cause the driver and crew to abandon the vehicle.

(2) *Kill indicators.* One or more of the following indicators may cause the gunner or BC to cease fire or shift to a different target.

- The vehicle stops moving.
- The vehicle is smoking

- The vehicle explodes.
- The crew abandons the vehicle.

d. **Dismounted Infantry/Antiarmor Systems.**

(1) *Kill standurd.* Destruction of dismounted point and area targets is difficult to measure. The goal is to neutralize the antiarmor firepower capability of the target either through destruction, damage, or suppression.

(2) *Kill indicators.* When engaging point or area dismounted infantry or antiarmor targets, the following indicators may lead the BC to cease or shift fire:

- The dismounted threat stops maneuvering.
- The dismounted threat's antiarmor fire ceases or becomes noticeably ineffective.
- The antiarmor systems are hit by the 25-mm rounds.
- Dismounted infantry casualties are observed.

Note: When suppressing an area target, the duration of required suppression is based on the METT-T requirements of the situation. Suppression should be maintained as long as the unit gains a tactical advantage by doing so, or until another element can close with the target and destroy it.

Section IV
FIRE COMMANDS

Fire commands are the language of gunnery. When any language is incorrectly used, confusion and misunderstanding will result. All direct-fire engagements begin with a fire command. Fire commands alert the crew to initiate actions. Subsequent fire commands direct the fires of the selected weapon, sustain and control the engagement until the target is destroyed, and end the engagement. Fire commands coordinate the crew's efforts. All variations are derived from the basic seven elements. Fire commands will vary in form, but must include those elements necessary for the crew to select ammunition, determine the target information, and fire the weapon.

2-10. ELEMENTS OF A FIRE COMMAND

The sequence and elements of a fire command are alert, weapon/ammunition, description, direction, range, execution, and termination.

a. **Alert.** The first element alerts the crew of an immediate engagement and who will conduct the engagement.

b. **Weapon/Ammunition.** The second element informs the crew of the weapon and ammunition that is to be used.

c. **Description.** The third element identifies the target for the crew. If there are multiple targets, the BC tells the crew which target to engage first.

d. **Direction.** The fourth element is given to guide the gunner when the BC cannot lay the weapon for direction or elevation.

e. **Range.** The fifth element of a fire command informs the gunner of the range to select. It is also used with the ODS vehicles when the BELRF reports errors.

f. **Execution.** Once the crew responds to the first five elements, the BC gives the sixth element. Before the execution element, the BC reconfirms the target as hostile.

g. **Termination.** The seventh element informs the gunner when to stop firing or shift to another target in a multiple engagement.

2-11. FIRE COMMAND TERMS

Listed below are terms used during direct-fire engagements. These terms are common to all fire commands.

a. **Alert Terms.** Various terms are used in the alert to identify who is to conduct the engagement. For turret weapons, the term "Gunner" is used. For firing port weapons, the terms "Left bank" "Right bank," or "Rear bank" are used.

b. **Weapon/Ammunition Terms.** The following terms are used for selection of weapon/ammunition.

WEAPON/AMMUNITION	ANNOUNCED AS
25-mm HEI-T	HE
25-mm APDS-T, APFSDS-T, TPDS-T	SABOT (pronounced SAY-BO)
25-mm TP-T	HE or SABOT (Announce the type of ammunition that TP-T is simulating.)
M240C coax	COAX
TOW	MISSILE

c. **Description Terms.** Most targets must be designated by using the following terms.

TYPE OF TARGET	ANNOUNCED AS
Tank or tank-like target	TANK

TYPE OF TARGET	ANNOUNCED
Infantry fighting vehicle or armored personnel carrier	PC*
Unarmored vehicle	TRUCK
Helicopter	CHOPPER
Fixed-wing aircraft	PLANE
Personnel	TROOPS
Machine gun	MACHINE GUN
Antitank gun or missile	ANTITANK
Any other target*	(Briefest term possible)

*The term "PC" may be used for most lightly armored targets; for example, self-propelled artillery, self-propelled antiaircraft systems, command and control vehicles, and self-propelled ATGMs. Combination targets, such as a truck-mounted ATGM system, can be identified by combining terms—in this case, ANTITANK TRUCK. The BC may announce MOVING as part of the description element.

d. **Direction Terms.** These terms are used to guide the gunner's aim into the target area.

(1) *Traverse.* This method is used when targets are outside the gunner's field of view and the BC cannot, or chooses not to, lay the gun for direction. The BC commands TRAVERSE RIGHT (or left). The gunner traverses rapidly in the direction commanded. As the gunner nears the targey, the BC commands STEADY, and the gunner slows his traverse. When the gunner is laid on the target, the BC announces ON. The gunner stops traversing because the target should be in his field of view. If the target is not in the field of view, the gunner searches the target area until he can identify the target or the BC issues a subsequent direction correction.

(2) *Shift.* This term is used when two or more targets are visible at the same time through the ISU. The BC commands SHIFT LEFT (RIGHT), PC. The gunner immediately shifts to the next target in the subsequent command and engages.

(3) *Reference point and deflection.* The reference point must be easily recognized by the gunner. The BC uses his binocular to measure the deflection from the reference point to the target and announces the necessary shift. For example, the command might be REFERENCE POINT, BRIDGE, RIGHT THREE ZERO. The gunner lays the reticle of the sight on the reference point, estimates 30 mils, and traverses right 30 mils and tries to identify the target.

(4) *Range card data.* During limited visibility conditions when the BC cannot see the target, he uses range card data to give the gunner the deflection,

elevation, and range (see Appendix E). The BC uses the defection from the range card and commands DEFLECTION. The gunner lays the turret for direction using the turret azimuth ring and repeats the deflection reading to the BC. The BC then uses the elevation from the range card and commands ELEVATION. The gunner, using the gun elevation indicator and pointer, lays the weapon for elevation and repeats the elevation reading to the BC. Then, the BC uses the range setting from the range card and commands RANGE. The gunner indexes the range and repeats it to the BC.

e. **Range Terms.** Range is announced in 200-meter increments corresponding to the settings on the range select knob. If the range is an odd number, it is rounded off to the lower hundred meter range. Rounds that fall short of a target are easier to sense. Examples of announced range include the following.

RANGE	ANNOUNCED AS
900 meters	EIGHT HUNDRED OR EIGHT
1,200 meters	ONE TWO HUNDRED, TWELVE, OR TWELVE HUNDRED
3,040 meters	THREE THOUSAND OR THIRTY

Note 1: As long as the crew understands the terminology, any of these examples can be used.

Note 2: On ODS vehicles, if the gunner determines the range using BELRF, it is not necessary for the BC to announce the range.

f. **Execution Terms.** There are three terms used to execute the fire command.

(1) *Fire.* The command FIRE tells the gunner to fire the weapon when he has completed his crew duties and has the correct sight picture.

(2) *At my command.* If the BC wishes to delay firing he says AT MY COMMAND. This term is used when a target must be killed at a specific location, or more than one vehicle must shoot at the same time. Examples: The commander determines a BMP is best killed on a bridge to halt the enemy column, or the platoon leader wants to surprise the enemy with cross, depth, or frontal fire.

(3) *From my position.* Normally, the gunner engages all main gun targets. If the gunner is unable to identify or engage the desired target, the BC will engage the target. He says FROM MY POSITION, makes the final precise lay, says ON THE WAY and fires. When the gunner is able to resume

his duties, the BC should return control to him. Once the hand off is completed, the BC gives the gunner the command FIRE.

g. **Termination Terms.** To terminate an engagement, the BC commands—

- CEASE FIRE. This terminates the engagement.
- CEASE TRACKING. This terminates a missile engagement.

h. **Response Terms.** Additional response terms must be used in fire commands are as follows.

(1) *Identified.* The gunner uses this term to inform the BC that he has located the target(s) stated in the fire command. "Identified" stated by itself indicates to the BC that the gunner has confirmed the target is as stated in the description. If not, the gunner will state "Identified" followed by friendly, friend in sector, neutral, or doubtful.

(2) *Cannot identify.* This term informs the BC that the gunner cannot find the target. The BC must either re-lay the weapon or engage the target.

(3) *Cannot engage.* This term informs the BC that the gunner can identify the target, but is unable to conduct the engagement.

(4) *On the way.* This term informs all crew members that a weapon is being fired, alerting them to observe the round.

i. **Repeat Terms.** When a crew member fails to hear or understand a part of the fire command he announces the element in question. For example, if the gunner says "Ammo". The BC repeats only the ammunition or weapon element.

j. **Correction Terms.** To correct an error in a fire command, the BC commands CORRECTION and corrects only the element in error. For example, GUNNER HE, TRUCK, ONE SIX HUNDRED. CORRECTION, ONE EIGHT HUNDRED, FIRE.

2-12. FIRE COMMAND METHODS

Precision and battlesight are the two basic types of fire commands. The precision fire command is the most accurate method to engage a target. The battlesight fire command is the fastest method to engage a target.

a. **Precision Fire Command.** Precision fire commands are used in defensive engagements when the Bradley has the advantage of time, distance, and the Bradley is protected until exposing the turret for the engagement. Time is used to lay the turret weapons on target, to determine range, to issue a fire command (except the execution and termination elements), and to adjust the fire control system. (The BELRF, on the ODS vehicles, will transfer the range determination duty to the gunner.)

(1) The BC determines the range and announces it to the gunner who indexes the announced range.

EXAMPLE 1

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"SABOT"	
Description	"PC"	
Direction (optional)		
Range	"ONE SIX HUNDRED"	
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

EXAMPLE 2

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"COAX"	
Description	"TROOPS"	
Direction (optional)		
Range	"SIX HUNDRED"	
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

(2) If the BC wants the gunner to determine the range, he commands RANGE. The gunner immediately initiates range determination procedures once he has detected the target. When the gunner has determined the range, he announces "Identified" and the range. The BC commands FIRE. The gunner indexes the range, then announces "On the way."

EXAMPLE

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"HE"	
Description	"TRUCK"	
Direction (optional)		
Range	"RANGE"	
		"IDENTIFIED"
		"ONE FOUR HUNDRED"

ELEMENT	COMMANDER	GUNNER
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

(3) For the ODS vehicles with the BELRF and BCIS systems, precision fire commands are altered. Before engaging the target, the gunner discriminates that the target is a threat and that no friend or friend in sector signal has been received by the BCIS system. He uses the BELRF to laze on the target. If the gunner has received the range and discriminated the target he replies to the BC's fire command with "Identified."

EXAMPLE

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"SABOT"	
Description	"PC"	
Direction (optional)		
Range		
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

Note 1: If the BELRF returns an error code or receives a multiple return, the gunner tries to laze on the target again. If this does not eliminate the problem, the gunner announces "Range." This will require either the BC or gunner to apply range determination procedures and the gunner to induce range manually into the fire control system.

EXAMPLE

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"SABOT"	
Description	"PC"	
Direction (optional)		
Range		"RANGE"
	"ONE TWO HUNDRED"	
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

Note 2: If either a "friend" or "friend in sector" signal is received by the BCIS, the gunner will reply with "Identified friend" or "Identified friend in sector." The commander will immediately command CEASE FIRE, and the crew will repeat the acquisition process.

EXAMPLE

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"SABOT"	
Description	"PC"	
Direction (optional)		
Range		
		"IDENTIFIED FRIEND"
Execution		
Termination	"CEASE FIRE"	

b. **Battlesight Fire Command.** Battlesight fire commands are used during offensive operation where speed and accuracy are required. In the fire command, the word "battlesight" replaces the ammunition/weapon and the range element. The target description identifies which battlecarry ammunition and range is used, for example, PC = sabot, 1,200 meters; or troops = coax, 600 meters. When the auxiliary sight is used, the range line aiming point is the same as the battlecarry range in the ISU.

EXAMPLE 1

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"BATTLESIGHT"	
Description	"PC"	
Direction (optional)	"TRAVERSE RIGHT"	
Range		
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

EXAMPLE 2

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"BATTLESIGHT"	
Description	"TROOPS"	
Direction (optional)		
Range		
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

c. Subsequent Fire Command. The BC uses his observations to formulate subsequent fire commands to adjust the gunner's firing. The alert and execution are required. Range or deflection elements are announced as necessary to direct the gunner.

(1) *Alert.* The BC announces his range observation as the alert (for example, SHORT). This also notifies the gunner that a subsequent fire command follows.

(2) *Range correction.* If the round goes over the target, he subtracts range; if short, he adds range. A correction more than 200 meters may require the gunner to index a different range in the ISU or the auxiliary sight. Range errors under 20 meters are best adjusted by target form.

(3) *Deflection correction.* The deflection correction is based on the BC's deflection observation. If the round goes to the left of the target, his correction is to the right. Deflection corrections may be given in mils or target forms.

(4) *Execution.* The BC completes the subsequent fire command with the command of execution, FIRE.

2-13. TOW FIRE COMMAND

The TOW fire command is used to engage enemy tanks and other targets beyond the range of the 25-mm gun. Normally, the Bradley remains protected and fires from defilade. The word "missile" is always the ammunition element and no range element is needed.

EXAMPLE

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"MISSILE"	
Description	"TANK"	
Direction (optional)		

ELEMENT	COMMANDER	GUNNER
Range		
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE TRACKING"	

Note: The only term that may change is the description term. Other terms such as "PC, " "Chopper," or "Bunker" maybe used.

2-14. FIRING PORT WEAPON (M2 ONLY) FIRE COMMAND

There are six firing port weapons on the basic Bradleys on three separate banks; two on the ramp of the M2A2. The BC or FPW gunner identifies a target and issues a fire command.

EXAMPLE

ELEMENT	COMMANDER	FPW GUNNER
Alert	"LEFT BANK" (LEFT REAR/RIGHT REAR)	
Weapon/Ammunition		
Description	"TROOPS"	
Direction (optional)		
Range	"TWO HUNDRED"	
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

2-15. MULTIPLE TARGET ENGAGEMENT

In combat, Bradley crews will be required to engage multiple targets. These engagements will require speed and accuracy to suppressor destroy all targets. The BC must prioritize the targets by threat levels, and the gunner must identify all targets before the engagement begins.

EXAMPLE 1

Moving to a battle position, the BC acquires two BMPs to the front. While 1aying the turret for direction, he issues a fire command.

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"BATTLESIGHT"	
Description	"TWO PCS, LEFT PC"	

ELEMENT	COMMANDER	GUNNER
Direction (optional)		
Range		
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
		"SHORT, BOT"
Termination	"CEASE FIRE"	
Description	"RIGHT PC"	
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

Note: Only the description execution, and termination were needed to complete the engagement.

EXAMPLE 2

In the battle position, the BC acquires one tank and one BMP to the front. While laying the turret for direction, he issues a fire command.

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"MISSILE"	
Description	"TANK AND PC, TANK"	
Direction (optional)		
Range		
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE TRACKING"	
Weapon/Ammunition	"SAMBOT"	
Description	"PC"	
Range	"ONE TWO HUNDRED"	
Direction	"SHIFT LEFT"	
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

Note: The weapon/ammunitiom description range, execution, and termination were necessary for continuing this engagement.

EXAMPLE 3

While moving, the BC acquires one BMP and dismounted infantry to the front. While laying the turret for direction, he issues afire command.

ELEMENT	COMMANDER	GUNNER
Alert	"GUNNER"	
Weapon/Ammunition	"BATTLESIGHT"	
Description	"PC AND TROOPS, PC"	
Direction (optional)		
Range		
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY" "LEFT ONE"
Termination	"CEASE FIRE"	
Weapon/ammunition		
Description	"TROOPS"	
Range		
		"IDENTIFIED"
Execution	"FIRE"	
		"ON THE WAY"
Termination	"CEASE FIRE"	

2-16. INFANTRY PLATOON AND SCOUT SECTION FIRE COMMANDS

The platoon leader uses two processes, in varying degrees, to control fires—fire planning and fire commands. He decides how to control fires based on the situation and the time available to plan and prepare. Thus, in a meeting engagement or in a movement to contact when time to plan and prepare is limited, the platoon leader initiates fires with a fire command. During the fight, fires are controlled by fire patterns as specified in the platoon SOP (orally transmitted unless otherwise specified). In a prepared defense, with several days to plan and prepare, the platoon leader initiates the fight with a fire command or an event (enemy crossing a trigger line). He relies on detailed planning and preparation to distribute fires during the fight. Further fire commands may be required, but the object of the planning phase is to anticipate events and coordinate fires before the fight starts. A well-planned

defense requires minimum platoon radio net traffic during execution; termination, trigger points, priority engagement and targets are established in advance.

Note: Use of fire commands is based on knowledge of the enemy, and time available to plan, prepare, and rehearse.

a. Standardized platoon fire commands must be established by unit SOP and practiced by platoon leaders and platoon sergeants for proficiency. Using a standard format for a platoon fire command ensures that all essential information and control measures are given in minimum time. Even during adverse conditions, a standard format causes positive reaction by the unit. Brevity and clarity are essential, Abbreviated methods for identifying target locations are encouraged; however, everyone must know the meaning of the abbreviations.

b. Coordinating instructions or additional information may be given by the platoon leader to individual BCs; this information is not part of the platoon fire command. When a BC sends a contact or spot report and believes all other BCs in the platoon received the report, the platoon leader issues only the elements needed to complete a fire command. In all cases a crew has the freedom to engage a target without a platoon fire command if it is under immediate threat.

c. A standard platoon fire command may include as many as eight elements in the following order: alert, weapon or ammunition, description location, range, control, execution, and termination. The battlefield situation or platoon SOP dictates the number of elements used in a fire command.

ALERT	“Red, this Red Six.”
WEAPON or AMMUNITION (optional):	"TOW”
DESCRIPTION:	“Four tanks and three BMPs.”
LOCATION (optional):	“East of TRP zero zero four.”
RANGE (optional)	“Two four hundred.”
CONTROL (optional):	“Depth.”
EXECUTION:	“At my command.“
TERMINATION:	“Cease fire.”

d. Below is an example of a spot report given to the platoon leader by his wingman, and the platoon leader giving only those elements necessary to complete the fire command.

“Red Six, this is Red Two, identified two PCs east of TRP zero zero four, one two hundred meters, over. ”

“Red Two, this is Red Six, fire.”

CHAPTER 3

FIRE CONTROL AND DISTRIBUTION

As an integral part of the combined arms team, the BFV infantry platoon provides dismounted infantry and supporting direct fires at the necessary point on the battlefield. Destroying or suppressing the enemy with direct fires is essential to all combat operations. Leaders control the fires of BFV crews, automatic riflemen, antiarmor gunners, grenadiers, riflemen, and available fire support assets to achieve a desired effect on the enemy and prevent friendly and civilian casualties. The platoon can only perform effective fire control and distribution through fire planning (from SOP to detailed) and rehearsals.

3-1. PRINCIPLES OF FIRE CONTROL AND DISTRIBUTION

To maximize the platoon's ability to engage the enemy, leaders must synchronize the fires of all direct-fire weapons and indirect-fire assets. The BFV infantry platoon achieves fire control and distribution through fire plans (detailing control and distribution measures) and fire commands. When developing, refining, and executing fire plans, leaders apply the following principles: task-organize, destroy the greatest threat first, employ the best weapon for the target, avoid overkill, minimize exposure, plan for limited visibility, prevent fratricide and civilian casualties, and develop contingencies for diminished capabilities. Ultimately, the fire plan integrates the platoon's fires to support the commander's fire plan and intent.

a. **Task-Organize.** The BFV infantry platoon consists of four BFV crews and two squads, which the platoon leader task-organizes based on METT-T conditions. In the offense, the platoon normally organizes into two sections, each has two BFVs and a rifle squad (mounted or dismounted). Occasionally, the platoon organizes as two mounted sections supporting the maneuvering dismounted squads. When defending, the platoon leader positions four BFVs and two squads, including the dismounted antiarmor missile systems. Additionally, leaders consider the capabilities and limitations of individual soldiers and crews when determining task organization. In both offense and

defense, the platoon leader and platoon sergeant position themselves (mounted or dismounted) where they can best lead the platoon.

b. **Destroy the Greatest Threat First.** Normally, the platoon engages the enemy in relation to the danger it presents. This is determined by the threat type, range, and by the visibility conditions. Leaders determine the specific threat conditions from command guidance based on the operational area.

c. **Employ the Best Weapon for the Target.** The platoon has many weapons with which to engage the enemy. Using the appropriate weapon for the threat increases the probability of rapid enemy destruction and saves ammunition. Normally, BFVs engage enemy fighting vehicles, while squads concentrate on engaging the close dismounted threat. Probability of hit and kill, as determined by threat type and range, determine with which weapon to engage the enemy. (See Chapter 2, Table 2-1.)

d. **Avoid Overkill.** Using too many weapon systems against a single target wastes ammunition and decreases the probability of effectively acquiring and engaging multiple targets. Proper distribution of the platoon's fires prevents duplication of effort on a single target.

e. **Minimize Exposure.** Crews and soldiers increase their survivability by not exposing themselves to the threat, except as required to engage. To minimize their exposure, crews find and use natural and man-made defilade; dismounted soldiers seek cover and concealment. Additionally, only those elements required to engage a target expose themselves from covered and conceded positions.

f. **Plan for Limited Visibility.** The acquisition and engagement abilities of many systems decrease at night. Additionally, fog, smoke, and other obscurants can reduce visibility to such an extent that night observation-equipped systems cannot cover their surveillance responsibilities or engage targets at normal ranges. Leaders plan for normal limited visibility (night and light smoke) and consider likely extreme limited visibility conditions (dense fog, heavy smoke, and blowing sand). A critical element of any limited visibility plan is the coordinated use of dismounted NODs and illumination. Leaders adjust fire plain based on visibility conditions and acquisition capabilities of systems.

g. **Prevent Fratricide and Civilian Casualties.** Leaders use rules of engagement, weapons control status, weapons safety posture, and other control measures to prevent fratricide. Coupled with combat vehicle and aircraft identification training, vehicle recognition markings, position awareness, weapons safety procedures, and BC confirmation, the platoon can avoid causing friendly and civilian casualties.

h. **Develop Contingencies for Diminished Capabilities.** Although leaders initially develop plans based on maximum capabilities, they make

backup plans in the event of casualties or weapon damage or failure. While leaders cannot anticipate or plan for every event, they develop contingencies for probable occurrences.

3-2. FIRE CONTROL AND DISTRIBUTION MEASURES

Leaders apply fire control measures to establish a direct-fire SOP, modify the SOP based on METT-T conditions, and develop detailed fire plans as reconnaissance permits. Fire control and distribution measures are either weapons controlling instructions or physical control measures (Figure 3-l). Fire control and distribution measures musy be concise, simple, and clear.

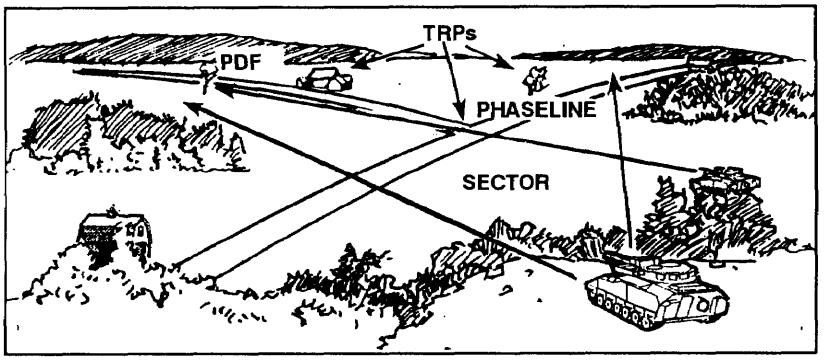


Figure 3-1. Physical control measures.

a. **Target Reference Point.** A target reference point (TRP) is an easily recognized, visible point on the battlefield used to control direct fires. For offensive operations, leaders plan TRPs on easily identified terrain features. During movement, halts, and hasty actions, leaders establish and adjust TRPs based on visible terrain. In the defense, leaders assign TRPs along likely enemy avenues of approach, where they want elements to mass fires. By designating TRPs as indirect targets, TRPs can also serve to call for and adjust indirect fires. Units designate TRPs as required to support their engagement plan.

b. **Sector of Fire.** A sector of fire is a designated area used to assign acquisition and engagement responsibility. For the direct-fire SOP, leaders designate sectors by clock direction and ensure sectors overlap for complete coverage. Leaders assign sectors on the ground by reference point. Additionally, leaders designate secondary sectors of fire to provide increased mutual support not provided by primary sectors.

c. **Primary Direction of Fire.** A primary direction of fire (PDF) is a designated direction or location used to orient an element, weapon system, or soldier to a particular area on the battlefield. Leaders designate PDFs when assigning a sector is inappropriate due to limited time or insufficient reference points.

d. **Phase Line.** A phase line is an observable linear feature used to control movement and fires. A trigger line is a phase line used to initiate fues or key movement. Leaders use phase lines to distribute fires in depth within a sector. Any prominent natural or man-made feature (ridge, stream, road, railroad track) makes a good phase line.

e. **Rules of Engagement.** Rules of engagement (ROE) are instructions that specify the limitations and circumstances when forces may engage. Factors influencing the ROE are national command policy, mission and commander's intent, operational environment, and law of war. ROE always recognize the soldier's right of self-defense. ROE clearly express the circumstances when a soldier may fire, the use of warning shots (normally not desired), the definition of a combatant, and the treatment of noncombatants.

f. **Weapons Control Status.** Weapons control status is an instruction that outlines the target-identification-based conditions when elements may engage. Leaders set and adjust the weapons control status based on friendly and enemy disposition and the clarity of the situation. The higher the probability of a friendly or civilian engagement the more restrictive the weapons control status (Table 3-1.)

STATUS	ENGAGEMENT CRITERIA
Weapons Hold	Engage only when engaged or ordered to engage.
Weapons Tight	Engage only targets identified as enemy.
Weapons Free	Engage targets not identified as friendly.

Table 3-1. Weapons control status.

g. **Engagement Priorities.** Engagement priorities are instructions that serve three functions: prioritizing the type(s) of enemy to engage first, distributing fires among the various types of targets, and achieving effective use of weapons and ammunition for the type target. In concert with the commander's concept, leaders determine which type(s) of target presents the greatest threat to mission accomplishment; for example, destroying enemy engineer vehicles may best prevent the enemy from breaching an obstacle defended by the platoon. Designating the type target to engage prevents overkill; as an example, one BFV of the section engages enemy fighting vehicles at medium- to long-range, while another BFV suppresses troops at near- to medium-range. Establishing engagement priorities for specific friendly systems ensures effective use of ammunition; for example, leaders designate light-armored vehicles as a BFV engagement priority to prevent a

designate light-armored vehicles as a BFV engagement priority to prevent a squad covering the same avenue of approach from engaging enemy scout cars with dismounted antiarmor munitions until necessary.

h. **Cease-Fire Criteria.** Cease-fire criteria are instructions given to BFVs that prevent overkill and keep the maximum number of systems available to acquire and engage other targets. For example, when both BFVs of a section begin to effectively engage a single target, the platoon leader disengages to scan for other targets.

i. **Fire Patterns.** A fire pattern is a distribution measure to spread the fires of a unit or element between multiple, simultaneous targets. Three basic fire patterns (frontal, cross, and depth) assist the platoon in distributing fires between multiple targets. Fire patterns are changed or used concurrently when necessary to ensure maximum coverage of a threat formation. This may become necessary if the threat adjusts his formation after being engaged.

(1) *Frontal fire.* The platoon leader initiates frontal fire when targets are in front of the platoon in a lateral configuration. BFVs engage targets to their fronts; the left flank BFV engages the left-most target; the right flank BFV engages the right-most target. As the platoon destroys targets, BFVs shift fires toward the center of the enemy formation.

(2) *Cross fire.* The platoon leader initiates cross fire when targets are configured laterally across the platoon's front but obstructions prevent firing to the front. The right flank BFV engages the left-most target; the left flank BFV engages the right-most target. Firing diagonally across an engagement area provides the crew with more flank shots, this increasing the chance of kills and reducing detection if the threat continues to move forward. As the platoon destroys targets, BFVs shift fires toward the center of the enemy and from near to far.

(3) *Depth fire.* The platoon leader initiates depth fire when targets are in a columm or column-like formation. The left flank BFV engages the farthest target, the right flank BFV engages the closest target. As the platoon destroys targets, it shifts fires to the center of the enemy formation.

j. **Engagement Techniques.** Engagement techniques are methods of engaging the enemy to achieve desired target effects, while minimizing friendly exposure. There are a number of techniques that platoons, sections, or squads use to engage the enemy.

(1) *Alternating fire (mounted and dismounted).* The BFVs of a platoon or section or members of the dismounted element alternate fires into an area or onto a specific target. Alternating fires provide constant suppressive fire and hinder enemy acquisition of friendly elements by minimizing individual BFV exposure and presenting multiple points of fire.

(2) *Simultaneous fire (mounted and dismounted).* All BFVs of a platoon, section, or members of the dismounted element fire into their assigned sectors at the same time. Simultaneous fire achieves maximum destructtion and fire superiority.

(3) *Sequence fire (AT4).* A single soldier fires AT4s in sequence, applying engagement corrections for each subsequent round until he achieves the desired target effect. Sequential fire allows the soldier to apply corrections from his previous rounds.

(4) *Pair Fire (AT4).* Two soldiers engage a single target with AT4s; the first soldier announces his range and fires; the second soldier makes range and lead adjustment, then fires. Pair fire allows the second soldier to apply corrections learned from the first soldier's round.

(5) *Volley fire (AT4).* Two or more soldiers simultaneusly fire AT4s at a specific target, as initiated through a fire command. Volley fire puts the most rounds on a target in the shortest time, but it can be ineffectiveif the range is wrong.

(6) *Methods of fire distribution.* Leaders must distribute the fires of their organic weapons to destroy or suppress enemy positions. There are two ways to distribute fire on a target—point fire and area fire.

(a) Point fire. Point fire is directed against a specific identified target such as a machine gun or ATGM position. All weapons are fired at the target. Spreading out the platoon on the ground aids in point fire, because the target is hit from multiple directions. Point fire is not often used, because the platoon seldom encounters a single, clearly identified enemy weapon.

(b) Area fire. Area fire is distributed over a larger area when enemy positions are numerous or less obvious. Each weapon or BFV in the defense or overwatch element is given a specific sector of the target area to fire into. This is done to ensure that the entire target area is covered by fire and observation.

k. **Weapons-Ready Posture.** The weapons-ready posture is ammunition and range selection instruction that allows leaders to prepare systems and soldiers for the most likely engagement. Given an anticipated threat and visibility conditions (terrain and weather), leaders establish the desired weapon, ammunition, and range for each weapon. For BFVs, weapons-ready posture is the battlecarry expressed as the ammunition to select and range to index. For squads, the weapons-ready posture for each soldier or weapon may be different—range set on an M249, ammunition loaded by a grenadier, anti armor weapon carried at the ready. Additionally, the weapons-ready posture affects the ammunition loaded in BFV ready boxes, stowed in ready racks, and carried by dismounted soldiers.

l. **Weapons Safety Posture.** The weapons safety posture is an ammunition handling command that allows leaders to control precisely the safety status of their weapons (Table 3-2). Soldier adherence to and leader supervision of the weapons safety posture prevents accidental discharge of weapon.

SAFETY POSTURE	BFV WEAPONS AND AMMUNITION	SQUAD WEAPONS AND AMMUNITION
Ammunition stowed: "Stow ammo."	25-mm and coax ammunition in shipping cans. TOW missiles stowed in racks. Smoke grenades in shipping cans.	Small-arms ammunition in shipping cans. Grenades in shipping boxes. AT4s and missiles stowed in designated locations in the vehicle.
Ammunition ready: "Fill magazines;" "Load ready boxes and launchers."	25-mm ready boxes loaded. Coax ammunition boxes loaded. TOW missiles in the launcher. Smoke grenades in the launchers.	Magazines filled. Magazines, M249 ammunition boxes, hand and M203 grenades in pouches or vests.
Ammunition locked: " Lock ammo."	25-mm rounds loaded into feeder. Manual safety is ON. Coax ammunition on feed tray; bolt locked forward.	Magazine locked into rifle. All weapons on SAFE.
Weapons ready: "Ready weapons."	25-mm round cycled to the rotor. Coax ammunition on the feed tray; bolt locked to rear. Manual safeties are OFF, ARM-SAFE-RESET switch on SAFE.	Round chambered into rifle. M249 ammunition on feed tray; bolt locked to rear. All weapons on SAFE.
Weapons cleared: "Clear weapons."	Gun feeder removed and cleared. Coax cleared and bolt group removed.	Magazine removed and rifle cleared. M249 cleared and ammunition box removed.

Table 3-2. Weapons safety posture.

m. **Weapons Safety Rules.** Weapons safety rules are weapons handling instructions that apply during combat and training to prevent accidental discharge and injury. While soldiers are responsible for safe weapon's handling, leaders must enforce these rules.

(1) A soldier must always handle a weapon as if it is loaded.

(2) When assuming control of a weapon, the soldier must clear it.

(3) A soldier must never point a weapon at another soldier or orient turret weapons at friendly vehicles or soldiers.

(4) A soldier must never place his hands over the muzzle of a weapon or rest the muzzle pointed at his body.

(5) A soldier must keep his weapon on SAFE unless preparing to fire.

(6) A soldier must adhere to the weapons safety posture directed by leaders.

3-3. FIRE PLANNING

Fire planning is a continuous process that focuses on METT-T conditions. Leaders establish the direct-fire SOP based on probable conditions and capabilities of the platoon. Leaders modify the SOP as METT-T conditions become apparent or change (Table 3-3). During the planning phase of an operation, METT-T analysis yields a template of the enemy and anticipated conditions, which leaders use to alter the SOP and establish mission-specific control measures. When moving temporarily halted, or executing hasty actions, leaders issue instructions to supplement or adjust the SOP to fit current conditions. After reconnaissance, leaders develop an engagement plan-incorporating both direct and indirect fires—that supports the commander's fire plan and intent. The key to execution of any fire plan (from SOP to detailed) is rehearsal.

PERIOD or PHASE	ACTION
Training	Develop and rehearse the direct-fire SOP based on contingencies and capabilities.
Preparation for combat	Establish mission-specific fire control and distribution measures, adjust the SOP, and rehearse.
Movement, halts, and hasty actions	Issue supplemental instructions and talk-through probable engagements as time permits.
Post-reconnaissance	Develop a detailed engagement plan and rehearse

Table 3-3. Fire planning process.

a. **Direct-Fire Standing Operating Procedure.** A well-rehearsed direct-fire SOP ensures quick, predictable reaction by all members of the platoon. (Figure 3-2, page 3-10.) The leader bases each element of the SOP on the capabilities of the platoon and the anticipated conditions. For example, if the contingency area is a desert, with good observation and long engagement ranges, the leader selects extended battlecarry settings for BFVs.

(1) A standard respective position for TRPs allows leaders to quickly establish and communicate their locations. A technique is to always number reference points from left to right—three is usually adequate for a platoon during movement, at halts, and for executing hasty actions.

(2) Leaders use sectors and engagement priorities to ensure target acquisition and distribute fires. A technique is for the platoon leader and platoon sergeant to search and engage primarily near- to mid-range troops, while their wingmen observe for mid- to long-range light armored fighting vehicles.

(3) Leaders set the weapons-ready posture to serve established sectors and engagement priorities. For example, in conjunction with the aforementioned sectors and engagement priorities, the platoon leader and platoon sergeant select HE HI and index 8 for range; their wingmen select AP HI and index 12 for range.

(4) The standing fire pattern enables the platoon to distribute frees during a multiple like-target engagement. A form of frontal fire works well for a majority of situations. The platoon leader and platoon sergeant engage the close, middle targets and subsequently work their way to the outside of the enemy formation. The wingmen the outside targets to their respective fronts, and subsequently work their way toward the inside of the enemy formation.

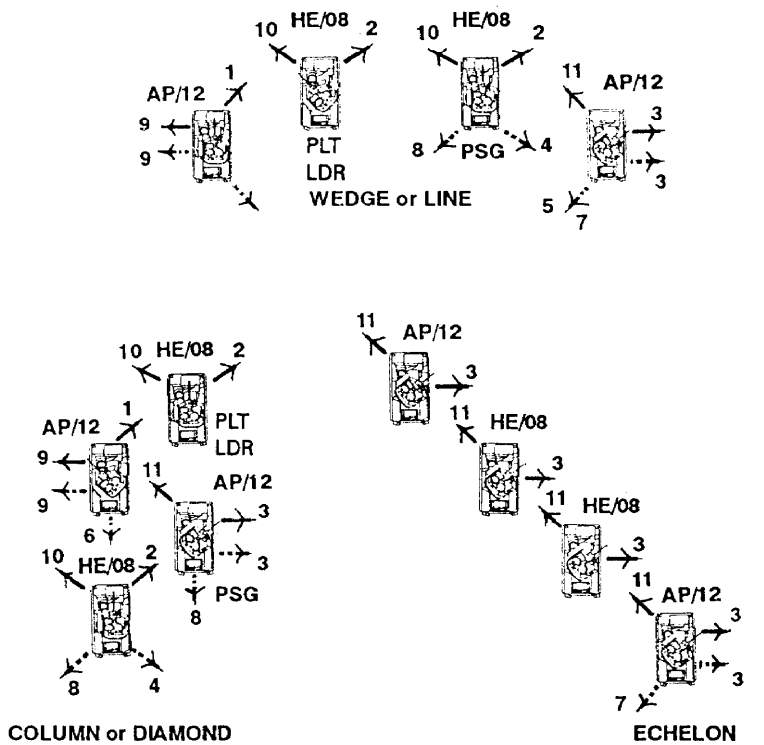
(5) Leaders set the standard engagement techniques to achieve desired target effects, minimize friendly exposure, and conserve ammunition. A technique is for the BFVs to initiate with simultaneous fire, then revert to alternating fires. A squad suppression pattern technique is to initially engage with simultaneous fires, then sustain suppression with alternating fires—each weapon firing a given number of rounds or bursts and leaders filling lulls in fire.

(6) Leaders select an initial weapons control status that allows soldiers to engage the enemy, while minimizing the chance of fratricide. Weapons tight is a good initial weapons control status (Table 3-2, page 3-7).

(7) Leaders set shift signals that are both visual and audible. A technique is to use a green pyrotechnic and codeword to shift fires and a red pyrotechnic and codeword to cease fires.

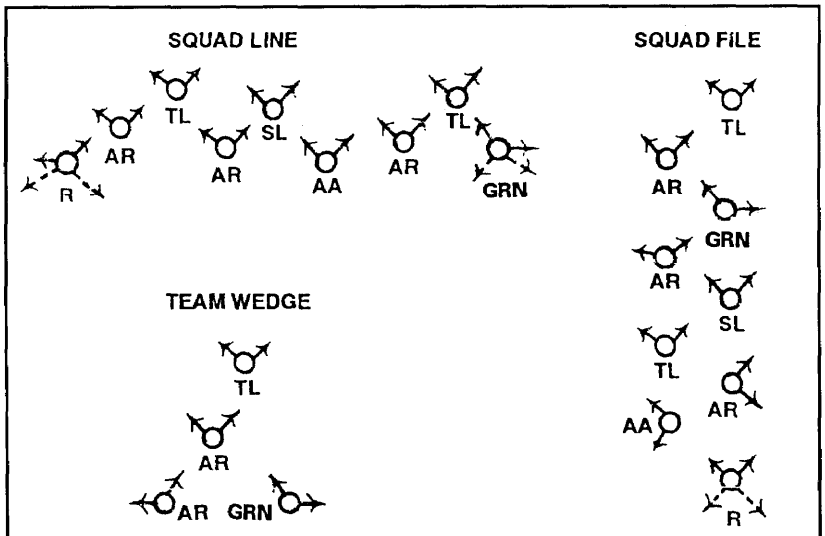
(8) Leaders plan for degraded capabilities and loss. A technique is for one BFV of a section to temporarily assume the responsibilities of a nonmission-capable or degraded BFV of the same section and make permanent adjustments as operational tempo permits. Additionally, if an automatic rifleman or antiarmor gunner becomes a casualty, the assigned backup secures the M249 or dismounted antiarmor weapon and assumes the responsibilities.

Target Reference Points: TRP 1 - left; TRP 2 - center; TRP 3 - right.
Shift Signals: Shift fires - green pyrotechnic and "GREEN HORNET;" Cease fires - red pyrotechnic and "REDMAN."
Weapon Control Status: WEAPONS TIGHT, unless stated otherwise.



Sector of Fire and Weapon-Ready Posture: Per diagram; platoon leader and sergeant—close- to mid-range; wingmen—mid- to long-range; rear-most BFV assumes secondary sector if it is the last BFV in the entire formation.
Engagement Priorities: Platoon leader and sergeant—troops; wingmen—heavy- and light-armored fighting vehicles.
Cease Fire Criteria: Platoon leader or sergeant ceases fire at a target that is effectively engaged by a wingman; platoon leader ceases fire at a target that is effectively engaged by platoon sergeant.
Fire Pattern: Frontal; platoon leader and sergeant—close, middle targets, then toward outside; wingmen—outside targets, then toward inside.
Engagement Technique: Simultaneous fire, then alternating.

Figure 3-2. Example BFV platoon direct-fire SOP.



Sectors: Per diagram.
Weapons-Ready Posture: M249s - 4:1 mix, 500 meters; grenadiers - HEDP, 150 meters; AT4s - 200 meters; riflemen - ball, 300 meters, small aperture; point man - burst.
Suppression Pattern: Initially simultaneous fire, then alternating fire.
Simultaneous fire: M249s - six 5-round bursts; grenadiers - 2 rounds HEDP; riflemen - 20 aimed rounds; AT4s - fired sequentially (hardened targets only).
Alternating fire: M249 No. 1 - three 5-round bursts, then rifleman - 5 aimed rounds and grenadier - 1 round HEDP, then M249 No. 2 - three 5-round bursts, then rifleman - 5 aimed rounds and grenadier - 1 round HEDP; leaders fill lulls in fire.

Figure 3-2. Example BFV platoon direct-fire SOP (continued).

b. **Mission-Specific Measures and SOP Adjustment.** METT-T analysis yields requirements to establish mission-specific fire control and distribution measures and adjust the direct-fire SOP. Leaders indicate physical control measures (such as TRPs, phase lines, and boundaries) on operations graphics and sketches. They assign PDFs for specific elements based on probable enemy locations. Also, they adjust elements of the direct-fire SOP (such as weapons-ready postures, engagement priorities, and sectors) based on new anticipated conditions and the current capabilities of individual soldiers, crews, squads, and systems. For example, the platoon leader selects extended battlecarry range settings for BFVS based on the desert

environment; assigns fighting vehicles at long-range as an engagement priority for a wingman's crew that is the most effective with long-range 25-mm fires, and narrows the sector of a BFV that is operating in the manual mode due to a drive malfunction.

c. **Supplemental Instructions.** As an operation proceeds, leaders issue fire control and distribution instructions based on observed and reported METT-T conditions. Leaders continuously ask themselves the following questions: "What can I use to control fires?" "Where is the enemy likely to come from?" "What friendly units may be in front of me?" Leaders designate and adjust TRPs as the terrain changes. They assign PDFs for elements toward probable enemy locations or avenues of approach. Additionally, they alter the weapons control status for friendly maneuvering units. For example, while moving, a platoon leader designates a road intersection as a TRP, assigns it as the PDF for one section, and changes the weapons control status from *tight* to *hold* as a friendly unit moves in front of the platoon. Leaders ensure their subordinates know the TRPs by pointing out their location as they assign them or previously assigned ones become visible. For example, "Platoon, this is platoon leader. TRP 1 is where the tree line protrudes to the road. Company TRP 2 is the hill to the right of the road. TRP 3 is the first building of the village to our right."

d. **Detailed Fire Planning.** Reconnaissance is the basis for detailed fire plans, and rehearsal is the key to their execution. Commanders conduct detailed fire planning as time permits. (See FM 71-1 and FM 71-2.) In the offense, commanders establish TRPs, assign PDFs, and plan indirect fires based on their reconnaissance. In the defense, commanders integrate direct-fires, supporting obstacles, and fire support to build engagement areas. Commanders tell platoons where to mass fires by designating TRPs. Platoon leaders orient forces on assigned company TRPs, assign additional TRPs as required, and designate approximate positions for BFVs, squads, and dismounted antiarmor missile systems and automatic weapons. Squad leaders orient and assign positions for antiarmor and automatic weapons not directed by the platoon leader and position the remainder of the squad. BCs establish exact fighting positions by observing their assigned TRP from both turret-defilade (scanning) and hull-defilade (engagement) positions. To help identify dead space, leaders have a vehicle move through the sector or engagement area, while BC position BFVs and leaders position dismounted antiarmor weapons. After approving BFV and squad positions, the platoon leader draws a platoon sector sketch based on BFV range cards and squad/section sector sketches. Based on the company fire plan, platoon leaders set engagement priorities, weapons-ready posture, and fire pattern.

Rehearsals (preferably full-scale) ensure subordinates know and can execute the fire plan.

e. **Sector Sketches.** Leaders use sector sketches to confirm coverage of their acquisition and engagement responsibilities, orient subordinate elements, provide information to higher leaders, and control fires. After confirming weapons positions, subordinate leaders prepare a sketch of their engagement plan. (Figures 3-3 and 3-4, page 3-14.) A technique is for all leaders to prepare sector sketches on acetate to a scale established by the commander. Squad/section and platoon sector sketches are similar, with the size of elements shown being the primary difference. The platoon sketch shows BFV, squad, and antiarmor missile positions. Leaders submit their completed sector sketches to the next senior leader. After approval, leaders distribute sketches to their subordinates. Both the platoon leader and platoon sergeant should get copies of the company fire plan. The platoon leader issues copies of the platoon sketch to section leaders and squad leaders. Sector sketches show—

(1) Main terrain features in the sector.

(2) TRPs.

(3) Primary and alternate positions. The squad/section sketch shows BFV and soldier fighting positions.

(4) Primary and secondary sectors of fire and MELs.

(5) Primary directions of fire or final protective lines.

(6) Dead space.

(7) OP(s).

(8) Obstacles.

(9) Indirect fires associated with the engagement plan.

(10) Adjacent element positions.

(11) Remount point(s).

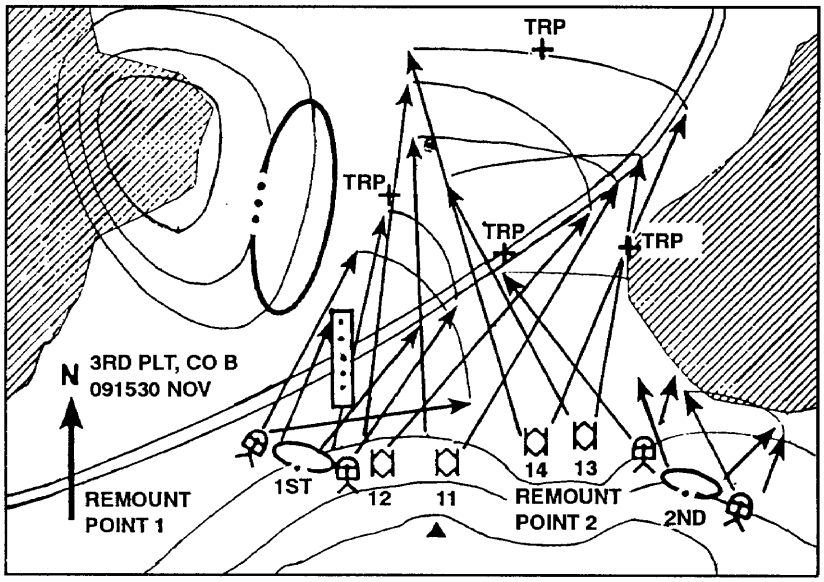


Figure 3-3. Platoon sector sketch.

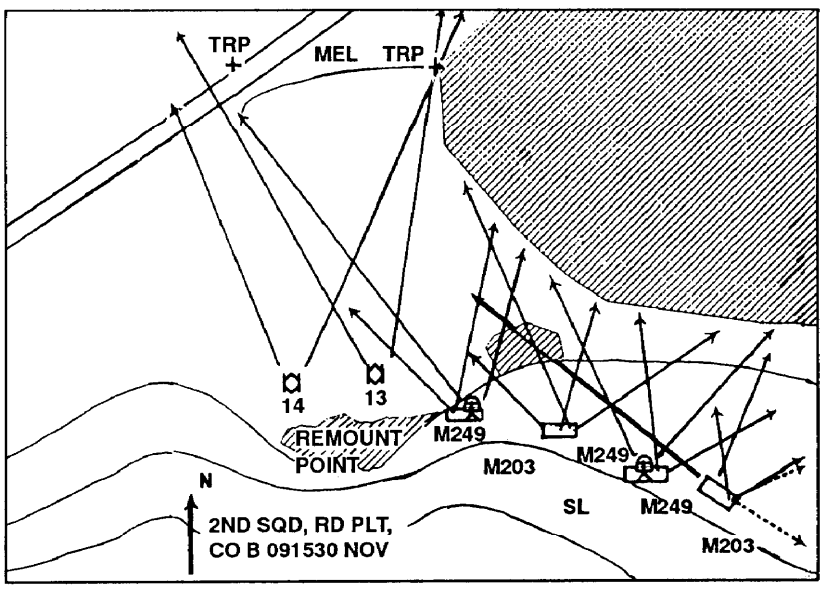


Figure 3-4. Squad/section sector sketch.

CHAPTER 4

WEAPONS SYSTEMS CHECKS AND MALFUNCTIONS

This chapter discusses boresight procedures, zero procedures, prefire checks, malfunctions, and postfire checks. Crews perform boresighting before zeroing to ensure correct alignment of all weapons systems before firing. Crews perform a prefire check on the turret and all turret weapons systems to ensure operation. A thorough prefire check reduces many of the common malfunctions encountered during firing. If a malfunction occurs, the crew tries to clear it. After firing the weapons systems, the crew makes a postfire check.

4-1. BORESIGHT PROCEDURES

Boresighting aligns the ISU and weapons systems to a common point of aim. Boresighting allows easier and quicker zeroing of the turret weapons systems.

Note: Boresight kits must meet the standards of accuracy testing before crews boresight the weapons systems. A kit not meeting the standards is turned into battalion maintenance. Telescopes and adapters that meet the standards are formed into complete kits. Accuracy tests are performed during semiannual services on vehicles or when problems are detected during zeroing. All information about boresight equipment and testing procedures is in Appendix B.

a. There are two methods of boresighting the thermal sight to the daysight—the convenient-target method and the buddy boresight method. The convenient-target method is used during good visibility. The buddy boresight method is used during limited visibility. This procedure can be done only after the 25-mm gun daysight has been boresighted. Both methods are described in detail in TM 9-2350-252-10-2 and TM 9-2350-284-10-2.

b. For restricted or confined areas, like a motor pool, the close-in boresight panel is used to boresight the turret weapons. (See Appendix C for details on the close-in boresight panel.)

c. Crews must boresight the TOW launcher to the TOW reticle (as outlined in the appropriate TMs). Vehicles must have the TOW reticle electronically aligned before the crew boresights the launcher.

d. All turret weapons systems are foresighted before crews fire the Crew Baseline exercise. The weapons are not boresighted again unless the 25-mm receiver is removed, the M240C machine gun is removed, or someone stands on or pulls on the weapons systems from outside of the vehicle.

4-2. ZEROING PROCEDURES

Zeroing the 25-mm gun allows the gunner to confirm the weapons systems boresight and to make adjustments to the sight reticle in relationship to the impact of the round. Where boresighting brings the ISU line of sight and the weapons systems point of aim together, zeroing allows fine adjustment of that alignment. (Information on zeroing procedures is in TM 9-2350-252-10-2 or TM 9-2350-284-10-2.)

a. After boresighting the 25-mm gun must be zeroed in the manual mode. The gunner and BC observe the strike of the round through their primary sights. The gunner lays the reticle on the target and squeezes the manual trigger switch to fire a round. If the strike of the round is observed within the center of the reticle circle, the 25-mm gun is zeroed. If the round is not centered in the sight reticle circle, the gunner adjusts the boresight control knobs to align the reticle with the round impact. The gunner then re-lays the reticle and fires another round. The procedure is repeated until either the 25-mm gun is zeroed or three rounds have been fired. If three rounds have been fired without zeroing the 25-mm gun, the master gunner checks the system to determine if the problem is mechanical. Once the 25-mm gun has been zeroed to the daysight, the crew leaves the gun aimed at the same point on the target and adjusts the nightsight and auxiliary sight reticles to the daysight point of aim. This does not require firing more zeroing rounds. Crews zero using the most accurate ammunition they have. Superelevation is induced in the ISU when switching between HE and AP ammunition. If problems are noted during firing with superelevation, the crew notifies unit maintenance.

b. Zeroing the coax requires the BC and the gunner to work together. As the gunner fires a short burst of 10 to 15 rounds, he uses his primary sight to observe tracer impact on the target. The BC uses his sight extension to observe the impact. After the BC and the gunner have observed the tracer impact, the BC makes adjustments using the azimuth and elevation knobs to move the impact of the rounds to the reticle aiming point. This sequence is continued until the coax is zeroed. The coax zero target should be placed at a range of 800 meters based on the dispersion, the accuracy, and the ability to observe impact.

c. The crew conducts zeroing procedure during BT VI, Crew Practice 2. The crew then confirms zero during BT VII, Crew Practice 3; and BT VIII, Crew Qualification. Confirmation of zero allows the crew to ensure the vehicle's weapons systems have retained their zero. Normally, confirmation requires only one or two rounds. During confirmation, the crew may need to make some adjustments. If adjustments are needed, the crew uses the same steps used in the zeroing process.

Note: After zeroing, M2A2ODS/M3A2ODS crews must ensure that they realign the laser range finder reticle with the gun reticle.

4-3. PREFIRE CHECKLIST

The crew performs prefire checks before conducting live fire. The crew uses a checklist similar to Figure 4-1 and the turret PMCS outlined in TM 9-2350-252-10-2 or TM 9-2350-284-10-2 to reduce vehicle problems on the firing range.

DATE 29 NOV 95 **PREFIRE CHECKLIST** BUMPER NO. A-66

GUNNER CHECKS:	INITIALS BC	INITIALS GNR
1. Ensure before-operations PMCS has been completed on the hull and turret.	CMP	RJN
2. Ensure barrel is LOCKED in (grab barrel and twist, remove muzzle brake plug).	CMP	RJN
3. Ensure receiver is LOCKED in, and the breech is properly lubricated.	CMP	RJN
4. Ensure bolt and track are lubricated, and that the track hook latch is LOCKED.	CMP	RJN
5. Ensure bolt is LOCKED in SEAR.	CMP	RJN
6. Ensure manual SAFE is on.	CMP	RJN
7. Time and install feeder.	CMP	RJN
8. Ensure BPI is LOCKED in SEAR.	CMP	RJN
9. Ensure straight drive shaft is LOCKED in.	CMP	RJN
10. Ensure power cable is properly attached and SECURELY fastened.	CMP	RJN
11. Ensure feeder handle LOCKS in place without resistance.	CMP	RJN
12. Ensure AP/HE feed and link eject chutes are secure (front, back, top, and bottom).	CMP	RJN
13. Ensure sear retractor is in the OUT position (flush with receiver).	CMP	RJN
14. Ensure feed shaft stops are not PROTRUDING or BENT.	CMP	RJN
15. Ensure feed select solenoid operates manually.	CMP	RJN
16. Manually cycle the M242, 25-mm gun in AP/HE.	CMP	RJN

Figure 4-1. Example of a prefire checklist.

DATE 29 NOV 95 **PREFIRE CHECKLIST** BUMPER NO. A-66

GUNNER CHECKS:	INITIALS BC	INITIALS GNR
17. Ensure feed select solenoid operates properly in power mode (select AP/HE SS, LO, HI).	CMP	RJN
18. Power cycle M242, 25-mm gun in AP/HE. Use gunner's, BC's, and manual handweel trigger. Ensure gun fan activates when triggers are squeezed.	CMP	RJN
19. Manually check elevation, depression, and traverse of turret.	CMP	RJN
20. Elevate/depress gun, traverse turret 360 degrees in normal and fast turret mode.	CMP	RJN
21. Raise and lower the TOW launcher. Ensure launsher elevates and depresses.	CMP	RJN
22. Ensure proper operation of the ISU:	CMP	RJN
a. Clean optics (eyepieces and outside lenses).	CMP	RJN
b. Ensure correct reticle appears when selecting AP, HE, TOW, and 7.62.	CMP	RJN
c. Ensure superelevation changes as range select knob is rotated.	CMP	RJN
d. Ensure the ammunition and range settings are correct.	CMP	RJN
e. Ensure thermal sight can be focused in high magnification.	CMP	RJN
f. Ensure defogger is operating.	CMP	RJN
23. Ensure drift can be nulled out of the system.	CMP	RJN
24. Boresight the M242, M240C, TOW, auxiliary sight, and laser range finder.	CMP	RJN
25. Ensure NBC system operates.	CMP	RJN
26. Ensure 25-mm ready boxes are uploaded with NO MORE THAN TWO ROUNDS ABOVE THE FORWARDER.	CMP	RJN

BC CHECKS:	
1. Ensure coax is CLEAR and barrel is securely LOCKED in the receiver.	CMP
2. Ensure azimuth and elevation knobs turn freely.	CMP
3. Install coax and ensure it is LOCKED with the front and rear pins.	CMP
4. Ensure coax feed chute is fastened at both ends.	CMP
5. Charge coax. Check the chamber and manually ride the bolt forward.	CMP
6. Power cycle the coax from the BC's, gunner's, and manual handwheel triggers.	CMP
7. Charge the coax ready box and place it on SAFE.	CMP
8. Ensure coax ready box is uploaded.	CMP
9. Check communications:	CMP
a. Ensure red, yellow, and green flags are on board.	CMP
b. Conduct radio checks:	CMP
(1) Administration net.	CMP
(2) Firing net.	CMP

Carlos M. Ayuso — BC SIGNATURE

Rodney N. Ale — GUNNER

Figure 4-1. Example of a prefire checklist (continued).

4-4. MALFUNCTIONS

Malfunctions are a major cause of lost firing time on BFV ranges. Crew errors cause most malfunctions. These errors can be easily corrected. BFV crews must know possible reasons a malfunction occurred, so they can take the necessary steps to correct the malfunctions and continue with training.

Note: The following steps do not replace misfire procedures. Crews perform misfire procedures then perform the following steps.

a. **25-mm Gun.** If none of the following corrects the malfunction, the crew notifies the master gunner or maintenance personnel.

(1) If the gun did not cycle, the crew checks for the following:

- Is the ARM-SAFE-RESET switch on SAFE?
- Is the LO AMMO OVRD light flashing?
- Is ammunition selected?
- Are the annunciator lights on?
- Is the power cable installed?

(2) If the gun cycled to misfire, the crew checks for the following:

- Is the manual safe on SAFE?
- Is the tension released from the ammunition belt?
- Is the gun out of ammunition?

(3) If the gun cycled but not to sear or misfire, the crew checks for the following and then uses the hand crank to manually cycle the gun back to sear and tries again:

- Is the tension released from the ammunition belt?
- Is the sear retractor out?
- Is the straight drive shaft down?

b. **M240C Machine Gun.** If none of the following corrects the malfunction, the crew notifies the master gunner or maintenance personnel.

(1) If the bolt did not go forward, the crew checks for the following:

- Is the ARM-SAFE-RESET switch on SAFE?
- Is the manual safe on SAFE?
- Is the LO AMMO OVRD light flashing?
- Is coax solenoid plug connected?
- Is ammunition selected?

(2) If the bolt did go forward, the crew checks for the following:

- Is the ammunition belt seated in the feed tray?
- Is there a round or casing stuck in the chamber?
- Is the machine gun out of ammunition?

c. **Turret Drive.** If none of the following corrects the malfunction, the crew notifies the master gunner or maintenance personnel.

(1) If the turret will not traverse, the crew checks for the following:

- Is the turret travel lock locked?
- Is the drive motor in manual?
- Is the turret drive turned on? If so, the crew turns the turret drive off for 30 seconds, then turns it on.

(2) If the gun will not elevate or depress, the crew checks for the following:

- Is the drive motor in manual?
- Is the turret drive turned on? If so, the crew turns the turret drive off for 30 seconds, then turns it on.

d. **Communications.** If communication is lost, the crew checks the following:

- Is the AM-1780 power light on?
- Are the radio cable connections loose?
- Is the CVC cord disconnected?

4-5. POSTFIRE CHECKS

The crew performs postfire checks after firing. The checks consist of clearing all weapons systems and removing all ammunition residue from the exterior of the vehicle. Leaders verify that crews clear all weapon systems per AR 385-63. (On training ranges, the range safety officers verify that all weapon systems are cleared.) Postfire checks prevent many accidents from occurring.

CHAPTER 5

GUNNERY TRAINING

Bradley gunnery is one of the most important training activities for a Bradley crewman. Gunnery begins with a basic knowledge of the vehicle, turret, weapons, and ammunition capabilities. It is a continuous process that develops and evaluates a crew's ability to function as a crew and as a vehicle team that is part of the Bradley platoon. A crewman must know not only how to operate the vehicle and its weapon systems, but also how to maintain these systems through preventive maintenance checks and services. The goal of infantry Bradley gunnery is to produce proficient, combat-ready Bradley platoons. This includes the mounted and dismounted elements of the platoon. Crew drills, mounted and dismounted battle drills are the tools used to gain teamwork as a combined mounted and dismounted fighting element. Therefore, drills are also an important part ofgunnery and a crewman's training.

Section I

CREW TRAINING

Before proficient with collective tactical tasks can occur, a crew member must become proficient in individual and collective crew skills. Crew gunnery develops and evaluates individual and collective crew skills. The goal of crew gunnery is the qualification of crews. Crew qualification tasks must be challenging and realistic. Crews must be proficient in the following skills:

- Engaging moving targets from a moving Bradley.
- Engaging multiple targets using the auxiliary sight.
- Engaging targets using manual controls.
- Engaging multiple targets from the commander's position.
- Engaging multiple targets requiring different ammunition types.
- Engaging targets in an NBC environment.
- Engaging targets at night.

5-1. PRELIMINARY GUNNERY

Preliminary gunnery (Chapter 10) develops individual crew member skills needed to operate the vehicle and turret weapon systems. Bradley commanders are proficient with all tasks performed on the vehicle. Gunners are proficient with all gunner and driver tasks. Drivers are proficient with all driver tasks. However, crews that have all crew members proficient with all vehicle tasks are normally better crews.

a. The crew receives classroom instruction on gunnery techniques, gunnery training, and platoon training.

b. The driver is trained and evaluated on—

- Performing preventive maintenance checks and services on the hull.
- Performing unit driver requirements.

c. The BC and gunner are trained and evaluated on—

- Performing preventive maintenance checks and services on the turret.
- Manipulating the turret.
- Operating the turret weapon systems controls.
- Disassembling and assembling the turret weapons.
- Uploading downloading and clearing the turret weapons.
- Performing immediate action on the turret weapons.
- Boresighting the weapon systems.

d. The BC is trained and evaluated on laying the weapon systems on targets, while issuing fire commands.

5-2. CONDUCT OF FIRE TRAINER

The COFT provides the BC and gunner a simulated environment to gain proficiency with crew coordination skills. COFTs do not provide a driver's station; however, drivers are encouraged to participate with the BC and gunner and develop the coordination needed to synchronize movement of the vehicle into and out of defensive positions. Additional driver tasks, such as ammunition counting and announcing vehicle and TOW launcher status (up and down), can also be included.

a. The gunner is trained and evaluated on—

- Reacting to fire commands.
- Performing engagement techniques.

b. The BC is trained and evaluated on—

- Initiating fire commands.

- Acquiring and designating targets.
- Conducting target hand-off procedures.
- Performing engagement techniques from the BC position.

5-3. DEVICE GUNNERY

Device gunnery (Chapter 11) provides device-based training for collective crew tasks on vehicles. It includes Bradley Table I, Crew Defense, and Bradley Table II, Bradley Crew Proficiency Course. These tables are conducted in local training areas or ranges using MILES or PGS. Thru-sight video will also enhance this training.

a. The crew is trained and evaluated on—
- Installing and removing Bradley training devices—MILES or PGS and thru-sight video.
- Operating as a crew in a gunnery range environment.

b. The driver is trained and evaluated on—
- Performing berm drills.
- Applying proper driving techniques.

c. The gunner is trained and evaluated on—
- Boresighting training devices—MILES or PGS.
- Focusing, aligning, and calibrating the thru-sight video.
- Engaging targets with training devices—MILES and PGS.

d. The BC is trained and evaluated on—
- Controlling the crew, vehicle, and weapons systems.
- Laying the weapon systems on targets.

5-4. CREW GUNNERY

Crew gunnery (Chapter 12) introduces the crew to live-fire gunnery. Crew gunnery includes Bradley Table V, Crew Practice I; Bradley Table VI, Crew Practice 2; Bradley Table VII, Crew Practice 3; and Bradley Table VIII, Crew Qualification.

a. The crew is required to perform pre-fire checks.

b. The BC and gunner are required to perform—
- Zeroing the weapon systems.
- Uploading, downloading, and clearing the weapons using live ammunition.
- Engaging targets with full-caliber ammunition

Section II

PLATOON TRAINING

Platoon gunnery training combines the mounted crew and the dismounted infantry. Platoon training begins with individual crew member and dismount member skills. It continues with collective crew, mounted and dismounted battle drills. The goal of platoon gunnery is to qualigfy Bradley platoons in a tactical and live-free scenario during platoon qualification.

5-5. PRELIMINARY TRAINING

Preliminary training develops individual skills with assigned weapons organic to the Bradley platoon. This training includes both crew and dismounted members.

a. The crew members receive training on—

- Preliminary gunnery tasks.
- COFT.

b. The dismount members receive training on—

- Individual weapon and equipment (preliminary training).
- Movement formations and techniques.

5-6. INTEGRATED TRAINING

Integrated training develops mounted and dismounted collective tasks by conducting crew drills and battle drills. Both mounted and dismounted elements participate in all drills.

a. The vehicle teams are trained and evaluated on crew and battle drills.

b. The platoon and section are trained and evaluated on mounted battle drills.

c. The platoon and squad are trained and evaluated on dismounted battle drills.

5-7. SECTION AND PLATOON TRAINING

Section and platoon training consists of section and platoon device gunnery (Bradley Tables III and IV) and platoon gunnery (Bradley Tables XI and XII).

a. **Section and Platoon Device Gunnery.** During device gunnery, squad, vehicle sections, and platoons are combined in device-base training exercises. Areas trained and evaluated during section and platoon device gunnery are—

(1) *Bradley Table III, Bradley squad/section exercise.*

- Integrated drills.
- Squad fire control and distribution.
- Squad collective tasks.

(2) *Bradley Table IV, Bradley platoon proficiency course.*

- Platoon fire control and distribution.
- Command and control functions.
- Platoon collective tasks.

b. **Platoon Gunnery.** Platoon gunnery trains and evaluates the entire platoon in tactical, full-caliber, live-fire exercises. It consists of BT XI, Bradley Platoon Practice, and BT XII, Bradley Platoon Qualification. These are tactical exercises evaluated by senior evaluators. Senior evaluators evaluate all actions, tasks, and missions on and off of the live-fire range. All evaluations are in accordance with ARTEP 7-8-MTP.

(1) Bradley platoon practice (BT XI) allows platoons to refine and verify tactics and techniques developed during previous training. It provides the platoon leader with an opportunity to confirm his fire control and distribution plans and standing operating procedures.

(2) Bradley platoon qualification (BT XII) evaluates the platoon as an effective fighting element. Asessments from qualification identify strengths and weaknesses for use in developing training directions for the platoon.

Part Two
Training Manager's Handbook

CHAPTER 6
BRADLEY PLATOON TRAINING PROGRAM

The Bradley platoon's strength comes from the skill, courage, and discipline of the individual soldier—mounted and dismounted. Individual capabilities are enhanced by team work and cohesion in crews, squads, sections, and platoons. This cohesion is an essential ingredient to the Bradley platoon's success in close combat. The platoon training program must focus on developing tough, combat-ready platoons. Bradley infantrymen must have the skill and the will—not just to participate in the close fight, but to dominate it. Training events that require subordinate leaders to use their initiative and take independent actions are essential for preparing for the decentralized operations that characterize the mechanized battlefield.

Bradley infantry leaders must be the most capable soldiers in the unit. Their leadership determines the unit's success or failure in battle. These key leaders must be tactically and technically proficient and possess a warrior spirit. A critical leader task is the ability to coordinate and integrate the mounted and dismounted elements to maximize the platoon's combat potential. The leader must be resourceful, tenacious, decisive, and lead from the front. Each squad and platoon leader must be innovative and flexible in the employment of his unit. He must have the mental agility to quickly transition from mounted to dismounted combat and have the instinct to take action based on the situation and the commander's intent. Above all else, the Bradley leader must possess the skills and attributes essential to the platoon's survival and success in close combat. Platoon leaders, commanders, and staffs are the primary training

managers and trainers. To accomplish their training responsibility, commanders must—

- Base training on wartime mission requirements.
- Identify applicable Army standards and set unit goals.
- Assess current levels of proficiency.
- Provide the required resources.
- Develop and execute training plans that result in proficient individual leaders, and units.
- Develop a tough, thorough, and well-balanced training program for mounted and dismounted infantry.

Section I
TRAINING PROGRAM DEVELOPMENT

Battle focus is a concept used to derive peacetime training requirements from wartime missions. Battle focus guides the planning, execution, and assessment of each unit's training program to ensure its members train as they plan to fight. The battle focus process is basically the same for AC and RC units, whether they are MTOE or TDA units. FM 25-100 and FM 25-101 explain how to plan, resource, and execute training events. FM 7-7J, FM 23-1, and ARTEP 7-8-MTP provide the tactics, techniques, procedures, and standards to evaluate Bradley platoon training. A complete training program emphasizes physical fitness and rifle marksmanship and precision gunnery skills. Night training, especially live-fire, should be routine to exploit technical capabilities.

6-1. MISSION-ESSENTIAL TASK LIST DEVELOPMENT PROCESS

A unit's training program must support the METL. Time, resources, and command emphasis need to be focused on training tasks that support the METL. These are collective tasks used by commanders and platoon leaders. Platoon sergeants and squad leaders should use the appropriate MTP to identify individual tasks that support the collective tasks (ARTEP 7-8-MTP). To develop the METL, the commander must know the war plans and external directives.

a. **War Plans.** The most critical parts of METL development are the unit's wartime operations and contingency plans. The missions and related information provided in these plans are key to determining essential training tasks. The commander reviews each war plan and selects each mission that his unit is expected to execute in combat.

b. **External Directives.** External directives are additional sources of training tasks that relate to a unit's wartime mission. These include—

- Mobilization plans.
- Installation wartime transition and development plans.
- Force integration plans.

c. **Task List.** Once all possible tasks are listed, the commander identifies those tasks that are most critical to success on the battlefield. This refined list becomes the METL.

6-2. COMMANDER'S ASSESSMENT

Before developing a training program, the commander must determine his unit's proficiency on each METL task.

a. To determine the unit's proficiency, the commander may use the following.

(1) *Individual training.* CTT results will show basic individual training proficiency. The BGST evaluates specific Bradley-related individual proficiency. Preliminary weapons training and qualification scores indicate proficiency levels of the various weapons organic to the squads and platoon. Army physical readiness test scores should also be reviewed.

(2) *Crew training.* Crew training proficiency can be measured by reviewing the COFT unit summaries and performance analysis or session summaries. Crew device gunnery results and evaluation sheets from the last gunnery period will provide more field-oriented data to determine proficiency.

(3) *Dismounted infantry training.* Dismounted infantry training proficiency can be measured by reviewing after-action reviews from dismounted squad and platoon situational exercises (STX) lanes and gunnery results from dismounted live-fire exercises (LFX). (See Appendix D.)

(4) *Section/platoon training.* Section/platoon training proficiency can be measured by reviewing after-action reviews from STX lanes and ARTEP results. Usually, STX and FTX results are subjective by nature. Objective gunnery data that supports this analysis include results from section/platoon device gunnery and platoon practice and qualification live-fire gunnery.

b. Evaluation of training uses specific standards to measure the demonstrated abilities of individuals, crews, squads, and platoon. Accurate evaluations are key to identify where the training emphasis needs to be placed. Leaders must make on-the-spot corrections and demand aggressive action to correct training deficiencies. Evaluations can be one of the following:

(1) *Informal.* Evaluation that is conducted by unit leaders during on going training.

(2) *Formal.* Evaluation that uses dedicated evaluators. Formal evaluation is generally scheduled on the long-range or short-range training plan.

(3) *Internal.* These evaluations are planned, resourced, and conducted by the unit undergoing evaluation.

(4) *External.* These evaluations are planned, resourced, and conducted by a higher headquarter or another unit.

c. The commander conducts his assessment with input from the executive officer, S3, subordinate leaders, and master gunners.

Note: For more detailed information see FM 25-100, FM 25-101; ARTEP 7-8-MTP, ARTEP 71-1-MTP, and ARTEP 71-2-MTP.

Section II

INTEGRATED TRAINING STRATEGY

The commander must develop his training strategy after assessing strengths and weaknesses of his unit. His assessment and strategy must consider personnel turbulence (changes). The strategy must focus on his METL, sustain his unit's strengths, and correct weaknesses. The commander will find that some tasks apply to all soldiers, some apply only to the BFV crew, while others apply only to the dismounted infantry soldiers. This dictates an integrated training strategy. Figure 6-1 depicts an integrated gunnery strategy as a flowchart. Any unit can adapt this strategy to its specific training requirements. It is a logical progression of gunnery events that includes separate and integrated mounted and dismounted training, and leads the platoon to a collective tactical, live-fire evaluation during BFV platoon qualification.

6-3. MOUNTED CREW TRAINING

The BC (in coordination with the platoon leader and master gunner) is the principal trainer for crew duties, crew coordination, and gunnery skills to form an efficient crew (Figure 6-2, page 6-6). His primary references are this manual, FM 7-7J, ARTEP 7-7J-DRILL, ARTEP 7-8-MTP, and appropriate technical manuals.

a. Preliminary gunnery training focuses on the technical aspects of the BFV weapons system gunnery theory, turret operations, and elementary gunnery techniques. The trainers combine classroom instruction and hands-on training to provide each crewman a knowledge of the capabilities, lirnitations, and characteristics of the vehicle. Crews learn fundamentals of turret manipulation; gun lay; tracking and adjusting fires for the 25-mm, coax, and TOW weapons. TOW system training, consisting of classroom subjects, COFT, and hands-on tasks, is also conducted. Technical proficiency is tested during the record BGST.

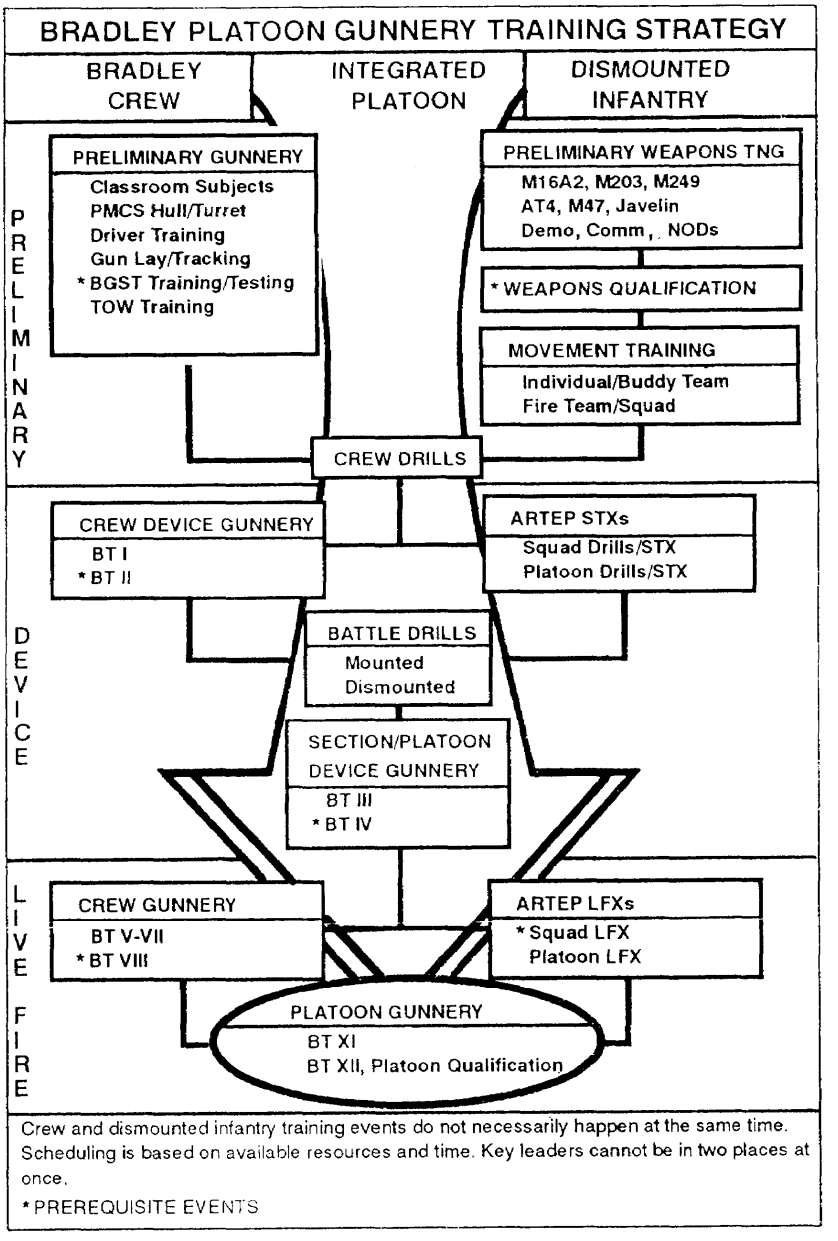


Figure 6-1. Sample integrated platoon training strategy.

b. Device gunnery training allows crews to practice and refine their collective skills on their vehicles, while using low-cost, training devices. At this point, individual crew duties and actions are integrated and crews perform as a team. The crew conducts a defense exercise that allows the driver to practice "berm drills," while the crew engages single and multiple, stationary and moving targets. Their abilities are evaluated during Bradley Table II, Bradley Crew Proficient Course (BCPC).

c. Crew gunnery training solidifies crew collective gunnery techniques using live ammunition. Crews must meet increasingly difficult standards during variable and challenging conditions similar to combat. The outcome is a crew that is highly skilled in destroying likely enemy threats on the battlefield. Crew proficiency is evaluated during crew qualification (BT VIII).

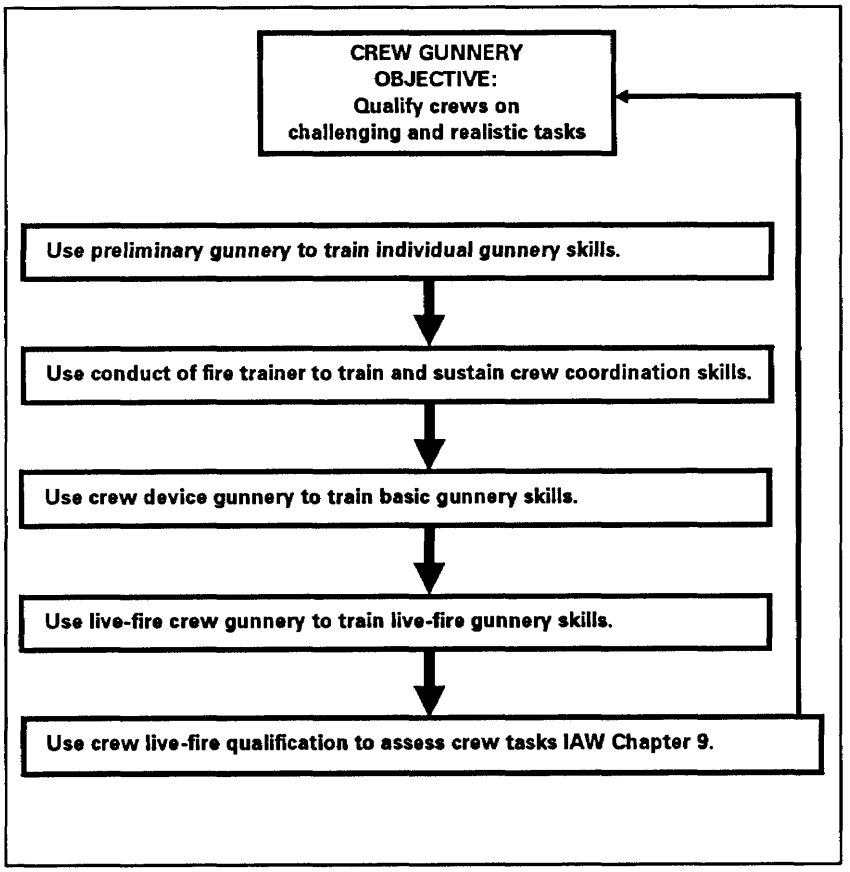


Figure 6-2. Crew gunnery strategy.

6-4. DISMOUNTED INFANTRY TRAINING

The squad leader (in coordination with the platoon leader and platoon sergeant) is the principal trainer for squad weapons, equipment, and tactical proficiency (Figure 6-3, page 6-8). His primary references are FM 7-7J, ARTEP 7-7J-DRILL, ARTEP 7-8-MTP, and appropriate weapon and equipment technical manuals. ARTEP 7-7J-DRILL and ARTEP 7-8-MTP contain the tasks, conditions, and standards to train and evaluate dismounted infantry operations. Units must develop training plans that provide resources for dismounted squad and platoon training. Leaders must ensure adequate time, training areas, equipment and ammunition, evaluators, and OPFOR are available. Training plans should include preliminary weapons training and qualification, movement training drills, STXs and LFXs. Platoon leaders must schedule their time between crew, mounted, and dismounted training events. The goal of dismounted training is to qualify squads and platoons on live-fire and battle-focused, collective tasks that support the unit's METL. Dismounted training should parallel Bradley crew training. This ensures both mounted and dismounted elements are prepared for integrated training at the prescribed times (crew drills, battle drills, BT III, BSSE; BT IV, BPPC; BT XII, Platoon Qualification). Dismounted training can be grouped into three categories: preliminary training, device training, and live-fire training. (See Appendix D.)

a. *Preliminary training* consists of weapons and equipment training and qualification and movement training. This training should be conducted during Bradley preliminary gunnery. Squad leaders conduct this training in the unit's local area. At the completion of this training, mounted and dismounted elements are integrated to conduct crew drills. Weapons training starts with squad weapon and equipment proficiency. Soldiers conduct M16A2 advanced rifle marksmanship training to learn the combat fire techniques required for dismounted infantry operations. The squad continues preliminary training by fining exercises with the M203 grenade launcher, M249 machine gun, AT4, and M47 Dragon or Javelin. They should become experts with demolitions, communication equipment, and night observation devices. Their proficiency is measured during weapon qualification and hands-on equipment tests. Each soldier learns the field craft, individual skills, and movement techniques required to survive in close combat. The dismounted infantrymen must meet increasingly difficult standards during variable and demanding conditions as they progress through buddy team, squad, and platoon exercises.

b. *Device training* consists of dismounted squad and platoon drills and STXs using MILES equipment. During this training, trainers must emphasize squad dismounted battle drills. Drills link soldier and collective tasks at squad and platoon levels. Drills are limited to situations requiring instantaneous

response; therefore, soldiers must continually practice and execute drills instinctively. Device training should be conducted during the crew device gunnery period This allows units to schedule PGS/MILES equipment for mounted and dismounted elements for one training period. At the completion of this training, mounted and dismounted elements are integrated to conduct battle drills and section/platoon device gunnery.

c. *Live-fire training* consists of squad and platoon live-fire exercises. This training can be conducted in the same time period as crew gunnery. This allows units to focus their mounted and dismounted training on live-fire events that requires the same type of resources (ammunition, ranges). At the completion of this training, mounted and dismounted elements are integrated for Bradley platoon practice and qualification (BTs XI and XII).

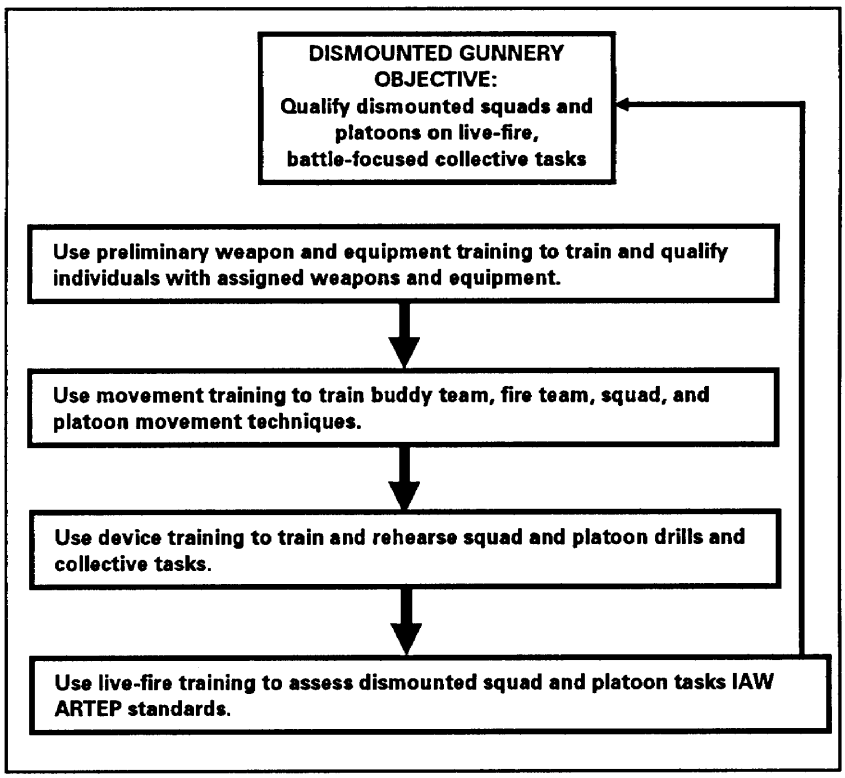


Figure 6-3. Dismounted gunnery strategy.

6-5. CROSS TRAINING

The commander, platoon leaders, first sergeant, and platoon sergeants manage all training to ensure every soldier is trained in individual as well as collective tasks for mounted and dismounted skills. The unit training program must focus on developing tough, combat-ready platoons with a balanced simultaneous and integrated dismounted and mounted plan.

a. All soldiers require individual weapons training, physical training, common task training, 11M skills training, and maintenance training. Additionally, all Bradley infantrymen should complete a diagnostic BGST. BGST tasks are 11M tasks that soldiers need to progress through the rank structure. A diagnostic BGST can help identify individuals who are proficient enough to be selected as gunners. It provides cross training if a last minute crew change is required. The CTT, EIB, and diagnostic BGST evaluate individual task proficiecy. All soldiers must complete the APFT and qualify with their individual weapon (normally the M16A2).

b. During preliminary and device gunnery training, cross training must occur as often as possible, because it is critical to countering personnel losses in peacetime or combat. Cross training must incorporate both the mounted and dismounted infantry to sustain basic infantry skills for the crews and provide additional training for the dismounted infantry to perform as a BFV crew. Cross training enhances the coordination between the mounted and dismounted fight. DA Pam 350-38 requires that alternate crews train regularly in the COFT, conduct crew device gunnery, and take the BGST. Additionally, the platoon leader's backup crew is resourced to fire crew gunnery.

6-6. INTEGRATED TRAINING

The platoon sergeant, squad leaders, and Bradley commanders in coordination with the platoon leader are the principal trainers for the collective skills of integrated vehicle teams, sections, and platoon. Primary references are this manual, FM 7-7J, and ARTEP 7-7J-DRILL. One of the most critical parts of the Bradley training program is integrated drills: crew, mounted, and dismounted. Trainers must emphasize that crew and battle drills are the techniques and procedures for immediate action. Trainers must ensure all members involved in a drill know exactly what their individual task is, when to accomplish it, and what to do if they cannot perform the task. Drills must be rehearsed and trained to standard before conducting tactical section or platoon missions.

a. **Crew Drills.** Crew drills instill instinctive reactions to situations on the vehicle. With crew drills, the vehicle team must coordinate and synchronize their actions. Fire team members must perforrn as loaders. The loader must react to BC and gunner commands and inspect and load 25-mm

ammunition and TOW rounds. The dismounted infantry must react instinctively and without hesitation when mounting and dismounting the vehicle, while the driver reacts to the BC's command to raise and lower the ramp.

b. **Mounted Battle Drills.** Mounted battle drills instill instinctive reactions to situations the mounted section and platoon may face in combat. Mounted elements must immediately react to contact or ambush or immediately initiate an attack.

c. **Dismounted Battle Drills.** Dismounted battle drills instill instinctive reactions to situations that squads and platoons may face while dismounted from the vehicle. Dismounted squads and platoons must immediately react to contact, ambush, or initiate an attack. They must have the training experience and confidence to clear trenches, buildings, wood lines, and obstacles with minimal leader orders.

d. **Device Gunnery.** Device gunnery provides training for the Bradley section with the Bradley squad/section exercise (BT III, BSSE) and the platoon with the Bradley platoon proficiency course (BT IV, BPPC). These exercises develop and evaluate collective skills of the integrated section and platoon in a realistic tactical scenario using training devices.

e. **Platoon Gunnery.** Platoon gunnery trains and evaluates Bradley platoons using full-caliber ammunition. BT XI, Bradley Platoon Practice, provides platoons a live-fire exercise to refine collective task execution during a tactical live-fire scenario. Platoon leaders must control the platoon while mounted and dismounted. He leads the platoon by example and through orders to his platoon sergeant and squad leaders. The platoon practice table should place emphasis on fire control and distribution in increasingly difficult situations as the platoon executes missionessential tasks. The outcome is a platoon that has the agility and flexibility to quickly transition from mounted to dismounted combat, fight as a unit, and win on the battlefield. This ability is evaluated during BT XII, Bradley Platoon Qualification. (Figure 6-4.)

f. **Combined Arms Live-fire Exercise.** Platoon training does not stop with qualification. The platoon is integrated into company CALFEXs and externally evaluated during company or battalion ARTEPs. During these multiechelon training events, the platoon fights as part of the combined arms team.

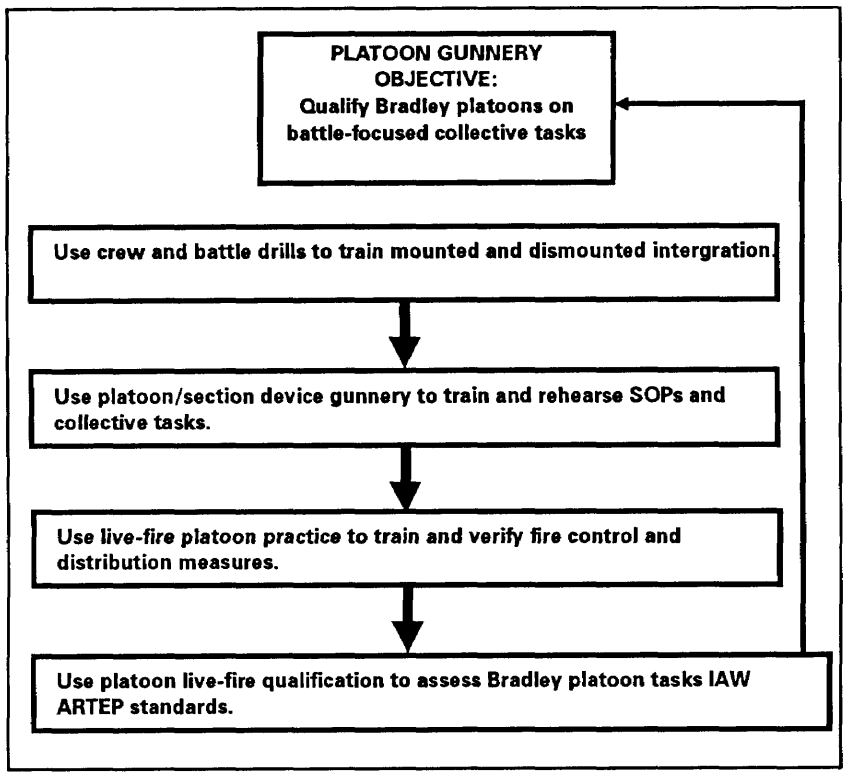


Figure 6-4. Platoon gunnery strategy.

Section III
TRAINING PLANS

Once the commander has developed his METL and made a thorough assessment of training proficiency, he begins the detailed process of developing a training plan. When planning the gunnery aspect of the training plan, the master gunner is the most valuable asset to aid the commander.

6-7. BRADLEY MASTER GUNNER

The primary mission of the master gunner is to aid and assist commanders at all echelons in the planning, development, execution, and evaluation of all Bradley related training (individual, crew, and collective).

a. His specific responsibilities are directed by the commander. Examples of his duties are—

- Assist the validation or certification of newly assigned soldiers.
  - — Setup or conduct initial skills training for new BCs or gunners.
  - — Assist in training new BC and gunner crews.
  - — Develop or conduct training and certification of Bradley crew evaluators.
- Assist all elements within the unit concerning gunnery training.
- Forecast all ammunition for training.
- Manage gunnery records, BGST records, turbulence rosters.
- Coordinate and control training device usage.
- If senior instructor-operator qualified, train other IOs to conduct COFT training.
- Plan and manage COFT training.
- Train crews on MILES gunnery peculiarities (boresighting point of aim, maintenance).
- Execute gunnery training. Supervise live-fire ranges to ensure all standards are followed.
  - — Confirm zero techniques.
  - — Coordinate target arrays, exposure times for targets, maneuver box verification, and setup of overall ranges to ensure they are in accordance with standards set forth in this manual.
- Set up and conduct BGST training and evaluate the results.
- Advise the commander of the tactical capabilities of the Bradley against threat systems in coordination with the S2.

b. The master gunner has been formally trained to function at battalion level. He has extensive training in BFV maintenance, range planning and execution, and all phases of gunnery training. The master gunner's main responsibilities are listed above, but change in scope depending on the level that he is assigned. Such differences areas follows.

Note: The master gunner should not be assigned additional duties other than those listed here. Unit gunnery training programs need a great deal of attention to be effective.

(1) *Brigade/division master gunner—*

- Works closely with master gunners at lower echelons to ensure standards are uniform throughout training programs.

- Develops the Bradley crew evaluator written certification test in accordance with this manual.
- Provides any new information on ways to improve training Bradley crews.
- Coordinates with installation/major training area range control personnel.
- Assists in developing and upgrading range facilities.

(2) *Battalion master gunner—*

- Is responsible for the continual education of the master gunners in the battalion.
- Assists the battalion commander and command sergeant major in the selection of master gunner school candidates.
- Develops new training techniques to improve crew training.
- Coordinates with brigade for BFV training assets.
- Certifies Bradley crew evaluators in accordance with this manual.
- Certifies BGST evaluators in accordance with this manual.
- Certifies range safety personnel.

(3) *Company master gunner—*

- Assists in the BFV services as required, works with organizational maintenance on turret problems and DA Form 2408-4.
- Coordinates with the battalion S3 to secure company gunnery training assets.
- Trains Bradley crew evaluators in accordance with this manual.

(4) *Platoon master gunner—*

- Is primarily responsible for the platoon BFV weapon system and turret maintenance.
- Updates company master gunner on the platoon's crew training.
- Assists the company master gunner in unit gunnery training.

6-8. KEY LEADERS AND TRAINERS RELATIONSHIP

The goal of all infantry BFV gunnery is to train Bradley-equipped platoons to prepare for war using tough, realistic, and measurable standards. The key leaders and trainers in this process are the commanders, sergeants major, operation officers, master gunners, and platoon leadership.

a. The battalion commander is the first to impact on the unit's execution of platoon qualification. His command emphasis on training the whole platoon sets the precedent for successful platoons. The battalion commander defines the unit's METL with the input of his superior and subordinate commander's METL. This METL drives the scenarios and engagements for platoon qualification when prepared according to this manual. The battalion commander then conducts a training assessment to analyze the unit's preparedness to perform these tasks. This assessment incorporates input from the company commander's assessments, as well as his personal observations; the command sergeant major; the CTC's take-home packages from external evaluations; previous gunnery; and COFT progress. This assessment then becomes the groundwork for structuring the unit's long- and short-range training plans.

b. The battalion operations officer (S3) with his master gunner then projects the METL training needs against the unit training calendar in accordance with the commander's guidance. Multiechelon and sustainment training are the key to success. The training plan includes the basic individual tasks and progresses to task force training. The master gunner assists the S3 in developing the mounted and dismounted training strategy by developing scenarios and forecasting ammunition, ranges, and training aids.

c. Based on command guidance, the master gunner focuses on planning both dismounted and crew training support. His area of expertise is ensuring the scenarios comply with this manual and ensuring the range complex supports these scenarios. The master gunner is specifically trained in ensuring the scenario targets comply with the safety requirements. His involvement throughout the process uses his expertise on the entire Bradley platoon training and not solely the vehicle crew. The master gunners keep the commander and S3 informed of unit training on the COFT and marksmanship results of all individual and crew-served weapons.

d. The company commander and his master gunner have a relationship similar to the S3 and his master gunner. The company commander provides the battalion commander with his METL, training assessment, and unit-specfic training needs. He also provides his master gunner with his guidance on training priorities. The company master gunner provides input to the commander on crew and dismount training needs and helps in the planning. He also informally keeps the battalion master gunner informed of company training. Formally, he assists the commander in defining and requesting training devices, ammunition, ranges, and resources to support the training. He also advises the commander on the maintenance status of turret-specific problems (for example, approaching barrel wear out).

e. The platoon leader has several experienced NCO sources to assist him in the analysis, planning and preparation of his platoon training. The most important source of information and assistance is the platoon sergeant. This NCO knows the platoon's strengths, weaknesses, training assessments, and maintenance status firsthand. The platoon sergeant is the primary source for the platoon leader to rely on in preparing his platoon training. The platoon master gunner provides the same expertise as the company master gunner. His knowledge of the training devices, strategies, and this manual makes him an invaluable asset in preparing the platoon's training. The platoon master gunner provides the necessary expertise required when the platoon is tasked to do a specific mounted or dismounted training event for the platoon or company. Again, the master gunner ensures the range or training scenario complies with this manual and the safety requirements. The platoon sergeant closely supervises the platoon master gunner. The platoon sergeant also consolidates input from the dismounted squad leaders into the platoon and company training strategy.

6-9. CREW STABILITY MANAGEMENT

The greatest problem a commander must contend within developing training plan is the cause and effect of crew turbulence (personnel changes). Commanders must develop a plan to reduce and control turbulence before developing and executing his training plan. Turbulence is unavoidable but may be reduced by planning ahead. Some possible solutions for reducing turbulence are as follows.

a. **Short-Term Solutions.**

(1) Change personnel as a crew not a single crewman. For example, if a staff sergeant, Bradley commander, is promoted to platoon sergeant then his entire crew moves with him. This causes only one crew change not two.

(2) Train an alternate for each position.

b. **Long-Term Solutions**

(1) Continually cross-train personnel for replacements. Experienced soldiers are easier to train than new soldiers.

(2) Form complete crews as personnel come into the unit. Match the loss dates (ETS, PCS, and DEROS) within the same crew.

6-10. LONG-RANGE PLANNING

Long-range planning is resource oriented. Commanders identify training needs from the METL task proficiency assessment. Goals are established and resources are forecasted and allocated to reach these goals. FM 25-101 contains more detailed information on long-range planning. Commanders must answer several questions when considering the long-range plan.

a. What is the current platoon proficiency level (mounted and dismounted)? This is based on—

- Squad and crew turbulences (changes).
- Performance during previous gunnery, maneuver exercises, and squad and platoon STXs and LFXs.

b. What are the performance goals for the platoons? What proficiency level must crews and dismounted infantry reach to accomplish METL tasks. Some goals are—

- Meet or exceed DA Pam 350-38 qualification standards.
- Set a percentage of qualified marksman, sharpshooter, and expert for M16 riflemen, grenadiers, AT4/Dragon/Javelin gunners, and M249 gunners.
- Set a percentage of qualified, superior, and distinguished ratings for BFV crews.
- Obtain an overall rating of trained on collective dismounted STXs and LFXs.
- Obtain an overall rating of trained on Bradley Table XII.

c. What resources are necessary and where is the command emphasis? (DA Pam 350-38 also shows ammunition authorization for every weapon system in the battalion.)

- Correct tasks that do not meet the standard.
- Sustain proficiency in tasks that meet the standard.

d. What schools are needed to certify and train trainers?

- Master gunner course.
- Ranger school/light leader's course.
- Bradley crew evaluator (BCE) certification.
- Bradley gunnery skills test evaluator certification.
- MILES instructor course/PGS training.
- IO courses within the unit.

6-11. SHORT-RANGE PLANNING

Resources identified during long-range planning are allocated and prioritized during short-range planning. Command training guidance is published to provide trainers with detailed information on the training objective. Active and Reserve Components short-range training considerations are different. FM 25-101 explains this process in greater detail.

a. Gunnery resource considerations are ammunition, fuel and repair parts, range and maneuver area, and training devices availability.

(1) *Ammunition.*

(a) Commanders and master gunners must carefully manage ammunition allocations especially when dealing with 25-mm resources. Once the yearly ammunition authorization is known, ammunition should be allocated in a specific priority—

- Mounted crew training.
  - First Crew qualification.
  - Second: Crew practice.
  - Third: Qualification refires and additional training.
- Dismounted infantry training.
  - First: Weapons qualification.
  - Second: Squad and platoon LFX.
  - Third: LFX refries and additional training.
- Platoon training.
  - First: Platoon qualification.
  - Second: Platoon practice.

(b) Ammunition is forecasted well before the training event. There are many reasons why the ammunition authorization may fall short of the forecasted training requirement. When this happens, commanders must develop a strategy to train with less ammunition. Several considerations are—

- Mounted crew training.
  - Reduce the number of crew practice tasks for crews who are stabilized and have qualified previously. Give their ammunition to new crews.
  - Reduce rounds per engagement on training and practice exercises.
  - Increase device-based training.
  - Use PGS in crew practice scenarios. PGS will not train proper boresight, zero, and gun operation procedures.
  - Use MILES in crew practice scenarios. MILES is not suitable for moving target engagements because the gunner does not have to apply lead to engage a target. Also, BOT and TOT cannot be trained using MILES.
  - Increase use of COFT.
- Dismounted infantry training.
  - Dry-free or use MILES on STX lanes.
  - Reduce rounds per engagement on squad LFX (not platoon LFX).

- Platoon training.
  - — Dry-fire or use subcaliber (7.62-mm) on platoon practice.
  - — Use PGS on platoon practice. PGS will not allow leaders to see tracers from other vehicles for fire control and distribution applications.

(2) *Fuel and repair parts.*

- Train closer to garrison.
- Use a limited number of vehicles to train crews.
- Use HETs to move vehicles to the range.

(3) *Range and maneuver area* (to include targetry and range support personnel).

(4) *Training devices availability.*

b. Short-range gunnery scheduling considerations are—

(1) Vehicle services.

(2) Other mandatory training or events prescribed from higher headquarters.

(3) Nontraining events (holidays, leaves, installation support).

c. Short-range guidance considerations are—

(1) Crew and dismount training priorities and expected outcome.

(2) Leader, individual, and collective tasks associated with the training event.

(3) Steps required to prepare trainers and evaluators.

(4) Integration of crew and dismount training on the training calendar.

6-12. NEAR-TERM TRAINING PLAN

Near-term planning is primarily conducted at battalion, company, and platoon level. Its primary purpose is to conduct final coordination and provide specific guidance to the units.

a. Training meetings should be held at battalion, company, and platoon level so that detailed information is understood by all key personnel.

(1) Battalion meetings focus on training management. Considerations include the following.

(a) Final coordination of ranges, training areas, and ammunition.

(b) Coordination between units for maintenance, medical, logistical, and personnel requirements.

(c) Locking in and publishing unit training schedules.

(2) Company and platoon meetings discuss the specifics of executing the training event.

(a) Discuss when the training will be conducted to include movement times to the training area.

(b) Discuss personnel involved in the training event and highlight key individuals responsible to conduct the training.

Note: Detailed discussion of BFV range set-up, execution, and key individual responsibilities are discussed in Chapter 8.

(c) Discuss training location, uniform, and special equipment required to conduct training.

(d) Discuss specific personnel performance measures to be evaluated.

b. Commander's should require briefbacks to ensure that subordinate leaders understand all aspects of the training event.

c. The formal training plan culminates with the training schedule. However, commanders, key leaders, and all trainers must continue to informally plan and coordinate training with a series of pre-execution checks. Additionally, trainers, soldiers, and support personnel must thoroughly prepare for training.

(1) Pre-execution checks systematically prepare soldiers, trainers, and resources to ensure training starts properly. These checks are developed and responsibility for them fixed during short-range planning. FM 25-101, Chapter 3, contains a sample pre-execution checklist. Trainers should combine this list with range and training area checks and considerations from Chapter 8 of this manual to develop an intensive pre-execution checklist.

(2) Commanders prepare trainers to conduct performance-oriented training by providing time, guidance, resources, and references. These trainers rehearse their preparations and review the tasks and subtasks to be conducted. This preparation gives the trainer the confidence in his ability to perform the task and teach soldiers the correct skills.

Section IV
UNIT GUNNERY TRAINING

Gunnery training must use all available resources to raise and sustain the proficiency level of the METL tasks: training must be well-structured, realistic, effective, and safe.

Home station gunnery (HSG) is a continuous and progressive training program that is intensified two to three months before a major gunnery density. HSG is planned at battalion level. Execution is at company level. The HSG focuses on—

- Orienting the crew to the technical aspects of the turret systems.
- Exposing the crew to the most fundamental gunnery techniques.

- Integrating the crew as an efficient team, during device gunnery, before the introduction of live-fire.
- Orienting the dismounted infantry in doctrinal aspects of STX operations.
- Integrating the sections and platoon during device gunnery.

Major gunnery densities normally focus on—

- Orienting the dismounted infantry in the fundamental aspects of an LFX.
- Refining crew skiIls using full-caliber ammunition on full-scale ranges.
- Qualifying crews on crew qualification.
- Integrating the section and platoon in live-fire. training and qualification.

6-13. GUNNERY LEVELS

There are four levels to a well-rounded gunnery program. Each level is progressively more difficult. Crews, squads, sections, and platoons should not advance unless they are proficient in the previous level.

a. The four gunnery levels are—

(1) *Preliminary.* Preliminary gunnery introduces the crew to the vehicle system and develops individual and crew skills involved with operating the BFV, turret, and weapon systems. It provides classroom instruction as well as hands-on applications. Hands-on tasks include gun lay, tracking, adjustment of fires, range card, and basic TOW gunnery tasks, and COFT TOW exercises. Elements of preliminary gunnery are in Chapter 10.

(2) *Device.* Device gunnery trains crews, sections, and platoons using device-based training. Crews conduct BT I, Crew Defense, that allows the driver to practice berm drills using the vehicle, while the crew engages single and multiple, stationary and moving targets. The crew's abilities are evaluated during BT II, Bradley Crew Proficiency Course. Sections conduct the BT III, Bradley Squad/Section Exercise. BT III allows the dismounted squad and vehicle section to train together and develop techniques needed to perform squad collective tasks. BT IV, Bradley Platoon Proficiency Course, integrates the entire platoon in a device-based combat scenario. The platoon's leaders develop their command and control skills and identify strengths and weaknesses of the platoon for future training emphasis. Elements of device gunnery are in Chapter 11.

(3) *Crew.* Crew gunnery refines and evaluates those crew skills, developed during preliminary and device gunnery, using live fire. It consists

of crew practice and qualification (BTs V, VI, VII, and VIII). Elements of crew gunnery are in Chapter 12.

(4) *Platoon.* Platoon gunnery integrates the platoon in live-fire tactical scenarios. Platoons refine and verify tactics and techniques developed during previous training. Platoons are dusted on their collective abilities during BT XII, Platoon Qualification. Platoon gunnery consists of platoon practice and qualification (BTs XI and XII). Elements of platoon gunnery are in Chapter 15.

b. Gunnery conditions should be varied so that crews are trained to fight in any battlefield environment. Commanders should vary conditions for all training so that the crews can perform in adverse weather and degraded mode of gunnery. Thermal sights must be used not only at night but also during daylight operations in smoke, adverse weather conditions, and concealing terrain.

(1) *Adverse weather.* Soldiers must be aware that adverse weather impacts their senses and the mechanical operation of the weapons system.

(a) Target acquisition range determination, and BOT are hindered by fog, snow, and heavy rain.

(b) Cyclic rates of fire and ballistics are affected by temperature extremes and humidity.

(2) *Degraded mode gunnery.* BFV crews must engage targets with less than a fully operational system or less than ideal situations.

(a) Battle damage and maintenance problems can deny the use of primary sights and turret control systems. Crews must continue the fight using—

- Auxiliary sight.
- Commander's handstation.
- Manual turret operation.

(b) NBC conditions severely influence the crew's ability to—

- Operate the turret controls and perform crew duties.
- Observe through the optics.
- Perform during continuous operations.

6-14. TRAINING REQUIREMENTS

Requirements specified in this manual are—

a. All BCs, gunners, and platoon alternate crew members must successfully complete the Bradley gunnery skills test (BGST) within the 3 months (4 months RC) before live fire.

b. All crews must qualify on Table II within the 3 months (4 months RC) before full-caliber live fire.

c. All BCs and gunners must have completed the TOW gunnery program to standard within the 3 months (4 months RC) before TOW missile live fire.

d. All infantry platoons must have completed Table IV within the 6 months before Table XII.

e. All crews that will live-fire during infantry platoon, scout team, or Stinger squad qualification must qualify on Table VIII within the 6 months before Tables X, XA, or XII.

f. All squad members must qualify with their individual weapons within the 6 months before Table XII.

g. All squads must complete a squad live-fire exercise to ARTEP standards within the 6 months before Table XII.

h. Each scout team must have received a passing score on the scout team training table (BT IX) within 3 months before firing the scout team qualification table (BT X).

i. All BGST evaluators must have successfully completed BGST within 1 year and achieved a "GO" on the BGST station they will evaluate within the 30 days before evaluating BGST.

j. All Bradley crew evaluators (BCE) must certify or recertify in accordance with BCE certification program (Chapter 9) within the 90 days of any live-fire exercise.

CHAPTER 7

TRAINING DEVICES

BFV training must be balanced with resources and time. The use of devices, simulators, and training aids provides the commander an economical way to train effectively and still maintain the standards. However, training devices do not replace live-fire gunnery. The commander and master gunner must begin with an assessment of the unit proficiency, and know the level of proficiency required of their unit to accomplish the training. The trainers must also know the capabilities and limitations of all devices, simulators, and training aids. This chapter identifies resources that enhance a unit's ability to train, sustain, and evaluate BFV gunnery and tactical training. Table 7-1, page 7-14, is a quick reference for determining what devices, simulators, and or aids relate to specific training events.

Devices discussed in this chapter are the thru-sight video (TSV), the multiple-integrated laser engagement system (MILES), and the precision gunnery system (PGS). Simulators include the videodisc integrated gunnery simulator (VIGS), the unit-conduct of fire trainer (U-COFT), the mobile-conduct of fire trainer (M-COFT), the simulations network (SIMNET), and the close combat tactical trainer (CCTT). Training aids include the tracking board, laser target interface device (LTID), scaled models, and dummy rounds.

7-1. DEVICES

Devices are three-dimensional products used to conduct training. They mount on the actual equipment and can be activated either mechanically or electrically.

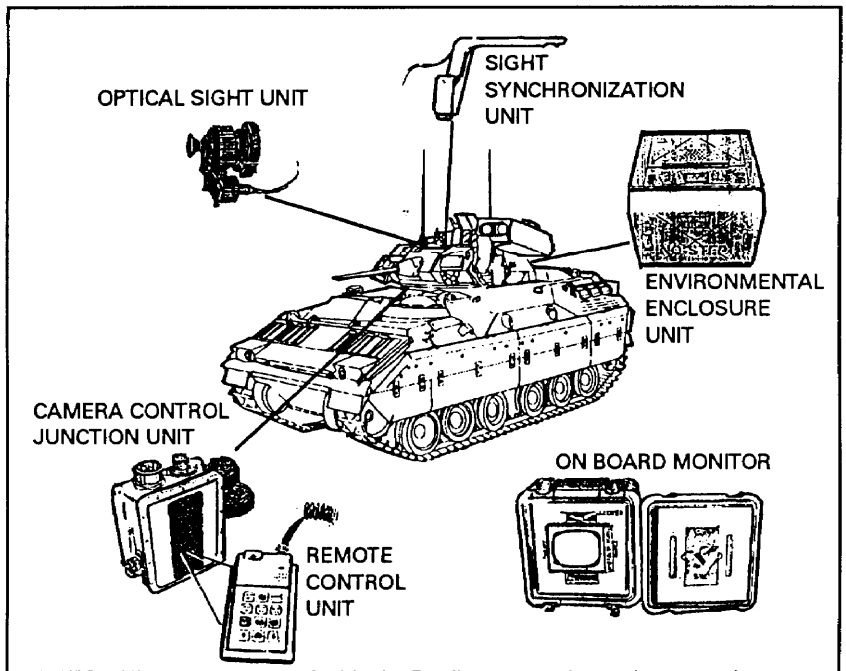
a. **Thru-Sight Video.** TSV (Figure 7-1, page 7-3) is a vehicle-appended system that provides a video and audio recording of gunnery or tactical engagement

exercises in real time. It is used for vehicle gunnery training to provide an evaluation and critique of actual engagement sequences. The TSV system is transparent to the crew. It provides an immediate playback capability through the use of an onboard monitor. The system also contains an after-action review subsystem that allows evaluators to playback, freeze, and zoom on individual engagements. These features provide an AAR enhancement that gives crews a view of their performance. The system is interchangeable with the Ml Abram and the M2/M3 Bradley. (TM 9-6920-708-10 provides more descriptive information.) The system components are—

- Audio video recorder.
  - — Environmental enclosure unit.
  - — Camera control junction unit.
  - — Optical unit.
  - — Cable assembly.
- After-action review.

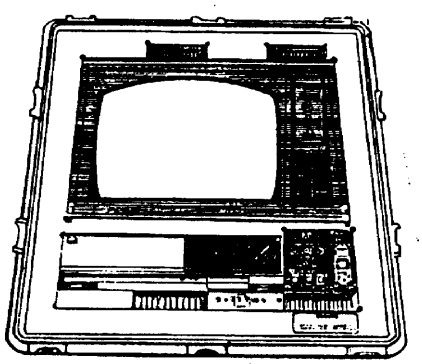
b. **Multiple-Integrated Laser Engagement System.** MILES (Figure 7-2, page 7-4) is an integrated family of low power, eye-safe, laser-based devices. It simulates the casualty-producing effects of direct-fire weapons using semiconductor laser beams. When fired, an invisible laser beam is sent out from a transmitter attached to the 25-mm gun and to the TOW launcher. The laser beam transmits coded messages (based on the weapon and ammunition selected) to the detector belt sensors on other MILES-equipped vehicles. The MILES for the M2/M3 fighting vehicle enables the crew to use the vehicle in realistic combat training exercises (force-on-force). It also provides the commander an economical way to train and evaluate his crew's proficiency in teamwork and crew coordination during gunnery training exercises. However, MILES is not suitable for training moving target engagements, because the gunner cannot apply lead to engage the target. Also, BOT and TOT cannot be trained using MILES, because the crew cannot see hit signatures or tracers. (TM 9-1265-375-10 provides more descriptive information.) The sysstem components are—

- Main gun/coax machine gun transmitter.
- Coax machine gun microphone.
- TOW transmitter.
- TOW simulator tube.
- 7.62 blank firing attachment.
- Combat vehicle kill indicator.



NOTE: All components are inside the Bradley except the environmental enclosure unit.

AUDIO VIDEO RECORDER
Subsystem



AFTER-ACTION REVIEW
Subsystem

NOTE: After-action review subsystem is in the AAR briefing area..

Figure 7-1. Thru-sight video.

- Flash weapons effects systems simulator.
- Detector belt system.
- Antitank weapons effects signature simulator.
- Control console.
- Battery box.

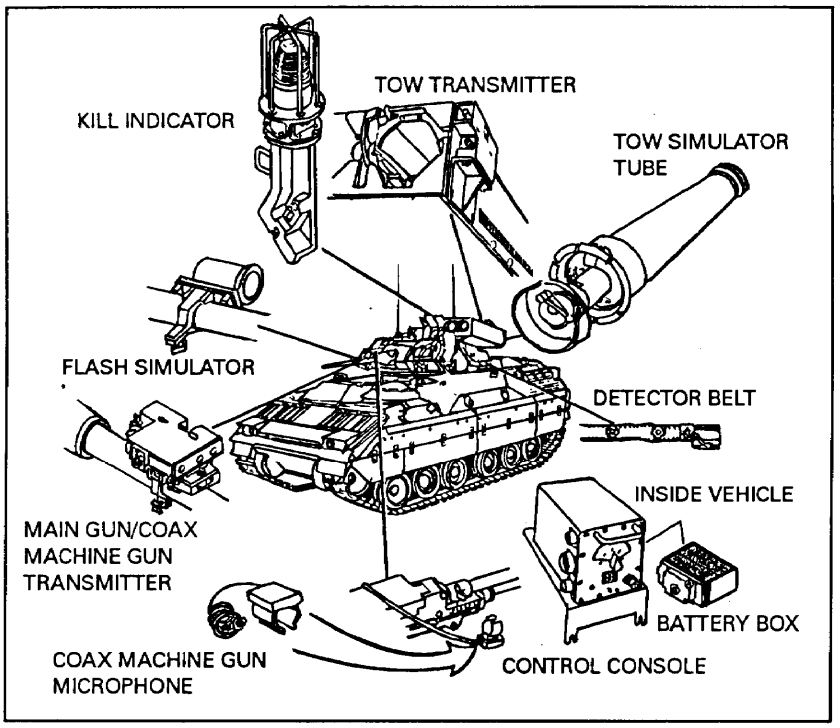


Figure 7-2. Multiple-integrated laser engagement system.

c. **Precision Gunnery System.** PGS (Figure 7-3) is an eye-safe laser simulation device that provides normal and degraded mode gunnery on unit vehicles. The system allows crews to develop and sustain gunnery skills while training using their own vehicles. All weapons and ammunition are duplicated in simulation by replicating tracer and missile signatures in the commander's and gunner's sights. This allows crews to apply lead, BOT, and TOT procedures during engagements. PGS is fully compatible on MILES-equipped ranges and the MILES battlefield. The system can send and receive hit, kill, and miss signals from other PGS, TWGSS (the system mounted on tanks), or MILES-equipped vehicles. A mounting reconfiguration allows the TOW to

be fired in "simulation" while the 25-mm and coax are fired "live." PGS provides BCEs the ability to review engagements during the AAR process. PGS displays ballistic information for each round fired. This information identifies placement of each simulated round in relation to the target, in mils, both in azimuth and elevation. (TM 9-6920-71l-12&P provides more descriptive information.) The system components are—

- Laser transceiver.
- Reference units.
- Hull detectors.
- Tracer burst obscuration simulator.
- Vehicle interface unit.
- Controller unit.
- Training data retrieval system.

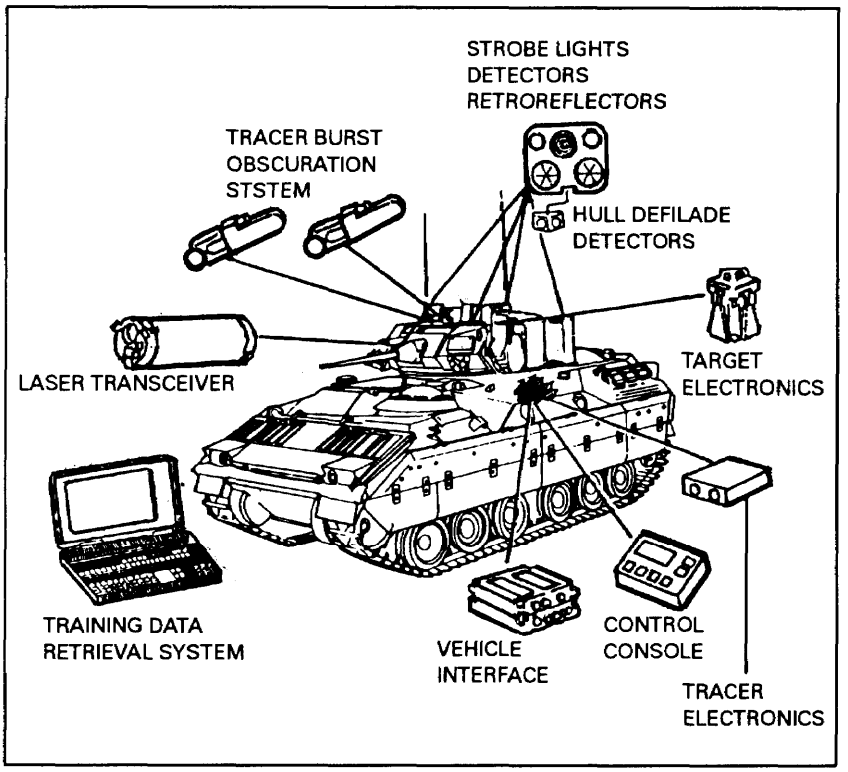


Figure 7-3. Precision gunnery system.

7-2. SIMULATORS

Simulators provide high-fidelity training without the use of the actual equipment. They are stand-alone trainers that emulate the functions of equipment or systems. Simulators use electronic or mechanical means to reproduce conditions necessary for an individual or crew to practice operational tasks in accordance with training objectives. They represent the equipment physically and fictionally to varying degrees and follow the mathematical equations that describe performance.

a. **Conduct of Fire Trainer.** COFT is the primary simulator for training crew gunnery skills without using ranges, ammunition, or vehicles. The COFT allows training without regard to time of day or climatic conditions. The two COFT configurations are unit-conduct of fire trainer (U-COFT) and mobile-conduct of fire trainer (M-COFT). (Operating instructions are in Instructor Utilization Handbook (IUH HB 23-1).)

(1) U-COFT (Figure 7-4) consists of three interconnecting shelters:

- The trainer shelter.
- The computer shelter.
- The integrated shelter.

Note: For operating instructions see Instructor Utilization Handbook (IUH HB 23-1) and TM 9-6920-737-10.

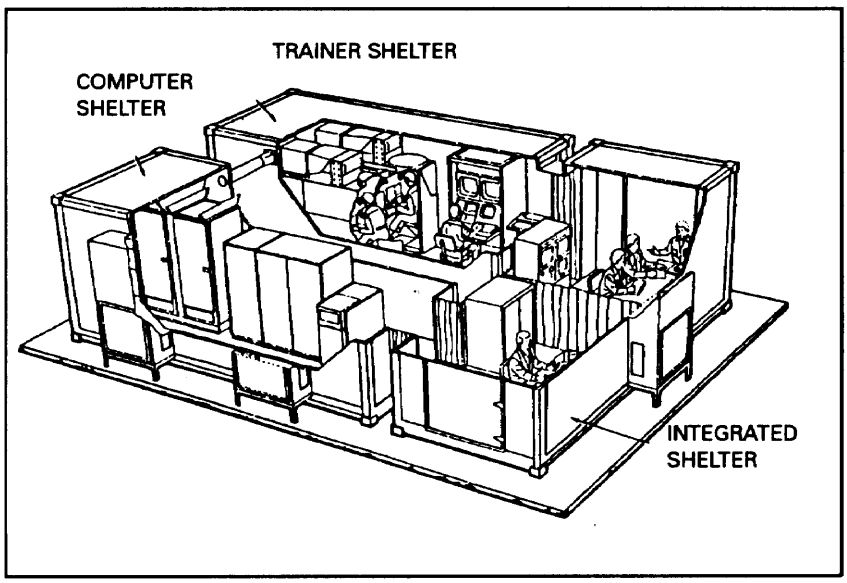


Figure 7-4. Unit-conduct of fire trainer.

(2) M-COFT (Figure 7-5) consists of a training shelter and a computer shelter mounted on a trailer to allow movement between various unit locations. This M-COFT is primarily for Army Reserve and National Guard.

- The training shelter.
- The computer shelter.

Note: For operating instructions see Instructor Utilization Handbook (IUH HB 23-1) and TM 9-6920-759-10.

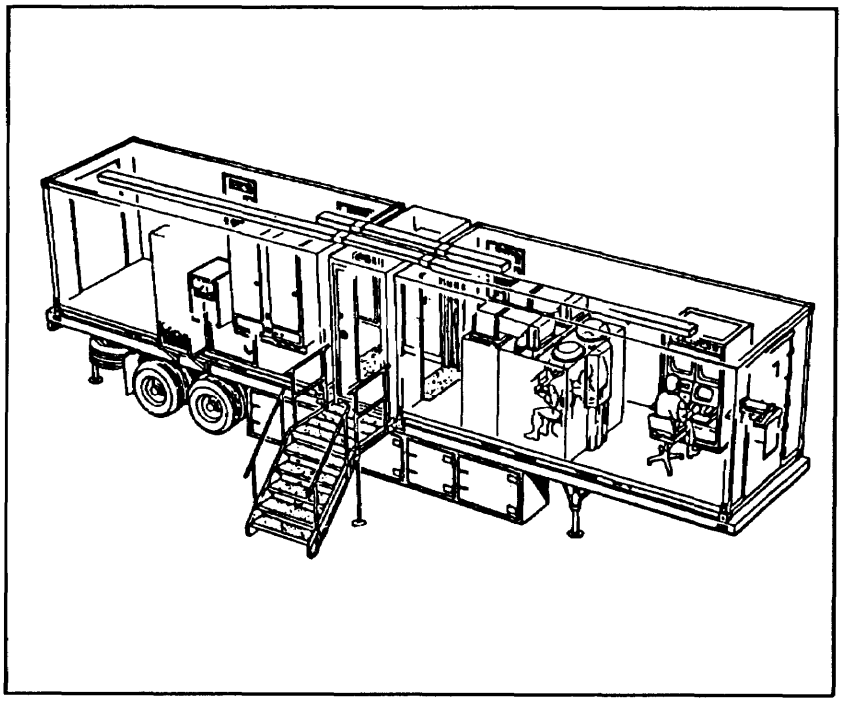


Figure 7-5. Mobile-conduct of fire trainer.

b. **Videodisc Integrated Gunnery Simulator.** VIGS (Figure 7-6, page 7-8) is a tabletop simulator that provides the primary controls, switches, and indicators used by gunners to identify and engage targets with the BFV turret weapons systems. This simulator trains gunners independently. (TM 9-6920-765-12&P provides more description information.) The system components are—

- Gunner's console.
- Videodisc player.

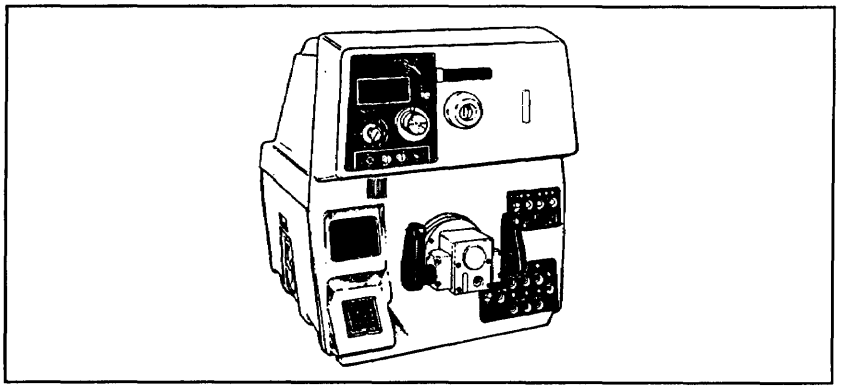


Figure 7-6. Videodisk integrated gunnery simulator.

c. **Simulations Network.** SIMNET (Figure 7-7) is a system of combat vehicle simulators linked to each other over a local area network. They simulate the Ml tank and the M2/M3 BFV. The configurations can vary from tank or infantry platoon up to a battalion task force. A company commander may train one platoon at a time using a subset of a company- or battalion-size configuration. When used as a company- or battalion-level trainer, a complete functional tactical operation center and combat trains command post are available to act as the administration logistics operations center that would normally be present during combat operations. Computer-generated imagery is used to create the illusion of riding in tanks and BFVs fighting force-on-force battles. The training benefits from SIMNET depend on two important factors: training know-how and leadership. The system and its computers are simple to use. With few exceptions, four hours of practice will support STX training on mounted tasks. As in any training, the leader must plan and prepare his objectives in advance and must ensure that the entire chain of command knows and supports the training objectives. The system components are—

- Simulator.
- Emulator.
- Semiautomated forces station.
- Tactical operations center.
- Combat trains command post.
- Site control command post.
- Plan view display.
- Data logger.
- Dismounted infantry work station.

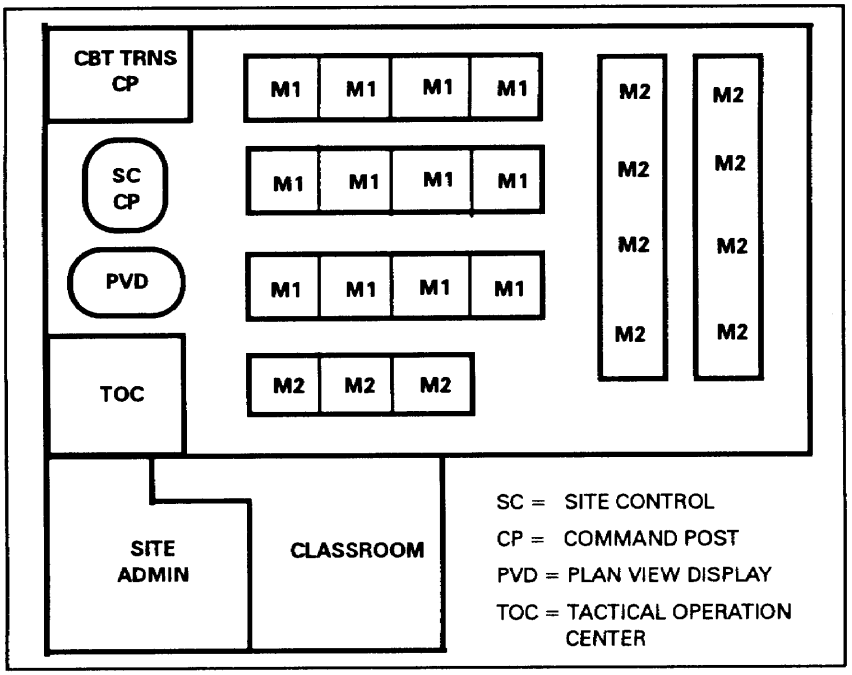


Figure 7-7. Simulations network.

d. **Close Combat Tactical Trainer.** CCTT (Figure 7-8, page 7-10) is a system of computer-driven combat vehicle simulators including the M1 Abrams tank, the M2/M3 Bradley, the HMMWV, the fire support team vehicle, and emulators that control other vehicle models and functions that work interactively; similar to the vehicles and functions they simulate. The simulators and emulators are connected by local area network. The system's computers create a simulated battlefield that when viewed by soldiers who are using the system, creates the illusion of moving and fighting over actual terrain while operating or riding inside the actual vehicles, and employing the actual weapons systems mounted in or on the vehicles. The trainer trains mounted crews through battalion task force soldiers in selected collective tasks. An important feature of the trainer is the computer-generated force (CGF) capability that can simulate both friendly and opposing forces with only limited human intervention from squad and crews up through regiment. It is a mounted task trainer; however, it includes the actions of dismouted infantry and scouts, and mounted and dismounted opposing forces, whose actions are controlled interactively by squad leaders and platoon leaders, and a CGF who operates dismounted workstations within a dismounted infantry module or from a CGF workstation.

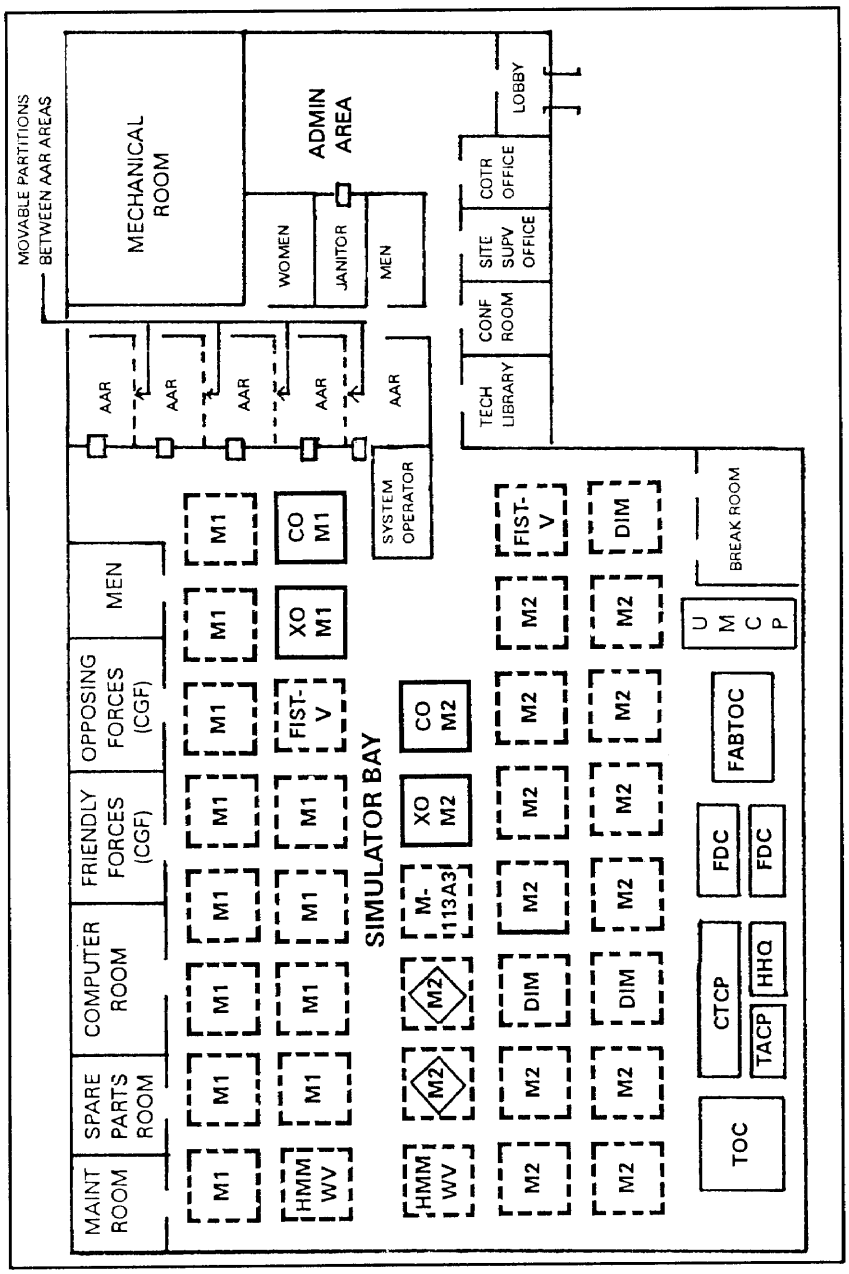


Figure 7-8. Close combat tactical trainer.

7-3. TRAINING AIDS

Training aids are tools that provide assistance in conducting training.

a. **Tracking Board.** The tracking board (Chapter 10, Figure 10-1) gives the Bradley commander and gunner practice in traversing and elevating the sight retitles as if they were tracking a vehicle moving cross-country. Tracking board exercises are practiced with the primary sight, the auxiliary sight, and the TOW reticle, both day and night. (For more detailed information on the use of the tracking board see Chapter 10.) An advanced tracking board (Chapter 10, Figure 10-3) is provided to make training more challenging to crews.

b. **Laser Target Interface Device.** LTID (Figure 7-9) aids in gunnery training with MILES/PGS. The LTID receives a coded MILES message and converts it into electrical pulses. These pulses activate the shock generator mechanism that activates a hit sensor, simulating a projectile striking the target. LTID can be used on full-scale, half-scale, or one-tenth-scale (on M31A1 lifters). Targets with LTIDs enhance training on BT I through IV and device-based BT XI. (See TM 9-1265-376-10.) The system components are—

- Detection assembly.
- Electronic assembly.
- Shock generator mechanism.

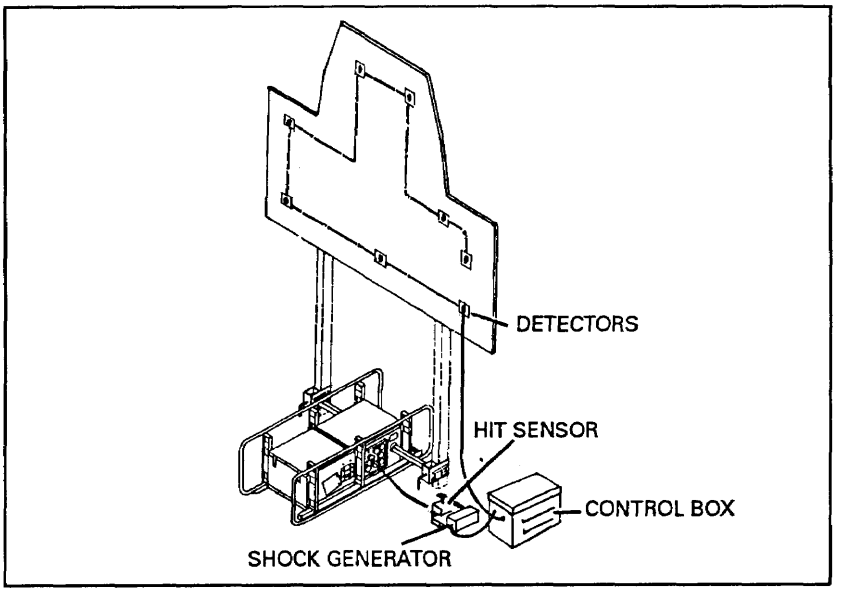


Figure 7-9. Laser target interface device.

c. **Scaled Models.** Armored vehicle scaled models can be used to train crews in target acquisition, range determination, and vehicle identification. These models are three-dimensional and are made of a hard plastic. Scaled models enhance preliminary gunnery training such as range determination, gun lay, and combat vehicle identification. Table 10-1, Chapter 10, is used when determining scale versus combat ranges. Scaled models are available in 1:10, 1:30, l:35, and 1:60 scale at the local TSC (Figure 7-10).

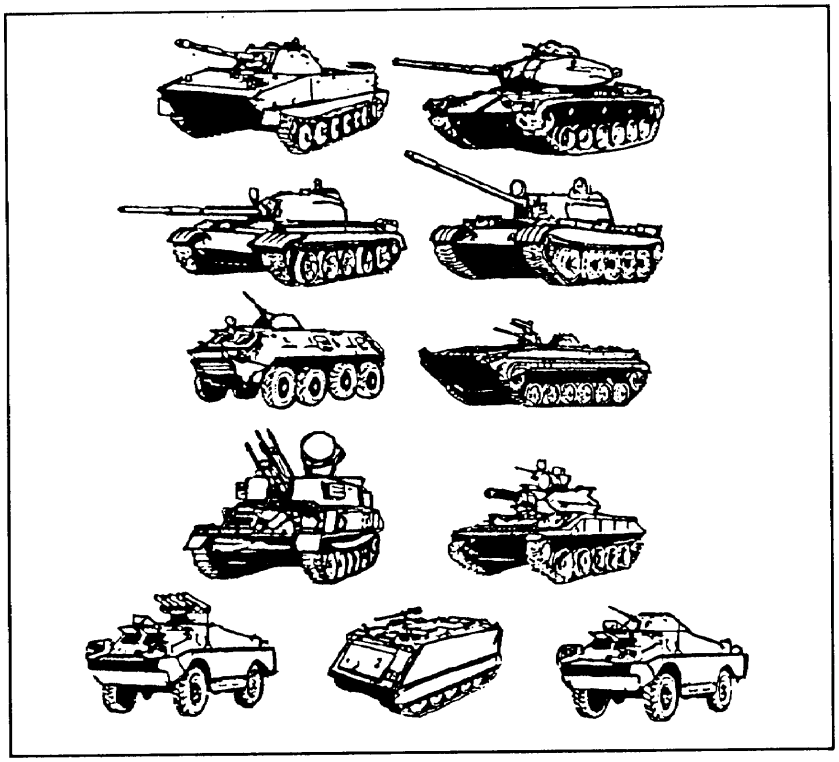


Figure 7-10. Armored vehicle scaled models.

d. **Dummy Rounds.** Various dummy rounds are available to conduct training with the M240C coax machine gun, the M242 25-mm automatic gun, and the TOW system.

(1) *M172 dummy round (7.62-mm).* The M172 is a 7.62-mm cartridge minus the gunpowder and primer. It is used for nonfire training with the M240C coax machine gun. It is made of brass with a metal tip. It is recommended for use over the plastic-tipped version. (The plastic tips can become bent and get jammed either in the weapon or the feed chute.) The

M172 dummy round can be used to train four of the tasks that are part of the BGST: Load the M240C coax machine gun, fire the M240C coax machine gun, apply immediate action, and unload and clear an M240C coax machine gun. The M172 round is a Class V item that can be requisitioned using DA Form 581. (Table 7-2, page 7-15, contains information required for requisitioning this round.)

CAUTION

Because the M172 dummy round is made of brass and can be damaged during training, the rounds should be inspected periodically and replaced as needed. Continued use of damaged rounds or links can damage the feed chute or the weapon. The links should be changed as often as possible.

(2) *M794 dummy round (25-MM).* The M794 dummy round is a nonfire training round used to conduct training on various 25-mm related tasks. The M794 dummy round is a cast metal round that is noncorrosive and weighs about the same as the M792 and M793 rounds. Previous dummy rounds were made from fired casings and had plastic or wooden tips. Because the casing of a fired round is slightly expanded, it could get stuck in the breech of the 25-mm gun. The use of such rounds should be discontinued and the cast metal rounds requisitioned. The M794 dummy round can be used to train crew members in the following tasks: Load and unload the HE and AP ready boxes, load the 25-mm feeder, apply immediate action on the 25-mm, and unload and clear the 25-mm gun (The conditions and standards for these tasks are in Appendix A.) Because the links can become damaged or rusty, they should be changed as often as possible. The M794 dummy round is a Class V item and can be requisitioned with DA Form 581. (Table 7-2, page 7-15, contains information required for requisitioning the M794 dummy round.)

(3) *Missile simulation round.* The MSR is used to train crews in all nonfire TOW related tasks. It is a dummy TOW round casing. It comes in a crate the same as an actual round. The MSR simulates the actual weight of a real TOW missile. Although the MSR does not have a diaphragm or humidity indicator, it does have a front cover and a forward handling ring. It is a nonexpendable major end item that can be requisitioned through the supply system. It should not be discarded if it is damaged. It can be used to practice uploading the BFV, uploading the TOW launcher, applying immediate action on the TOW subsystem, removing a misfired TOW, and unloading and stowing a TOW to its storage configuration. If the guide lugs or the electrical connector on the MSR are damaged, the round should not be used. Continued use of a damaged round will cause damage to the launcher.

	DEVICES			SIMULATORS			AIDS		
CHARACTERISTICS	TSV	MILES	PGS	VIGS	COFT	SIMNET CCTT	TRACKING BOARD	LTID	SCALED MODELS
PARTICIPANTS									
Gunner Only				X					
Gunner/BC	X		X		X		X	X	X
Gunner/BC/Driver		X				X			
Dismounted Infantry		X						X	
Platoon		X						X	
FEATURES									
Uses Bradley	X	X	X				X		X
Bradley Can Move	X	X	X						
Simulates Bradley				X	X	X			
Can Live Fire	X		X						
Force On Force	+	X	+			X			
Limited Visibility	X	X	X	X	X	X		X	
Use in NBC	X	X	X	X	X	X	X	X	X
Permanent Location					X	X			
Portable	X	X	X	X			X	X	X
Variable Difficulty				X	X	X	X		X
FEEDBACK									
Audio	X			X	X				
Visual	X	X	X	X	X	X	X	X	
Written			X		X	X			
TRAINING EVENT									
Preliminary Gunnery	X	X	X	X	X		X	+	X
Drill Training	+	X	X					+	
Device Gunnery	+	X	X			+		X	
Crew Gunnery	X		2						
Platoon Gunnery	+								
Special	+	+	+			X		X	

X - DESIGNATED USE
+ - ALTERNATE USE

Table 7-1. Devices, simulators, and aids.

NOMENCLATURE	DODAC
Cartridge, 7.62-mm Dummy M172	1305-A159
Cartridge, 7.62-mm Dummy M172 (carton packed)	1305-A162
Cartridge 25-mm Dummy M794 (carton packed)	1305-A966
Cartridge 25-mm Dummy M794 (linked)	1305-A967

Table 7-2. Requisition information.

CHAPTER 8

RANGE OPERATIONS

A permanent Bradley firing range is a designated post range or facility. There is a surface danger area diagrarn designating a firing line or maneuver area and safety limits, both on a map of the area and on the ground. Each range is designed for specific purposes—types of weapons and ammunition and particular firing tables. These ranges cannot be modified or used for other types of firing without approval; usually the range control officer is the approving authority.

Normally, temporary ranges fill specific needs of units. These may be a home-station subcaliber range where no permanent range exists or a special live-fire exercise range (combined arms live-fire exercises or ARTEP). Requests to establish a temporary firing range must be accompanied by a surface danger area diagram to inform the approving authority of the specific requirement and area desired.

8-1. RANGE PREPARATION AND OPERATION

A plan must be developed for conducting Bradley gunnery training. This plan varies with the tables to be trained. The plan should reflect consideration of the following areas.

a. **Assets.** Training can be conducted by battalion or by company.

(1) *Battalion.* The battalion signs for, administers, and clears the range or training site. The training company assists in range police and other administrative duties. This allows the company to concentrate on gunnery, tactics, and maintenance. Advanced gunnery tables require support from outside of the battalion because of the magnitude of the target array and number of personnel needed to control the range. The tactical tables should not require assets from sources other than the battalion.

(2) *Company.* The company signs for, administers, and clears the range or training area. The battalion provides the necessary support in details, safety officers, range guards, and administrative personnel.

b. **Opening the Range or Occupying the Training Site (Sequence of Events).** The required personnel perform the following tasks.

(1) *The OIC—*

- Arrives at the range or training site before the unit.
- Checks communications and, for live-fire exercises, ensures that backup communications are available.

- Briefks the safety officer, the evaluator and the units that will be trained.
- Ensures that range equipment is present and operational.

(2) *The NCOIC—*
- *Sets* up additional training areas.
- Supervises ammunition, targets, and administrative details.

(3) The *safety officer or safety NCO—*
- Ensures that barriers are closed or range guards are posted and briefed on their duties.
- Ensures that no live ammunition is present on a nonfiring range.
- Supervises placing vehicles in the correct order for firing or training.
- Inspects storage, handling and lot number for restricted or suspended ammunition.
- Inspects medics and vehicles.
- Inspects DA Form 2408-4 for each M242 freed.
- Gives safety briefing before all live-fire exercises.

(4) *The master gunner—*
- Gives final briefing to Bradley crew evaluators.
- Ensures that the concurrent training is setup.
- Arrives at the range or training site before the firing unit.

c. **During the Exercise.** The following actions are performed.
(1) *The OIC—*
- Controls the firing of live-fire exercises.
- Maintains efticient through-put within units and between units going through the course.
- Maintains all required communications.

(2) *The NCOIC–*
- Supervises all details.
- Controls the movement of personnel from firing positions to additional training and other administrative areas.

(3) *The safety officer or safety NCO—*

- Ensures that misfires are handled in accordance with safety regulations.
- Observes for any safety violation.
- Clears each Bradley on completion of exercise.

(4) *The master gunner—*

- Ensures that range firing is conducted in accordance with the appropriate gunnery table.
- Ensures that boresighting and zeroing are accomplished correctly.
- Conducts remedial training on site as needed.
- Supervises the Bradley crew evaluators.
- Assists safety personnel when required in clearing weapons.
- Assists maintenance personnel when required in troubleshooting and correcting fire control malfunctions.
- Assists the commander in determining or verifying alibi conditions.

d. **Closing the Range.** The following tasks are performed.

(1) *The OIC—*

- Notifies range control that firing has terminated.
- Debriefs the unit personnel.
- Ensures that the range or training area is cleared in accordance with local regulations and SOPs.

(2) *The NCOIC—*

- *Supervises* ammunition and target details.
- Ensures that range facilities have been policed.

(3) *The master gunner—*

- Ensures that all DA Forms 2408-4 are kept up to date.

(4) *The ammunition NCOIC—*

- Ensures that no munitions are removed from the range by anyone other than authorized personnel.
- Prepares residue certificates required by the ammunition supply point.

e. **Training Tips.** The following tips aid the OIC in conducting training on the range.

(1) *Brief key personnel.* Before moving to the training site, the OIC briefs key personnel in setting up the site and in reacting to unusual circumstances. This briefing keeps downtime to a minimum and prevents boredom.

(2) *Start on time.* The OIC has the training site ready and communications set up early so that crews can begin firing on time. He plans operations so that training is not interrupted for maintenance of the course until a prearranged time or normal shutdown time, which is posted in the daily range bulletin. He ensures that there is enough targets to complete all training before the scheduled break.

(3) *Use range marker lights (live fire).* The OIC does not allow firing at night without a light and a thermal range marker on the range safety markers. If the range marker lights fail, all ranges that use the same impact area must be closed. To prevent this, the OIC places two lights on each range safety marker, making sure that a backup light is available. The OIC makes sure that lights are in good operating condition and batteries are fresh.

(4) *Plan illumination.* The OIC registers weapons when possible to locate indirect illumination before dark. For ease of control and reduction of support requirements, the OIC locates indirect-fire weapons on the same range with firing vehicles (ammunition pads, OIC, safety officers, transportation communications).

(5) *Keep a log.* The OIC maintains an accurate log. A log helps keep the OIC informed of dry-firing and live-firing times and other important events. As a minimum, the log contains the following entries:

- When the unit occupied the range or training site.
- For live fire, when permission to fire was received from range control.
- Who gave the permission to fire.
- When the range was in a cease-fire status.
- When the range reopened.
- Compass azimuth to any stray impact points and time of impact.
- When the unit cleared and departed the range.

(6) *Brief guards.* The OIC has a plan to check and change guards frequently. Also, he makes sure that guards are briefed on their duties and their importance and that they understand the instructions.

(7) *Prepare for fire.* During dry seasons, there is always a danger of tracer illumination causing grass and forest fires. The OIC is prepared to quickly control the situation. The number of tracer rounds may need to be reduced in linked ammunition if fires persist.

(8) *Police the area.* The OIC keeps the area policed at all times. A clean training site reduces the chance of injury, especially at night. The area is policed continuously to avoid spending valuable time cleaning up after firing.

(9) *Brief visitors.* The OIC has a plan for briefing visitors and designate a briefing NCO or officer. Visitors are briefed before escorting them to the primary training site.

(10) *Check safety markers.* The OIC makes sure that range safety markers are present before any live firing begins; if light markers are used, they are checked before darkness.

(11) *Coordinate for munitions.* The OIC coordinates with the support elements for supplying live ammunition or pyrotechnics. This coordination ensures having the correct type of ammunition in the correct amounts at the right time and place. The OIC ensures that the ammunition to be fired has been checked against TB 9-1300-385 for restricted or suspended ammunition lot numbers.

(12) *Conduct other training.* The OIC stresses those areas in which the unit needs additional training. The following are suggested areas for additional training:

- Target acquisition.
- Range determination.
- Movement techniques.
- Crew tasks.
- Platoon tasks.
- Fire commands.
- Methods of adjustment.
- Stabilization training.
- Prepare-to-fire checks.
- Misfire procedures.
- Target identification.
- Maintenance of vehicles and weapons.

(13) *Position recovery vehicle.* The OIC quickly removes disabled vehicles from the course to prevent loss of training time. A manned recovery vehicle is in position to support the unit.

(14) *Brief bunker personnel (live fire).* The OIC briefs bunker personnel on safety regulations and requirements. Bunker personnel are given definite control measures, such as entering and exiting the bunker and bunker area. Bunker personnel have two means of communications with the tower.

(15) *Brief OPFOR personnel.* The OIC briefs OPFOR personnel on their role in the tactical training. The OIC makes sure tha tthey know what to do and

when to do it. He stresses that their actions must be the same for each unit going through the course.

8-2. RANGE AND TRAINING AREA RECONNAISSANCE

The OIC, the master gunner, and the NCOIC should personally conduct a reconnaissance and coordinate with range control before their unit occupies a range or training area. As a minimum, the following areas are checked during a reconnaissance.

- Where are the routes to the range or training area?
- How many vehicles can fire stationary or moving course simultaneously?
- Are there hull-defilade and defilade positions?
- What control facility (tower) is available and what is its condition?
- What communication hookups are available to operate the range?
- Are range limit markers visible during day, reduced visibility, and night firing?
- What and where are barriers and guard posts that need to be closed or manned?
- Are surveyed boresight panels available?
- Who finishes the targets, target supplies, or training devices used on the range?
- What requirements are necessary for target operators or target details?
- What ammunition can be used on the range?
- Has the range or training area been cleared of duds?
- Where are the following areas?
  - — Ammunition pad.
  - — Firing line and maneuver areas.
  - — Barriers and guard posts.
  - — Range limits.
  - — Helipad.
  - — Aid station
  - — Parking areas.
  - — Maintenance area.

— Latrine.
— Briefing and debriefing areas.
— Tower.

8-3. RANGE AND TRAINING AREA PERSONNEL, EQUIPMENT, AND LAYOUT

Good planning and execution of range or tactical training allows progressive training and evaluation of the unit. Administrative requirements are in AR 385-63, local range regulations, and unit SOPs. A range book containing all applicable regulations and reference materials (for example, range schedules, firing tables, gunnery tables, maps, range logs, range certification list) aids the OIC in operating the range efficiently.

a. **Required Personnel.** The following personnel are required for conducting range training and must be certified on operation of a range by the local range control office.

(1) *Officer in charge.* The OIC is responsible for the entire range or training site. This includes planning preparing coordinating, and executing the training exercise. AR 385-63, Chapter 4, lists an overview of the duties to be completed or supervised by the OIC. The OIC also designates assistants to be responsible for specific areas of operation. All personnel involved in conducting the training exercise report to the OIC regarding their respective duties.

(2) *Range safety officer.* The RSO is a commissioned officer, warrant officer, or NCO (staff sergeant or higher) who is weapon systems qualified. The RSO is a direct representative of the officer in charge of firing. The RSO does not have any other responsibility during range firing other than the following duties:

- Conducts a safety briefing before all live-fire exercises.
- Enforces all safety regulations.
- Ensures that all ammunition is handled correctly.
- Enforces smoking restrictions near the vehicles ammunition, and POL.
- Ensures that misfires are handled as stated in AR 385-63 and the appropriate operator's manual.
- Investigates and reports accidents in accordance with all regulations.
- Ensures that weapons on live-fire ranges are pointed toward the impact area at all times.
- Ensures that personnel are clear of the danger area (except as authorized in AR 385-63).

- Checks all DA Forms 2408-4 for proper combination of barrel, receiver, feeder, and round count.
- Using TB 9-1300-385, checks all ammunition for suspended or restricted lots.
- Ensures that barriers and guards are in place before the start of the exercise.
- Checks for identification and qualification of medical personnel, and ensures they have transportation, if required.
- Inspects and clears all weapons following the completion of fire.
- Checks DA Form 2408-4 for round count on the firing pin and breech.

(3) *Master gunner.* The master gunner is the commander's gunnery technical advisor; he assists the commander and the staff in planning, developing and conducting gunnery training. His range duties include—

- Prepares a surface danger area diagram and range overlay.
- Prepares scaled ranges if required.
- Organizes range firing exercises.
- Sets up range firing exercises.
- Ensures that range firing exercises are properly conducted.
- Supervises the Bradley crews to ensure that proper boresighting and zeroing are accomplished.
- Coordinates target array and layout for range firing and qualification.
- Conducts remedial training on site as needed.
- Ensures that a standard Bradley crew evaluator program is implemented.

(4) *NCOIC.* An NCOIC coordinates and supervises details and assists the OIC and RSO in operating the range or training area.

(5) *Ammunition NCO.* An ammunition NCO—

- Ensures that ammunition is accounted for by type and lot, is correct for the scheduled firing, and is properly stored and secured on the ammunition pad at the training area.
- Checks any ammunition resupply to be sure it is not restricted or suspended (checks with RSO and TB 9-1300-385).
- Issues the correct type and number of rounds as instructed by the OIC and keeps a running inventory to cross-check daily expenditures turned into the OIC by Bradley commanders.

- Ensures that the ammunition pad is continually policed of links, brass, and packaging materials.

(6) *Target NCO.* Target NCOs are not needed on many of the automated ranges. Where target NCOs are required, their duties areas follows:

- Ensures that targets are the type, color, and scale (if applicable) required by the OIC.
- Ensures that targets are in the proper location on the range.
- Ensures that the target detail is proficient in the operation and troubleshooting procedures for all target mechanisms used.
- Ensures that the target detail has the required equipment and supplies, and that pre-positioned targets are available when needed.
- Ensures that there are enough spare targets, target mechanisms, batteries, patches, and other related equipment on the range or training site to support training.
- Reports to the OIC any mechanical malfunctions that require prompt replacement to continue firing.

(7) *Bradley crew evaluator.* This evaluator—

- Enforces required safety precautions.
- Acts as an instructor during practice.
- Acts as an evaluator during qualification.
- Conducts an AAR after completion of firing.
- Debriefs crews at completion of firing.
- Confers with OIC on any scoring discrepancy.

(8) *Fire-fighting detail.* This detail is required at some range facilities during dry seasons. When such a detail is used, the following should be considered:

- Availability of fire-fighting equipment.
- Designated vehicles for soldiers and equipment.
- Access routes to the impact or target areas.

(9) *Bunker personnel.* Bunker personnel move targets, if applicable.

(10) *Radiotelephone operators.* These operators maintain communications during an exercise.

(11) *Medic.* The medic must—

- Know how to get to the nearest aid station or hospital.

- Know radiotelephone operating procedures for use during air evacuation.
- Have an identification card (medical) or a memorandum from his commander stating that he is a qualified medic.
- Be equipped for the mission.

b. **Range Equipment.** The OIC and NCOIC should make sure that the following equipment is on hand.

(1) *For gunnery and tactical exercises—*

- Current gunnery standards for the table being conducted.
- Targets and target operating and control mechanisms.
- Target repair equipment.
- Range regulations.
- Flashlights for scorers.
- Batteries for lights and radios.
- Vehicle recovery assets.
- Evaluator communications.
- Briefing tent.
- Scorecards .
- Stopwatches.
- Binoculars.
- Night vision devices with enough batteries.
- Field telephones, as required.
- Fire-fighting equipment.
- Vehicles:
  - — Target and scoring detail.
  - — Fire-fighting detail.
  - — Backup aid vehicle.
  - — Safety officers (on a moving range).
- Generators to power light sets.
- Equipment for concurrent training.
- Boresight equipment.
- Other TOE and expendable supplies.
- All other required regulations, SOPs rnaps, and overlays.

• FM radio sets and antenna GRC-292.

(2) *For gunnery exercises—*

• Range flag.

• Range lights or lanterns.

• Flag sets for vehicles and tower.

• Compass for marking rounds out of impact area.

• Ballistic fining tables.

(3) *For tactical exercises—*

• MILES equipment.

• OPFOR equipment.

• OPFOR personnel.

c. **Range and Training Area Layout for Gunnery Exercises.** A well-organized gunnery range provides maximum firiing time. If ranges are planned and organized and all items are collected before moving to the range, firing can start on time and finish in time to allow an orderly range clearance.

(1) A battalion-level range operation SOP saves time and energy for the firing unit. The SOP should include guidelines for occupying the range and describe actions to be taken for specific tasks such as—

• Coordinating with maintenance contact teams.

• Operating moving targets.

• Replacing targets.

• Repairing target mechanisms.

• Fighting range fires.

• Conducting range scenario.

• Firing orders

• Policing the range.

• Departing the range.

• Breaking down ammunition.

• Moving vehicles to the ammunition point and to the ready line.

(2) Stationary Bradley ranges use moving and stationary targets (Figure 8-1, page 8-12). Crews engage targets from a defensive position or berm. OICs and RSOs should coordinate with local range control for assistance in planning these exercises.

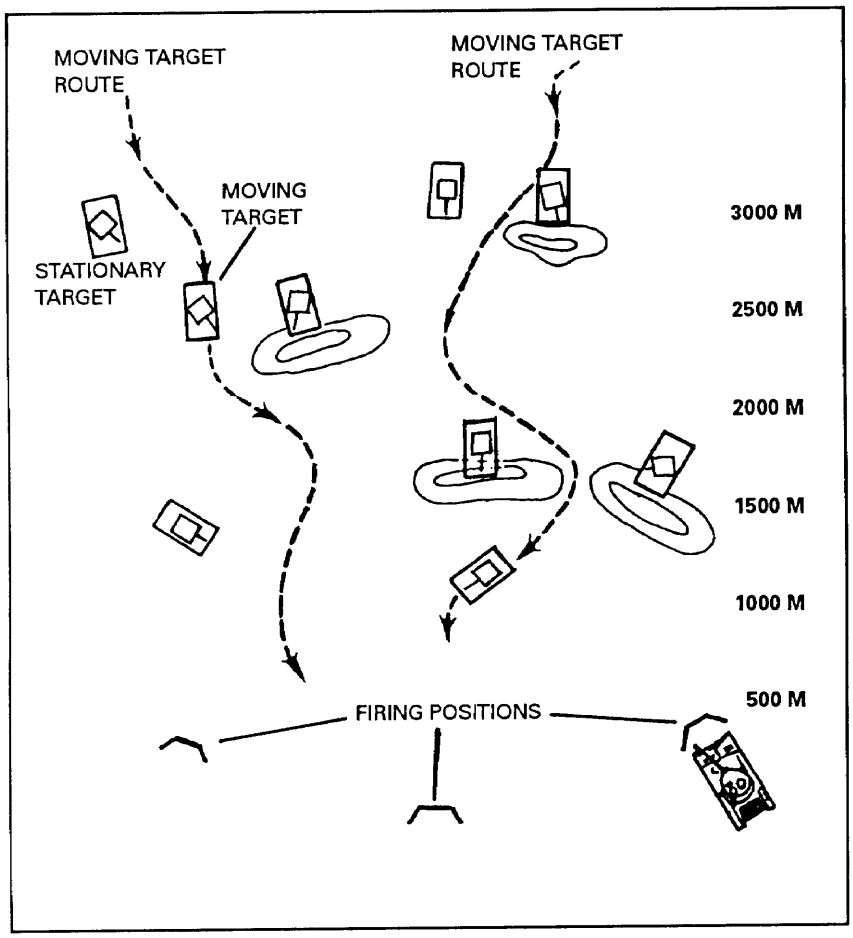


Figure 8-1. Sample layout of a Bradley stationary firing range.

(3) Moving ranges have a maneuver box not on stationary ranges (Figure 8-2). If course roads exist, then they should be used for movement. The BC should also use available terrain for masking the vehicle's position. Range control provides assistance to OICs in planning these exercises. Maneuver boxes are used to allow the vehicle crew to acquire, range, and destroy targets arranged in a realistic array as outlined on appropriate gunnery tables. Maneuver boxes must be clearly defined and adhered to (start and stop points) and at no time will this area extend or surpass the exposure and engagement times.

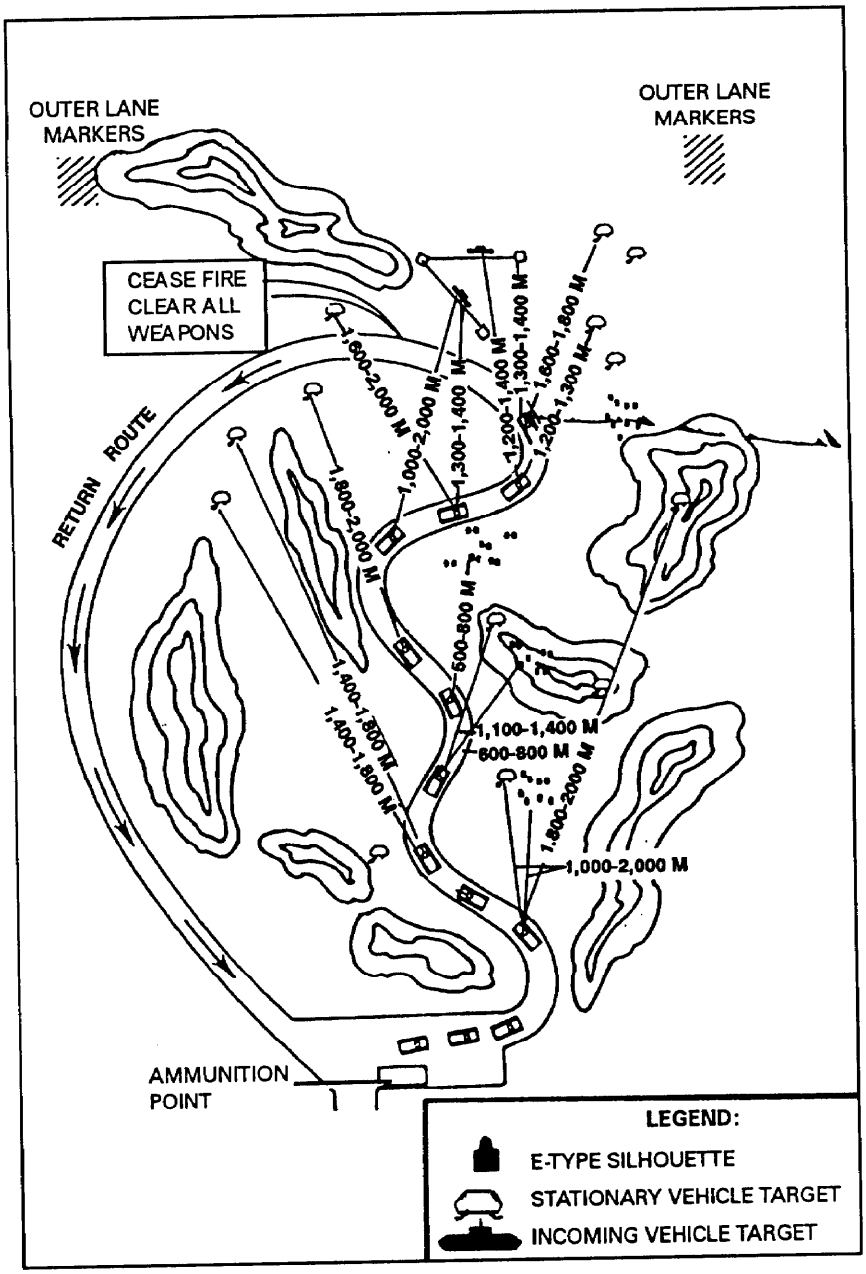


Figure 8-2. Sample layout of a Bradley moving range.

(4) To determine the size of a maneuver box, the average vehicle speed for the course and the target exposure time must be known. The procedure for determining the length of a maneuver box is as follows:

VEHICLE SPEED: 12 miles per hour

TARGET EXPOSURE: 42 seconds

1. Convert vehicle speed into meters per second by multiplying by the constant 0.4471416:
   12 (miles per hour) X 0.4471416 = 5.3656992
2. Convert meters per second into maneuver box length:
   5.3656992 X 42 (target exposure)= 225.35936 meters
3. Maneuver box length= 225 meters,

NOTE: The maximum distance the vehicle could travel and still have the target exposed is the length of the maneuver box. If the first number after the decimal is 5 or more, the length is rounded to the next whole number.

d. **Range and Training Area Layout for Tactical Training.** Tactical training is conducted either on ranges or in training areas, whichever is available. Most of the preparation that goes into a gunnery exercise also applies in tactical training.

(1) The configuration of the course depends on the local terrain. Each task must be adjusted to fit a specific piece of terrain, so tasks probably will not be encountered in the order in which they appear in a particular table.

(2) As in the gunnery tables, tactical tables need a range operation SOP that will save time and energy for the firing unit. The SOP should include guidelines for setting up the tactical range or training area and should describe actions to be taken for specific tasks, such as—

- Coordinating with maintenance contact team (for MILES devices).
- Testing MILES equipment.
- Setting up tactical table layout based on METT-T and table standards.
- Briefing OPFOR and controller personnel on duties for each engagement.
- Test firing weapons (Hoffman signature device, machine guns with blank adapters).
- Moving vehicles to the start point and issuing fragmentary orders to initiate movement down the course.

- Conducting after-action reports after each engagement and assembling Bradley crews (resetting MILES equipment).
- Controlling movement on the course to prevent congestion of Bradleys or platoons.
- Policing the range or training area.
- Departing the range or training area.

e. **Targets.** Full-scale targets should be of the same shape, size, and color as the threat targets they represent. TC 25-8 describes targets, target mechanisms, and target control in detail.

(1) *Hard targets (live fire).* When available and where ricochets do not present safety hazards, hard targets are preferred when firing 25-mm ammunition. Old tank hulls and turrets, armored personnel carriers, and wheeled vehicles make good hard targets. When filled with sand or dirt, these hard targets withstand many hits.

(2) *Soft targets (live fire).* Soft targets are made from target cloth or wood by the unit or range control activity. These targets should be olive drab. TC 25-8 describes targets, target mechanisms, and target sizes.

(3) *Target kill cues.* A visual cue must be used to indicate target kills; for exarnple, target drops, indicator lights, and red or black smoke.

f. **Flags.** On all ranges, vehicles display flags to show the vehicles' weapon status.

(1) *Red.* Bradley is engaging in firing. Weapons are loaded, pointing at the target area, and electrical safety and manual safety are off.

(2) *Green.* All weapons are cleared and elevated, and electrical safety and manual safety are on. All ammunition on board the vehicle is either loaded in the ready boxes or stowed.

(3) *Yellow (and red or green).* There is a malfunction on the vehicle. The yellow fag is used in conjunction with a red or green flag:

- Yellow and red. The Bradley has a malfunction or misfire; weapons are pointing at the target area and are not clear. (The electrical safety and manual safety are on; if not, range safety personnel are notified.)
- Yellow and green. The Bradley has a malfunction and all weapons are clear, and electrical safety and manual safety are on.

(4) *Red and green.* The Bradley is preparing to fire or the crew is conducting a nonfiring exercise. The 25-mm gun feeder may be loaded but the bolt is in the sear position, and the electrical safety and the manual safety

are on. The coax may be loaded, the bolt to the rear, and the manual safety is on.

g. **Range Control.** The range control officer is responsible for the coordination and safe conduct of range activity for all units. Normally, unit headers are required to receive a range briefing from the range control officer before occupying a range. This briefing is scheduled promptly to prevent any delay in training. Range control should also provide a set of local range regulations and policies.

h. **Range Communications.** The installation range officer controls all ranges by wire and radio communication. The control system is used for obtaining clearance to fire, making reports, coordinating, and calling cease fires.

(1) The OIC controls all training activities, including firing, by the best means available and always has a backup system.

(2) Wire is the preferred means of communication for target operators and personnel in the impact area or, in the case of tactical training with the OPFOR. In all cases, the OIC plans for a backup communication system to prevent delay.

8-4. ESTABLISHMENT OF A BRADLEY LIVE-FIRE RANGE

Before a site is selected for a scaled or full-caliber range, a detailed map and ground reconnaissance is made of areas available for firing.

a. **Site Selection.** The range must be large enough to accommodate all weapon systems and types of ammunition to be fired, along with the scenario requirements of the table(s) to be fired. Realistic conditions not provided by the selected terrain should be constructed to enhance training; for example—

- Defilade stationary firing positions.
- Sufficient maneuver area and enough targets to provide multiple firing points and target locations.
- Targets in realistic arrays and, if possible, not marked by berms.

b. **Ballistic Firing Table.** The ballistic data in firing tables for Bradley ammunition are used to develop or modify surface danger area diagrams.

(1) The use of ballistic characteristics combined with knowledge of the fire control system allows the crews to use the Bradley weapons more effectively. (See Table 8-1 for an extract of a ballistic firing table.) (See publications FT 25-A-2 and FT 7.62-A-2.)

CARTRIDGE, APDS-T, M791				MUZZLE VELOCITY, 1345M/S	
RANGE	SUPER-ELEVATION	DR/DSE	DH/DR	DRIFT	TIME OF FLIGHT
Meters	Mils	M/Mil	M/100m	Mils	Sec
1600	5.12	263	0.6	0.1	1.33
1700	5.49	257	0.6	0.1	1.42
1800	5.88	252	0.7	0.1	1.52
1900	6.27	247	0.7	0.1	1.61

10KM/HR CROSS WIND DEFLECTION	MAXIMUM ORDINATE	RANGE TO MAXIMUM ORDINATE	ANGLE OF FALL	REMAINING VELOCITY	RANGE
Mils	Meters	Meters	Mils	Meters/Sec	Meters
0.2	2.2	830	6	1075	1600
0.3	2.5	884	6	1058	1700
0.3	2.8	938	7	1041	1800
0.3	3.2	993	8	1025	1900

Table 8-1. Extract of ballistic Firing Table 25-A-2.

(2) The following terms explain the data in all gunnery firing tables. The data columns may differ slightly among various rounds of ammunition and types of weapons.

(a) Range: Vehicle-to-target distance.

(b) SupereIevation: Additional elevation induced into the fire control system to raise the ballistic flight of a given projectile to ensure that the projectile hits a target at a given range.

(c) DR/DSE: Number of meters a l-mil elevation change will make in linear range, on the ground, at a given range and superelevation.

(d) DH/DR: Change in height (in meters) of a projectile for a 100-meter change in linear range on the ground, at a given range.

(e) Drift: Number of roils the projectile moves to the right of the gun-target line because of the spin caused by the gun rifling.

(f) Time of flight: The amount of time it takes a projectile to reach a target at a selected range.

(g) 10 km/hr cross wind deflection: Generally, a round is most unstable when it exits the muzzle. This effect of wind deflection assumes a 10-kilometer-per-hour cross wind. The correction is applied into the wind; when wind speed is different from 10 kilometers per hour, the point of aim must be estimated.

(h) Maximum ordinate: The maximum height the projectile travels above the line of sight at a given range.

(i) Range to maximum ordinate: The range at which the maximum ordinate is reached. Out to this range, the projectile is ascending beyond this range, the projectile is descending. The range to the maximum ordinate will always occur shortly past half of the target range.

(j) Angle of fall: The number of roils between the projectile's trajectory at impact and the line of sight.

(k) Remaining velocity: Speed of the projectile in meters per second at a selected range.

c. **Surface Danger Area Diagrams.** Bradley units establishing ranges or modifying existing ranges must submit surface danger area diagrams to the range control officer before firing. Surface danger area diagrams show range boundaries and safety features in overlay from including range limit markers for firing positions. Ballistic firing tables (FT 25-A-2) that provide values for range, maximum ordinates, and superelevation for each ammunition type are needed to construct surface danger area diagrams. (Figure 8-3.)

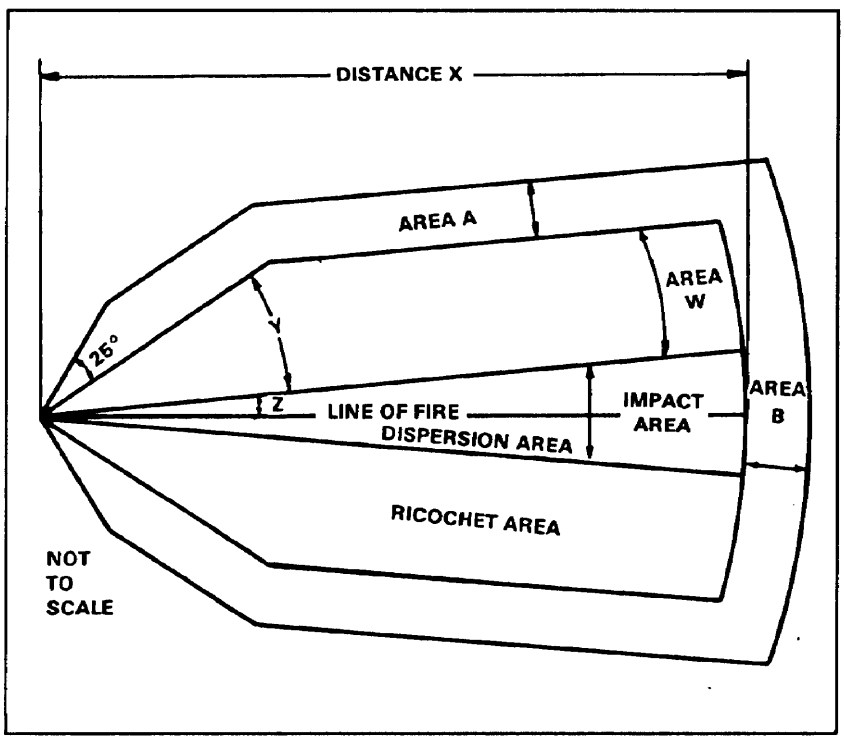


Figure 8-3. Surface danger area diagram for M792 ammunition.

(1) Surface danger area diagrams on established ranges should be modified when these ranges do not provide realistic conditions or do not make maximum use of available terrain. Restrictions and precautions for surface danger area diagrams are in AR 385-63. When engaging ground targets, distance X (maximum range) maybe reduced to 15 degrees elevation provided the firing elevation of the gun can be maintained at less than or equal to 15 degrees (Table 8-2, page 8-20 and 8-21). If the weapon cannot be controlled at or under 15 degrees, such as might happen when firing while moving over rough terrain with inoperative stabilization, the maximum range (distance X) should be used. Range at 15 degrees elevation is the maximum distance the projectile can travel when fired at elevations of 15 degrees or less. This value is derived using data from the ballisticc firing tables along with ricochet data.

(2) The M2A2ODS/M3A2ODS vehicles have eye-safe laser range finders. However, when other laser range finders are used, an additional buffer area, area C, may be required (AR 385-63, Chapter 19). Every object the laser beam strikes reflects energy. In most cases, this energy is diffused and is not hazardous. Mirrors, plastic, or glass, or other flat mirror-like objects having a vertical or near vertical surface in the target area that might reflect the laser beam and cause injury are removed. If this is impractical, the surfaces are covered with lusterless paint or some nonreflecting material such a cloth or cardboard.

DIMENSIONS FOR M791, APDS-T, 25-MM							
IMPACT MEDIA	AREA A Meters	AREA B Meters	AREA W[2] Meters	ANGLE Y Z Degrees	DISTANCE X[1] Meters	RICOCHET RANGE Meters	15-DEGREE ELEVATION RANGE Meters
Armor	NA	NA	1510	24 5	14,572	7294	11,550
Concrete	NA	NA	2208	34 5	14,572	7622	11,550
Earth	NA	NA	1466	18 5	14,572	7402	11,550
Water	NA	NA	263	6 5	14,572	5665	11,550

NOTES:
1. Distance X (maximum range) may be reduced to ricochet range when engaging ground targets at ranges up to 3,500 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,500 meters, use the 15-degree elevation range. When firing on the move over rough terrain, use Distance X.
2. When firing at aerial targets and the gun elevation is greater than 15 degrees, the ricochet area is defined by Area W and Angle Y is not required.
3. Area A and Area B, fragmentation areas, are not applicable for the M791, APDS-T round, because no significant fragmentation is expected with this round.

DIMENSIONS FOR M792, HEI-T, 25-MM							
IMPACT MEDIA	AREA A Meters	AREA B Meters	AREA W[2] Meters	ANGLE Y Z Degrees	DISTANCE X[1] Meters	RICOCHET RANGE Meters	15-DEGREE ELEVATION RANGE Meters
Armor	300	400	1373	28 5	6379	5265	5241
Concrete	300	400	1290	27 5	6379	5071	5241
Earth	300	400	908	19 5	6379	4792	5241
Water	300	400	1047	19 5	6379	4823	5241

NOTES:
1. Distance X (maximum range) may be reduced to ricochet range when engaging ground targets at ranges up to 3,000 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,000 meters, use the 15-degree elevation range; except for armor impact medium, use Ricochet Range distance, which is greater. When firing on the move over rough terrain, use Distance X.
2. When firing at aerial targets and the gun elevation is greater than 15 degrees, the ricochet area is defined by Area W and Angle Y is not required.

Table 8-2. Data for 25-mm ammunition.

DIMENSIONS FOR M910, TPDS-T, 25-MM							
IMPACT MEDIA	AREA A Meters	AREA B Meters	AREA W[2] Meters	ANGLE Y Z Degrees	DISTANCE X[1] Meters	RICOCHET RANGE Meters	15-DEGREE ELEVATION RANGE Meters
Armor	NA	NA	799	20 5	6404	4472	6017
Concrete	NA	NA	1143	27 5	6404	4643	6017
Earth	NA	NA	734	15 5	6404	4592	6017
Water	NA	NA	148	4 5	6404	3724	6017

NOTES:
1. Distance X (maximum range) may be reduced to ricochet range when engaging ground targets at ranges up to 3,000 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,000 meters, use the 15-degree elevation range. When firing on the move over rough terrain use Distance X.
2. When firing at aerial targets and the gun elevation is greater than 15 degrees, the ricochet area is defined by Area W and Angle Y is not required.

DIMENSIONS FOR M793, TP-T, 25-MM							
IMPACT MEDIA	AREA A Meters	AREA B Meters	AREA W[2] Meters	ANGLE Y Z Degrees	DISTANCE X[1] Meters	RICOCHET RANGE Meters	15-DEGREE ELEVATION RANGE Meters
Armor	NA	NA	1373	28 5	6047	5265	5112
Concrete	NA	NA	1290	27 5	6047	5071	5112
Earth	NA	NA	908	19 5	6047	4792	5112
Water	NA	NA	1047	19 5	6047	4823	5112

NOTES:
1. Distance X (maximum range) may be reduced to ricochet range when engaging ground targets at ranges up to 3,000 meters from stationary firing positions. When firing from a moving vehicle over level terrain at ground targets up to 3,000 meters, use the 15-degree elevation range; except for armor impact medium, use Ricochet Range distance, which is greater. When firing on the move over rough terrain, use Distance X.
2. When firing at aerial targets and the gun elevation is greater than 15 degrees, the ricochet area is defined by Area W and Angle Y is not required.
3. Values listed for Area W, Angle Y, and Ricochet Range are the same as listed in the dimensions for M792, since the M792 HEI-T projectile is ballistically similar to the M793, TP-T projectile.

Table 8-2. Data for 25-mm ammunition (continued).

CHAPTER 9

BRADLEY GUNNERY EVALUATION

Bradley gunnery evaluations require defined, measurable standards that reflect the proficiency level of crews, sections, and platoons. Bradley crew evaluators and observer-controlers evaluate and enforce the standards. Bradley crew evaluate evaluate device and live—fire crew gunnery. Observer-controllers evaluate device and live-fire section/platoon gunnery. This chapter contains evaluation guidelines and procedures for crew and platoon gunnery.

Section I

CREW GUNNERY EVALUATION

Crews must be evaluated on their abilities to function together while engaging targets. These abilities consist of crew coordination, weapon system proficiency, and marksmanship. All crew gunnery engagements (device and live fire) are evaluated as trained (T), needs practice (P), or untrained (U) based on the GO or NO-GO criteria of the engagement task and subtask standards.

9-1. ENGAGEMENT STANDARDS

Engagement standards consist of task and subtasks standards. Task standards must be met for a successful engagement. Subtasks support the task standards. Subtask standards are categorized as critical, leader, and noncritical. Critical subtasks are those tasks that are so critical that they must be accomplished to meet the engagement task standards. Leader and noncritical subtasks support the engagement task but their success or failure will have little impact on accomplishment of the engagement task. Not all subtasks apply to all engagements; however, the task standards will apply to every engagement. Engagement evaluation criteria for crew gunnery is—

T = GO on all task standards, a GO on all critical subtask standards and leader subtask standards, and no more than one NO-GO on a noncritical subtask standard.

P = GO on all task standards and a GO on all critical subtask standards, with a NO-GO on one or more leader subtask standards or a NO-GO on two or more noncritical subtasks standards.

U = NO-GO on one or more task standards or NO-GO on one or more critical subtask standards.

9-2. TASK STANDARDS

Engagement task standards require the crew to hit a given target with an appropriate number of rounds and type of ammunition without exposing the BFV beyond the given target's time to hit the Bradley.

Note: Partial credit for an engagement will not be given. A crew must kill all targets in an engagement in accordance with the appropriate engagement standards to receive credit for the overall engagement.

a. **Target Kill Standards.** The kill standards for crew gunnery are in Table 9-1. These kill standards identify minimum hits required to achieve a kill on a given target type. These kill standards are affected by budget constraints and limited resources. They do not reflect reality in combat. Crews receive an untrained rating if they fail to achieve a kill in accordance with Table 9-1 or they use an ammunition that is not designated for destroying a target in accordance with Table 9-2.

TOW targets	Hit with a minimum of 1 round
25-mm point targets	Hit with a minimum of 3 rounds
25-mm aerial targets	Hit with a minimum of 5 rounds
25-mm area targets	Suppress 75% of target using a Z pattern (one round in 6 of 8 boxes)
Coax point targets	Troop—hit 1 target with 1 round Truck—hit with a minimum of 3 rounds
Coax area targets	Hit one troop target with 1 round and suppress area with Z pattern

Table 9-1. Target kill standards chart.

TARGETS	DESIGNATED AMMUNITION AND MAXIMUM RANGE (Meters)			
	TOW	AP	HE	COAX
Armored	3,750			
Light-armored		2,500		
Unarmored			2,500	900
Aerial		2,500	1,200	
Troops			2,500	900

Table 9-2. Target ammunition requirments.

Note: Some ammunition types can destroy other types of targets and some are effective at greater ranges than shown in Table 9-2; however, Table 9-2 identifies the ammunition standard for Bradley gunnery.

b. **BFV Exposure Matrixes.** BFV exposure matrixes are used to determine the BFV crew's allowable exposure time to a given target. There are four matrixes—armored, light-armored/unarmored, aerial, and troops. The armored matrix is based on a standard target acquisition time plus the time of flight of the TOW missile (Table 9-3, page 9-4). The armored target timing matrix is based on the Bradley in a turret-defilade position—day defense and night defense. The light-armored/unarmored, aerial, and troop matrixes are based on threat target's time to hit a Bradley (Tables 9-4 through 9-6, pages 9-5 through 9-7). This methodology is based on various threat weapon systems capabilities.

(1) *Matrix condition.* Times in the light-armored/unarmored, aerial, and troop matrixes are based on the worst-case threat targets of the given category. There are three conditions that apply to the threat target. Each of these conditions gives the BFV crew additional time to engage the target because it takes the threat additional time to engage the BFV:

- NBC environment.
- Moving BFV.
- Moving threat target.

(a) NBC environments affect the threat's ability to rapidly engage a BFV. Therefore, the threat needs more time to place a hit on the BFV than it does during normal conditions.

(b) It is more difficult for the threat to hit a moving BFV. Therefore, the threat needs more time to place a hit on the moving BFV.

(c) It is more difficult for the threat on the move to place effective fire on a BFV. Therefore, a moving threat target needs more time to place a hit on a BFV than it does if the threat is stationary.

(d) To determine the allowable exposure time to a given target, the BCE must know the following:

- Target category—
  - — Armored.
  - — Light-armored/unarmored.
  - — Aerial.
  - — Dismounted troops.
- Number of target conditions—
  - — Normal conditions.
  - — 1, 2, or 3 additional conditions.
- Target range.

RANGE (Meters)	BRADLEY CONDITIONS	
	DAY DEFENSE (Seconds)	NIGHT DEFENSE (Seconds)
500	14	24
600	14	24
700	14	24
800	15	25
900	15	25
1,000	15	25
1,100	16	26
1,200	16	26
1,300	17	27
1,400	17	27
1,500	18	28
1,600	18	28
1,700	19	29
1,800	19	29
1,900	20	30
2,000	20	30
2,100	21	31
2,200	22	32
2,300	22	32
2,400	23	33
2,500	23	33
2,600	24	34
2,700	24	34
2,800	25	35
2,900	25	35
3,000	26	36
3,100	26	36
3,200	27	37
3,300	28	38
3,400	29	39
3,500	29	39
3,600	30	40
3,700	31	41
3,750	32	42

Table 9-3. BFV exposure to armored target timing matrix.

RANGE (Meters)	TARGET CONDITIONS			
	NORMAL (Seconds)	1 CONDITION (Seconds)	2 CONDITIONS (Seconds)	3 CONDITIONS (Seconds)
400	11	12	16	17
500	12	13	17	18
600	13	14	18	19
700	14	15	19	20
800	14	17	20	21
900	15	18	21	22
1,000	16	19	22	24
1,100	17	20	23	25
1,200	18	21	24	26
1,300	18	22	26	28
1,400	19	23	27	29
1,500	20	24	28	30
1,600	21	25	29	32
1,700	22	26	30	33
1,800	22	28	31	35
1,900	23	29	32	36
2,000	24	30	33	37
2,100	25	31	34	38
2,200	26	32	36	40
2,300	26	33	37	41
2,400	27	34	38	42
2,500	28	35	39	43

Note: Beyond 2,000 meters, the M910A1 round should be used.

Table 9-4. BFV exposure to light-armored/unarmored target timing matrix.

RANGE (Meters)	TARGET CONDITIONS			
	NORMAL (Seconds)	1 CONDITION (Seconds)	2 CONDITIONS (Seconds)	3 CONDITIONS (Seconds)
400	9	10	12	16
500	10	11	12	16
600	10	11	13	17
700	10	11	13	17
800	10	11	13	18
900	10	12	14	18
1,000	11	12	14	19
1,100	11	12	14	19
1,200	11	13	15	19
1,300	11	13	15	20
1,400	11	13	15	20
1,500	12	13	15	21
1,600	12	14	15	21
1,700	12	14	16	21
1,800	12	14	16	22
1,900	13	14	16	22
2,000	13	14	16	23
2,100	13	15	16	23
2,200	13	15	17	23
2,300	14	15	17	24
2,400	14	15	17	24
2,500	14	16	17	24
Note: Beyond 2,000 meters, the M910A1 round should be used.				

Table 9-5. BFV exposure to aerial target timing matrix.

RANGE (Meters)	TARGET CONDITIONS		
	NORMAL (Seconds)	1 CONDITION (Seconds)	2 CONDITIONS (Seconds)
300	8	10	13
400	9	10	14
500	9	11	14
600	9	11	15
700	10	12	16
800	10	12	16
900	11	13	16
1,000	11	13	16
1,100	12	14	17
1,200	12	14	17
1,300	12	15	18
1,400	12	15	19
1,500	13	16	19
1,600	13	17	20
1,700	14	17	21
1,800	14	18	21
1,900	15	18	22
2,000	15	19	23
2,100	16	19	23
2,200	16	20	24
2,300	17	20	25
2,400	17	21	25
2,500	18	21	26

Table 9-6. BFV exposure to dismounted troop targets timing matrix.

(e) Once the BCE knows the target category, conditions, and range, he refers to the applicable exposure matrix. When using an exposure matrix, the BCE looks at the left-hand column for the target range. He then follows that row to the right until it intersects with the number of conditions that applies to that target. The number in the corresponding box is the maximum allowable BFV exposure time to that target.

(f) For targets that are not at 100-meter increments, the BCE rounds the range up or down to the nearest 100 meters; for example, 1,536 meters is rounded dawn to 1,500 meters; 1, 668 meters is rounded up to 1,700 meters.

Note: When alternate targets must be used, such as substituting a stationary for moving target, the BCE uses the conditions that apply to the alternate target.

(2) *Timing procedures.* The BCE must record BFV exposure times for each task fired, even when computers are used. Exposure time is the time the firing BFV is exposed to any threat target(s). Timing procedures apply for single as well as multiple target engagements. During multiple target engagements, each target is timed separately. Timing is determined as outlined below; variations are not permitted.

(a) Offensive/retrograde engagements. In an offensive/retrograde engagement, the firing BFV is exposed in the open and on the move. Target exposure (presentation) indicates threat engagement time has begun.

- *Time starts* when the target or simultaneous targets are fully exposed (target lock) or the first round is fired (whichever occurs first).
- *Timing stops* for each target in an engagement when the target is killed or that target's exposure time has expired.

(b) Defensive engagements. In a defensive engagement the firing BFV must start in a turret-defilade position, move into a hull-defilade position to engage target(s), then return to the turret-defikide position.

- *Time starts* when one of the following conditions occurs:
  - When a crew fires the first round.
  - All targets are fully exposed (target lock) and the firing vehicle is stopped in a hull-defilade position.

Note: Time starts for turret-defilade armor engagements when all targets are fully exposed.

- *Time stops* for each individual target if during an engagement one of the following conditions occurs:
  - During or after an engagement, the firing vehicle *begins* to move back into a turret-defilade position.
  - The target is killed.
  - Target exposure time has expired.
  - For coax area engagements, time stops when one IRETS target is killed. The Z pattern is used but not timed.
- *Time resets* before the firing vehicle returns to the hull-defilade position.

c. **BFV Exposure Standard.** If a crew is exposed to a target longer than the allotted time (IAW Tables 9-3 through 9-6), the crew receives an untrained rating for the engagement.

EXAMPLE 1 ENGAGEMENT

A BFV in the defense, during NBC conditions, during a day engagement, engages a moving BTR-80 at 1,200 meters and an ATGM team at 600 meters.

TARGET POSTURE	TARGET CONDITIONS	BFV EXPOSURE TIME (Threat time to Hit)	TARGET EXPOSURE TIME
BTR-80, *moving*, 1,200 meters, *NBC* environment	2 conditions	24 seconds	50 seconds
ATGM, 600 meters *NBC* environment	1 condition	11 seconds	50 seconds

The BFV moves from a turret-defilade to a hull-defilade position (time starts for both targets), engages and kills the BTR-80, and returns to the turret-defilade position (time stops for both targets). The BFV was exposed to both the BTR-80 and ATGM team for a total of 12 seconds (time is reset). The BFV then returns to a hull-defilade position (time starts), engages and kills the ATGM team (time stops). The BFV was exposed for 8 seconds. The BFV engaged and destroyed the BTR-80 in 12 seconds and had 24 seconds to do so. Although the BFV killed the BTR-80 within the allotted time and killed the ATGM team, the crew receives a NO-GO in accordance with the BFV exposure time matrix (Table 9-6, page 9-7). Therefore, the crew is rated untrained (U) for this engagement.

RATIONALE: When the BFV assumed a hull-defilade position the first time, the BFV became exposed to both the BTR-80 and the ATGM team. The threat time to hit a BFV for an ATGM team at 600 meters, with 1 condition is

11 seconds. When the BFV exposed itself for 12 seconds while engaging the BTR-80, this allowed time for the ATGM team to hit the BFV.

EXAMPLE 2 ENGAGEMENT

A BFV in offense/retrograde, during a day engagement, engages a moving BTR-80 at 1,200 meters and an ATGM team at 600 meters.

TARGET POSTURE	TARGET CONDITIONS	BFV EXPOSURE TIME (Threat time to Hit)	TARGET EXPOSURE TIME
BTR-80, *moving,* 1,200 meters	2 conditions	24 seconds	24 seconds
ATGM, 600 meters	1 condition	11 seconds	11 seconds

The BFV is moving in offense/retrograde. Both targets are exposed simultaneously; therefore, the BFV is exposed to both threats (time for both targets starts). The BFV engages the BTR-80 first and kills it in 22 seconds (time for the BTR-80 stops). During the BTR-80 engagement, the ATGM's 11-secoml exposure time expired (the range computer dropped the target). The BFV cannot achieve a target kill on the ATGM in accordance with Table 9-1. The crew receives a NO-GO in accordance with both the target kill standards in Table 9-1 and the BFV exposure to dismounted troop targets timing matrix in Table 9-6. The crew is rated untrained (U) for this engagement.

RATIONALE: When the ATGM and BTR-80 were exposed simultaneously, the BFV was exposed to both targets and target exposure time had begun. Although the BFV killed the BTR-80 before the BTR-80 exposure time expired, the BFV failed to hit the ATGM before the BFV target exposure time had expired.

Note 1: On ranges that do not have defilade positions, markers must be placed in the ground to assist the BCE in determining when the firing vehicle is exposed and when it has returned to a defilade position. The vehicle must move at least one vehicle length when moving into and out of the defilade position.

Note 2: On computer-controlled ranges, scenarios must be adjusted to ensure multiple targets are programmed to lift at the same time, if possible.

9-3. CRITICAL SUBTASK STANDARDS

Critical subtask standards evaluate the crew's ability to engage targets in less than normal operating conditions. If the crew does not meet all of the applicable subtask stadards, the engagement task standards cannot be met. Therefore, the crew is assessed an untrained rating on the given engagement task.

a. Crew engages target(s) using the auxiliary sight.

(1) *Gunner's engagement:* Gunner must use the auxiliary sight to engage target(s) and the commander will not view through the commander's sight extension.

(2) *Commander's engagement:* Commander must use auxiliary sight to engage target(s) and the gunner will not view through the ISU.

b. Crew engages target(s) in an NBC environment.

(1) Vehicle crew must be in MOPP4 in accordance with STP 21-1-SMCT.

(2) Crew members must close all vehicle hatches.

(3) All crew members must restore intravehicular communication with each other.

(4) Bradley commander must restore radio communication with exercise controllers.

c. Crew engages target(s) using manual controls.

(1) Gunner must place traverse drive select lever in manual position.

(2) Gunner must place the gun elevation drive select lever in manual position.

(3) Gunner must engage target(s) using the traverse and elevation manual handwheels and trigger.

(4) The BELRF (ODS models) will not be used.

d. Commander engages target(s) using the commander's handstation.

e. Crew does not engage friendly target(s).

(1) Crew must identify target(s) as friendly.

(2) Crew does not fire on friendly target(s).

(3) Crew must report friendly target(s) in sector to exercise controllers.

9-4 LEADER SUBTASK STANDARDS

The leader subtask evaluates the Bradley commander's ability to control the crew, vehicle, and weapon systems. Without this control, engagements will not be synchronized and efficiency will suffer.

a. Bradley commander uses proper fire commands for each engagement.

(1) Bradley commander must include the required six elements of a precision fire command in proper sequence during single-target defensive engagements. For ODS models, the Bradley commander must include the required five elements of a precision fire command in proper sequence during single-target defensive engagements (the range element is optional).

- Alert.
- Ammunition and or weapons.

- Description.
- Range (optional for ODS models).
- Execution.
- Termination.

(2) Bradley commander must include the required five elements of a battlesight fire command in proper sequence during single-target offensive/retrograde engagements.

- Alert.
- Battlesight.
- Description.
- Execution.
- Termination.

(3) Bradley commander must include the required 11 elements of a multiple precision fire command in proper sequence during double-target defensive engagements. For ODS models, the Bradley commander must include the required 9 elements of a multiple-precision fire command in proper sequence during double-target defensive engagements (the range elements are optional).

- Alert.
- Ammunition and or weapon (for first target).
- Description (of all targets followed by repeating first target).
- Range (optional for ODS models).
- Execution.
- Termination (first target).
- Ammunition and or weapon (for second target).
- Description (for second target).
- Range (optional for ODS models).
- Execution.
- Termination (final target).

(4) Bradley commander must include the required eight elements of a multiple battlesight fire command in proper sequence during double-target offensive/retrograde engagements.

- Alert.
- Battlesight.

- Description (of all targets followed by repeating first target).
- Execution.
- Termination (first target).
- Description (second target).
- Execution.
- Termination (final target).

Note If targets are not exposed simultaneously (3 seconds or more separation), the commander may use 2 single-target battlesight fire commands.

b. Commander ensures the most-dangerous target is engaged before least-dangerous.

c. Commander ensures the proper ammunition and weapon system for the target(s) are selected in accordance with Table 9-2 and unit engagement criteria.

d. Commander ensures the vehicle movess at least one vehicle length when going from a turret-defilade to a hull-defilade position and when returning.

e. Commander ensures gunner does not fire before receiving the command to fire.

9-5. NONCRITICAL SUBTASK STANDARDS

Noncritical subtask standards apply to the techniques and procedures crews should use for successful engagements. If these subtask standards are not met, the crew can still meet the engagement task standards.

a. Commander or gunner must use proper response terms in support of the leader subtasks standards.

(1) Gunner confirms target by announcing “Identified” (for ODS models see Chapter 2.)

(2) Commander or gunner announces “Cannot identify” when he cannot identify the target.

(3) Gunner announces “Cannot engage” when he is inhibited from firing.

(4) Commander or gunner notifies the crew by announcing “Onthe way” before he fires a weapon sysstem.

b. Commander or gunner uses proper engagement techniques in accordance with Chapter 2.

(1) Commander or gunner fires a sensing round, two if the ammunition has changed, then fires a 3- to 5-round burst (25-mm point targets).

(2) Commander or gunner frees a sensing round, two if the ammunition has changed, then fires an effective Z pattern (25-mm area targets).

(3) Commander or gunner fires a 10- to 15-round initial burst, then fires additional 10- to 15-round burst(s) at point targets (coax).

(4) Commander or gunner fires a 10-to 15-round initial burst at center mass of a coax area target, then uses an effective Z pattern using 10- to 15-round bursts to suppress the remainder of the target area.

(5) Commander or gunner frees a 20- to 25-round burst (25-mm) on high rate at aerial target(s) while adjusting on the target.

c. Driver uses proper driving techniques.

(1) Returns to the hull-defilade position after a defensive engagement.

(2) Maintains a steady platform while in an offensive/retrograde engagement.

(3) Stays on course roads as briefed in the range safety briefing.

(4) Does not cause damage to the Bradley.

(5) Does not exceed the established range speed limits.

d. Crew uses proper defensive techniques.

(1) Gunner raises the TOW launcher before first engagement in the defensive position.

(2) Gunner lowers the TOW launcher before movement from the defensive position. (This standard applies to the last defensive engagement in that position.)

9-6. CREW DEVICE GUNNERY STANDARDS

Crew device gunnery consists of Bradley Table I, Crew Defense; and Bradley Table II, Bradley Crew Proficiency Course.

a. Bradley Table I is evaluated by the following task, conditions, and standards.

(1) *Task:* Engage and destroy stationary and moving targets from a defensive position during the day and night.

(2) *Conditions:* Given a MILES-or PGS-equipped BFV in a defensive position, suitable engagement area with LTID—equipped targets, during the day and night.

(3) *Standards:*

(a) During the day, the crew must achieve a minimum of a “P” rating on 7 of the 10 engagements with 1 of the 7 being an NBC engagement.

(b) During the night, the crew must achieve a minimum of a “P” rating on 7 of the 10 engagements with 1 of the 7 being an NBC engagement.

b. Bradley Table II is evaluated by the following task, conditions, and standards.

(1) *Task:* Engage and destroy stationary and moving targets from a stationary and moving BFV during the day and night.

(2) *Conditions:* Given a MILES- or PGS-equipped BFV, suitable maneuver and engagement area with LTID—equipped targets, during the day and night.

(3) *Standard:* The crew must achieve a minimum of a "P" rating on 9 of the 12 engagements with 1 of the 9 being an NBC engagement, 1 of the 9 being a TOW engagement, and 2 of the 9 being night engagements.

9-7. CREW LIVE-FIRE GUNNERY STANDARDS

Crew live-free gunnery consists of Bradley Table V, Crew Practice 1; Bradley Table VI, Crew Practice 2; Bradley Table VII, Crew Practice 3; and Bradley Table VIII, Crew Qualification.

a. Bradley Table V, Crew Practice 1, is evaluated by the following task, conditions, and standards.

(1) *Task:* Engage and destroy stationary and moving targets from a stationary and moving Bradley during the day and night.

(2) *Conditions:* Given a Bradley, using the coax machine gun with a single-shot adapter as a subcaliber device, authorized allocation of ammunition, suitable live-fire range with targets, during the day and night.

(3) *Standards:* The crew must achieve a minimum of a "P" rating on 7 of 10 engagements with 1 of the 7 being an NBC engagement and 2 of the 7 being night engagements.

b. Bradley Table VI, Crew Practice 2, is evaluated by the following task, conditions, and standards.

(1) *Task:* Engage and destroy stationary and moving targets from a stationary Bradley during the day and night.

(2) *Conditions:* Given a Bradley, authorized allocation of ammunition, suitable live-fire range with targets during the day and night.

(3) *Standards:* The crew must achieve a minimum of a "P" rating on 5 of 7 engagements with 1 of the 5 being an NBC engagement and 1 of the 5 being a night engagement.

c. Bradley Table VII, Crew Practice 3, is evaluated by the following tasks, conditions, and standards.

(1) *Task:* Engage and destroy stationary and moving targets from a stationary and moving Bradley during the day and night.

(2) *Conditions:* Given a Bradley, authorized allocation of ammunition, suitable live-fire range with targets during the day and night.

(3) *Standards:* The crew must achieve a minimum of a "P" rating on 6 of 8 engagements with 1 of the 6 being an NBC engagement and 2 of the 6 being night engagements.

d. Bradley Table VIII, Crew Qualification, is evaluated by the following task, conditions, and standards.

(1) *Task:* Engage and destroy stationary and moving targets from a stationary and moving Bradley during the day and night.

(2) *Conditions:* Given a Bradley, authorized allocation of ammunition, suitable live-fire range with targets during the day and night.

(3) *Standards:* The crew must achieve a distinguished, superior, or qualified rating.

Distinguished = Trained (T) on at least 9 of 10 total engagements.

Superior = Trained (T) on 8 of 10 engagements with 1 of the 8 being an NBC engagement and 2 of the 8 being night engagements.

Qualified = Trained (T) or needs practice (P) on 7 of 10 engagements with 1 of the 7 being an NBC engagement and 2 of the 7 being night engagements.

Unqualified = Untrained (U) on 4 or more engagements or "U" on both NBC engagements, or "T" or "P" on only 1 night engagement.

9-8. REFIRES FOR QUALIFICATION

A crew or crews that failed to achieve a distinguished, superior, or qualified rating will refire for qualification. The highest rating a crew refiring for qualification can obtain is qualified.

a. A crew will refire only engagements in which they received a "U" rating.

b. A crew will only refire the number of engagements required to obtain a qualified rating.

9-9. ALIBIS

Battalion and squadron commanders are the deciding authority on alibis. All alibi engagements will be refired. Alibis are only given for the following conditions:

a Range equipment failures.

b. Vehicle equipment failures that are not the result of crew error.

c. Uncle conditions not related to the firing vehicle or crew.

9-10. BRADLEY CREW SCORE SHEET

Evaluators use DA Form 7354-R. Bradley Crew Score Sheet to record the results of gunnery engagements. When annotating results on this form, evaluators must print all entries accurately and legibly. The instructions for completing the score sheet are on its reverse side. An example of a completed form is in Figure 9-1, page 9-18. A blank reproducible form is in the back of this manual.

BRADLEY CREW SCORE SHEET

For use of this form, see FM 23-1; the proponent agency is TRADOC

SEE BACK OF THIS FORM FOR INSTRUCTIONS

1. DATE: 6 FEB 96	2. RANGE: RED CLOUD HOTEL	3. UNIT: A-1-2 IN	4. TABLE: VIII
5. VEHICLE ID: R-33	6. COMMANDER: SFC DUNCAN	7. GUNNER: SGT CADY	8. DRIVER: PFC FLORES
9. BCE—DAY (Print name): BOTSFORD, JEFFREY Initials: JB		10. BCE—NIGHT (Print name): ELSEY, VICTOR Initials: VE	

11. ENGAGEMENT FM 23-1 Task NO.	12. TASK STANDARDS (Chap 9, para 9-2a-c) a	b	c	13. CRITICAL SUBTASKS (Chap 9, para 9-3a-e) a	b	c	d	e	14. LEADER TASKS (Chap 9, para 9-4a-e) a	b	c	d	e	15. NONCRITICAL SUBTASKS (Chap 9, para 9-5a-d) a	b	c	d	16. ENGAGEMENT ASSESSMENT (T, P, or U)	17. REMARKS
a. 5	G	TROOPS 5 SEC	G		G				G	G	G	G	G	G	G		N	T	DID NOT RAISE TOW
	G	PC 11 SEC																	
b. 2	G	GUN TRUCK 7SEC	G						G	G	G		N	G	G	G		P	GNR FIRED BEFORE CMD "FIRE"
	G	PC 15 SEC																	
c. 3	G	RPG TM 6 SEC	G	G					N	G	G	N	G	G	G		G	P	RNG ELEMENT VEH DID NOT MOVE FAR ENOUGH
	G	TRUCK 10 SEC																	
d. 4	G	RPG TM 6 SEC	G				G		G	G	G		G	N	G	G		T	"CANNOT ENGAGE"
	G	PC 12 SEC																	
e. 8	G	TROOPS 5 SEC	G						G	G	G	G	G	N	N		G	P	"IDENTIFIED" 50 RD INITIAL BURST
	G	GUN TRUCK 10 SEC																	
f. 1	G	TRUCK 8 SEC	G			G			N		G	G	G	N	G		G	P	RNG ELEMENT "IDENTIFIED"
g. 6	G	TROOPS 8 SEC	G						G	G	G	G	G	G	G		G	T	GOOD ENGAGEMENT
	G	PC 10 SEC																	
h. 7	G	PC 14 SEC	G		N				G	G	G		G	G	G	G		U	GNR HATCH OPEN
	G	TRUCK 22 SEC																	
i. 9	N	GUN TRUCK	N															U	DID NOT ENGAGE TARGET
j. 10	N	HIT PC COAX W/3RDS	G						N	G	N	G	G	N	N		G	U	OUT OF 25 AMMO, FIRED COAX "ON THE WAY"
	G	ATGM TM 9 SEC																	

18. QUALIFICATION RATING: D S (Q) UQ

DA FORM 7354-R

Figure 9-1. Example of a completed DA Form 7354-R, Bradley Crew Score Sheet.

1. **Date**. Enter the date of the last day engagement of the evaluation.
2. **Range**. Enter the name of the facility used, if two different facilities are used, both are listed in chronological order.
3. **Unit**. Enter the company, troop, or battery; battalion or squadron identification.
4. **Bradley Table Number**. Enter the Bradley table number fired.
5. **Vehicle ID**. Enter the bumper number of the vehicle assigned to the crew firing, even if the crew is using another vehicle, the bumper number of their assigned vehicle is used.
6. **Commander**. Enter the rank and last name of the Bradley commander.
7. **Gunner**. Enter the rank and last name of the Bradley gunner.
8. **Driver**. Enter the rank and last name of the Bradley driver.
9. **BCE—DAY**. Enter the last name and first name of BCE during day phase. BCE initials the form after conducting AAR.
10. **BCE—NIGHT**. Enter the last name and first name of BCE during day night phase. BCE initials the form after conducting AAR.
11. **Engagement Tasks**. Enter task numbers in order of engagement. If a gunnery event contains more than 10 engagements, use another score sheet. When using a second score sheet, complete items 1 through 10. Enter the task numbers of the Bradley table that is being evaluated in the order in which the tasks are fired.
12. **Task Standards**. (See Chapter 9, paragraph 9-2a through c.)
    a. Enter a "G" for GO or an "N" for NO-GO for target kill standards.
    b. Enter the target type and BFV exposure time to the target (for defensive engagements, use BFV's longest single-exposure time to a target).
    c. Enter a "G" for GO or an "N" for NO-GO for the BFV exposure standards.
13. **Critical Subtasks**. (See Chapter 9, paragraph 9-3a through e.)
    a. Enter a "G" for GO or an "N" for NO-GO for auxiliary sight engagements.
    b. Enter a "G" for GO or an "N" for NO-GO for NBC engagements.
    c. Enter a "G" for GO or an "N" for NO-GO for engagements requiring use of manual controls.
    d. Enter a "G" for GO or an "N" for NO-GO for engagements requiring use of the commander's handstation.
    e. Enter a "G" for GO or an "N" for NO-GO for engaging friendly targets.
14. **Leader Tasks**. (See Chapter 9, paragraph 9-4a through e.)
    a. Enter a "G" for GO or an "N" for NO-GO for use of proper fire commands.
    b. Ente a "G" for GO or an "N" for NO-GO for engaging most-dangerous targets first.
    c. Enter a "G" for GO or an "N" for NO-GO for using proper ammunition for the target.
    d. Enter a "G" for GO or an "N" for NO-GO for ensuring the vehicle moves the proper distance during defensive engagements.
    e. Enter a "G" for GO or an "N" for NO-GO for ensuring the gunner does not fire before receiving the command to fire.
15. **Noncritical Subtasks**. (See Chapter 9, paragraph 9-5a through d.)
    a. Enter a "G" for GO or an "N" for NO-GO for proper response terms.
    b. Enter a "G" for GO or an "N" for NO-GO for proper engagement techniques.
    c. Enter a "G" for GO or an "N" for NO-GO for proper driving techniques.
    d. Enter a "G" for GO or an "N" for NO-GO for proper defensive techniques.
16. **Engagement Assessment**. Enter the engagement assessment as T, P, or U.
17. **Remarks**. Annotate significant comments in the remarks column. Normally these comments are used as AAR points.
18. **Qualification Rating**. Circle the appropriate rating for crew qualification events: D - Distinguished, S - Superior, Q - Qualified, or JQ - unqualified.

DA FORM 7354-R, FEB 96 (Back)

Figure 9-1. Example of a completed DA Form 7354-R, Bradley Crew Score Sheet (continued).

Section II
BRADLEY INFANTRY PLATOON GUNNERY EVALUATION

Gunnery tasks are incorporated into tactical platoon collective tasks to provide live-fire evaluations. The standards for each collective task are in the training and evaluation outlines (T&EOs) in the MTP. An overall assessment is determined by combining the results of all evaluated collective tasks, and the platoon is rated T (trained), P (needs practice), or U (untrained). This section provides the requirements and guidelines for the live-fire tasks incorporated in support of each collective task standard.

9-11. EVALUATION TEAM

Evaluators enhance the training experience of platoons by providing valuable and creditable observations. Each evaluator should be of equal or higher rank than the element leader he is evaluating. Ideally, the evaluator should have held the position of the element leader he is observing. This lends credibility to his role, and soldiers, are more willing to learn from him. FM 25-101 and the MTP provide more information on the specific roles and procedures for evaluators. Sufficient evaluators and exercise support personnel should be tasked to thoroughly observe and evaluate the platoon's performance. Evaluators and support personnel assist the range safety officer and perform assigned tasks. Battalion commanders are responsible for selecting qualified personnel to act as a member of the evaluation team.

a. **Senior Trainer:** The battalion commander and his representative (battalion executive officer or S3) are responsible for the development, design, and execution of the training exercise. He receives all evaluator and support personnel evaluation packets and gunnery task penalty results. Along with personal observations, he determines the overall training assessment of the platoon. He is the approving authority for all alibis. He oversees the AAR.

b. **Senior Evaluator:** One per platoon. The senior evaluator should be a captain with company command experience. He observes leader tasks to include leader performance, overall collective task accomplishment, and mission success. The senior evaluator provides the senior trainer with evaluation results, observations, and an initial assessment. The senior evaluator conducts the AAR.

c. **Assistant Evaluator:** One per squad and section. The assistant evaluator should be a lieutenant or sergeant first class with previous platoon leader or platoon sergeant experience. He observes overall squad and section leader tasks, dismount element and vehicle actions, fire control and distributionm, and assists with live-fire safety. The assistant evaluator makes

initial assessments of the squad or section using T&EOs and observations. He provides input during the AAR.

d. **Gunnery Evaluator:** Two per platoon. A gunnery evaluator should be a master gunner. But, a certified Bradley crew evaluator, if he is familiar with target operations, can be a gunnery evaluator. Gunnery evaluators follow their designated section and record vehicle exposure times during defensive engagements and confirm with the range tower the target kills during offensive engagements. An additional gunnery evaluator can be placed with the computer operator to enhance range operations. The gunnery evaluators inform the evaluators of target misses for penalty or casualty assessments. Gunnery evaluators inform the senior evaluator which vehicles were overexposed during the engagements for penalty assessments.

9-12. LIVE-FIRE EVALUATION GUIDELINES

The following guidelines establish standards and procedures for gunnery tasks that support collective task assessment.

a. Collective task standards in the MTP are used for evaluations.

b. Penalties are imposed against the platoon's vehicles when they are exposed to the replicated threat beyond established threat based times (Chapter 9, Section I). Penalties are imposed against the platoon's dismounted elements based on targets they failed to kill. These penalties are assessed in accordance with the gunnery task penalty matrix in Table 9-7, page 9-24.

c. The senior evaluator or his designated representative may assess additional penalties based on observations (NBC, indirect fires, or other situations), but the matrix must be used to determine minimum penalties.

d. Penalties imposed are based on the respective threat target category and the weapon system (dismount or vehicle) exposed to the target.

e. Timing procedures used for determining vehicle overexposure are the same as in crew gunnery evaluation (Chapter 9, Section I).

f. If a target is not engaged and no vehicle was exposed to the threat, no penalty is assessed. However, the MTP standards for the collective task must be met (that is *kill* or *destroy* a percentage of the enemy).

SITUATION: The platoon is conducting the subtask OverWatch Support By Fire during a mounted assault. Section A is in the overwatch position and Section B is bounding.

Example 1: Section A is presented two BMP targets. Both BMP targets will be exposed simultaneously for 50 seconds. The BFV threat exposure time is 22 seconds for one BMP and 18 seconds for the other. Section A engages and kills the BMP with an 18-second threat exposure time while exposing a

BFV for 16 seconds. Section A then kills the BMP with a 22-second threat exposure time while exposing a BFV for 20 seconds. No penalty is assessed.

Example 2: Section A kills the BMP with an 18-second threat exposure time while exposing a BFV for 17 seconds. Section A fails to kill the BMP with a 22-second threat exposure time while exposing a BFV to the threat for more than 22 seconds; that BFV is assessed a penalty based on the gunnery task penalty matrix. Additionally, the senior evaluator may assess an additional penalty against the bounding section, because it was also exposed to the 22-second BMP and did not destroy the threat.

Rationale: Total target exposure time is 50 seconds. Depending on how long the Section A BFV was exposed, the 22-second BMP could have had 27 seconds of target exposure time remaining. Therefore, that BMP could have had 27 seconds to acquire and apply a burst on a bounding BFV This situation could vary based on conditions and range.

Example 3: If the section kills the BMP with an 18-second threat exposure time while exposing a BFV for 17 seconds, but fails to kill the BMP with a 22-second threat exposure time, but no BFV in either section was exposed to the threat beyond the BFV exposure time then no penalty is assessed. However, the MTP standards for that entire collective task must be met (that is *kill* or *destroy* a percentage of enemy).

g. Each collective task is evaluated individually. A collective task may consist of more than one live-fire engagement. Penalties assessed during the conduct of a collective task remain in effect throughout the entire collective task.

h. Reconstitution of the penalized element(s) occur at completion of a collective task if tactically feasible.

i. Total penalties for a collective task are combined and included in the evaluation of that collective task standards.

The platoon was being evaluated on the collective task assault mounted using the sample gunnery summery sheet (Figure 9-2). During the first live-fire engagement, the platoon concentrated fires on the objective from a support position. The platoon was presented 3 BMPs, 2 gun trucks, and 2 squads. Two BFVs were overexposed to 1 BMP and 1 squad, therefore, the platoon received 1 BFV catastrophic and 1 BFV mobility penalty for that engagement. In the second engagement, Section A bounded and was overexposed to 1 BMP and 1 squad; therefore, the platoon received 1 BFV catastrophic and 1 BFV mobility penalty. For the entire collective task, the platoon was penalized 2 BFV catastrophic and 2 BFV mobility penalties. These penalties arc compared against the collective task stanards in the MTP for evaluation assessment.

TASK	ELEMENT	SUBTASK	TARGETS PRESENTED	TARGET KILLS	PENALTIES ASSESSED
Assault mounted	Platoon	Concentrate fires on the enemy	1 BMP	1	
			1 BMP	1	
			1 BMP	1	1 BFV catastrophic
			1 Gun Truck	0	
			1 Gun Truck	1	
			1 Squad (7 IRETS)	1	
			1 Squad (7 IRETS)	1	1 BFV mobility
	Section A	Bound	1 BMP	1	
			1 BMP	0	1 BFV catastrophic
			1 Squad (7 IRETS)	0	1 BFV mobility
		TOTAL	**5 BMPs**	**4**	**2 BFV catastrophic**
			2 Gun trucks	**1**	
			3 Squads (7 IRETS)	**2**	**2 BFV mobility**

Figure 9-2. Gunnery summary sheet.

j. Target kills apply if the weapon system used to engage the target can destroy the replicated threat.

k. Failure to comply with an NBC condition during day or night phase results in an automatic "killed-in-action" for that individual(s) for the remainder of that collective task.

l. When engaging targets, proper platoon and crew fire commands must be used (Chapter 2).

m. Combat support and combat service support should be integrated into the exercise and applicable tasks evaluated. This can include Class I, III, V resupply, and casualty evacuation. During casualty evacuation, combat lifesavers should be used to the fullest extent.

n. Unit or platoon SOPs should be used to evaluate platoon actions during the exercise.

o. After-action reviews are conducted at the completion of day and night phases.

p. A platoon that receives an overall evaluation of "untrained" must complete the entire phase for qualification. A platoon may not redo or refire a collective task within a phase to achieve a "needs practice" or better rating.

q. Alibis can only be given for range targetry failures and safety considerations. The battalion commander is the approving authority for all alibis.

NOTE: Vehicles, weapons, or communication failures are not alibis. The platoon can expect these failures in combat. The platoon can cross-level ammunition, personnel, and equipment as they would in combat; however, the mission continues.

TARGET CATEGORIES	BFV OFFENSE/ RETROGRADE	BFV DEFENSE	DISMOUNTED INFANTRY
Aerial targets	Catastrophic	Catastrophic	Two soldier casualties per target not killed
TOW, Javelin, or Dragon targets	Catastrophic	Mobility and firepower	Two soldier casualties per target not killed
AP point targets	Catastrophic	Firepower	Two soldier casualties per target not killed
HE point targets	Mobility and Firepower	Firepower	Two soldier casualties per target not killed
ATGM teams, coax point or bunker target	Mobility	Firepower	One soldier casualty per target not killed
Dismount squad, coax area, or trench line	Mobility	Firepower	One soldier casualty per target not killed

Table 9-7. BFV platoon gunnery task penalty matrix.

9-13. PENALTY ASSESSMENTS

Penalty assessments reflect possible results of a platoon's action.

a. **Vehicle Penalties.** Vehicle penalties are classified as mobility, firepower, mobility and firepower, and catastrophic. During the conduct of the exercise, personnel must adhere to range safety requirements rather than enforce penalties that conflict with range safety.

(1) A *mobility penalty* hinders a vehicle's ability to move under its own power. If the evaluator imposes a mobility penalty, the vehicle cannot move from the location of notification. They remain there until reconstituted unless range safety requirements require otherwise. Vehicles may use their weapons systems to engage targets; however, they may not move. Therefore, they could become a stationary exposed BFV during the next engagements and penalized again based on this posture. This requires a platoon leader to make a decision before the next engagement based on the given situation,

(2) A *firepower penalty* hinders a vehicle's ability to use its weapons systems. If the evaluator imposes a firepower penalty, the vehicle receiving a firepower penalty cannot fire any of the vehicle weapons systems from the time of notification until reconstituted. The crew may continue to relay

situation reports and acquire and report any threat activity. This may require a platoon leader to adjust his direct-fire plan and engagement SOPs.

(3) A combined *mobility and firepower penalty* hinders a vehicle's ability to move under its own power and hinders a vehicle's ability to use its weapons systems. If the evaluator imposes a mobility and a fiepower penalty, the vehicle cannot move from that location and the weapons systems cannot be used.

(4) A *catastrophic penalty* is a total loss of the vehicle and all equipment on board. If the evaluator imposes a catastrophic penalty, all personnel on board at the time of notification are casualties in accordance with their MILES casualty tags. This may require a platoon leader to adjust his platoon's organization.

b. **Personnel Penalties.** Personnel penalties are classfied using GTA 8-11-5, Multiple-Integrated Laser Engagement System (MILES) Casualty Tag. If the evaluator imposes personnel penaltiers, each soldier in the platoon to include crew members receive a card. These cards identify a variety of personnel injuries ranging from minor injuries, only requiring self aid, to priority litter injuries that require casualty evacuation. Killed-in-action cards are also used. Crew members should receive return-to-duty cards due to range safety requirements that may require them to move the vehicle. These cards simulate the realism needed for leader decisions and incorporation of CSS missions.

Section III
BRADLEY CREW EVALUATORS

Evaluation of crew proficiency is a valuable part of device and crew gunnery. It identifies weaknesses and highlights strengths. These evaluations provide company commanders a report of a unit's crew proficiency. The importance of training the Bradley crew evaluator (BCE) lies upon unit master gunners. The goal of a BCE training program is to provide and maintain good quality crew evaluators.

9-14. BRADLEY CREW EVALUATOR TRAINING

Bradley crew duties are assessed by the BCE for device and crew gunnery. The BCE enforces safety requirements, acts as an instructor during nonqualification exercises, and acts as an evaluator for qualification exercises. The BCE is responsible for evaluating and rating the crew and for conducting an after-action review.

a. **Prerequisites.** A soldier must have at least a rank of sergeant (E5) with an MOS of 1lM, 19D, or 14R and have prior gunnery experience before attending a BCE certification course.

b. **Responsibilities.** Master gunners are gunnery subject matter experts. They develop and conduct BCE training as outlined in this section.

(1) *Division master gunners* (enhanced and separate brigade master gunners) are responsible for monitoring the BCE training program and developing certification examinations.

(2) *Battalion rnaster gunners* are responsible for the execution of the BCE training program.

9-15. CERTIFICATION REQUIREMENTS

Certification is initial training for BCEs. BCEs must be certified within 90 days of any live-fire exercise. Certification consists of the following requirements.

a. A 40-hour BCE training program.

b. A written examination consisting of a minimum of 40 questions. BCEs must achieve a 90 percent score to pass. The certification examination must contain a minimum of two questions in each of the following areas:

(1) Range safety (AR 385-63 and local range SOPs).
(2) Fire commands (Chapter 2, Section IV).
(3) Engagement procedures (Chapter 2, Section III).
(4) Offensive BFV timing procedures (Chapter 9, Section I).
(5) Defensive BFV timing procedures (Chapter 9, Section I).
(6) Multiple target timing procedures (Chapter 9, Section I).
(7) BFV exposure timing matrixes (Chapter 9, Section I).
(8) Scoring of multiple target engagements (Chapter 9, Section I).
(9) AAR procedures (Chapter 9, Section IV).
(10) Refires and alibis (Chapter 9, Section I).
(11) Score sheets.
(12) Threat-based target exposure timing matrixes (Chapter 12).

c. A hands-on evaluation requires BCEs to evaluate a crew firing 10 engagements using a videotape or COFT and to conduct an AAR in accordance with Section IV.

(1) When using the COFT, BCEs use the briefing monitor to evaluate a firing crew during their scheduled COFT session. This does not interfere with the COFT IO or scheduled COFT training.

(2) Clocks and score sheets to be used during live-fire gunnery are used for the evaluation.

9-16. RECERTIFICATION

Recertification is refresher training for BCEs. Recertification consists of the certification examination and the hands-on evaluation. BCES must be recertified within 90 days of live-fire exercise.

9-17. SUSTAINMENT

Sustainment training sustains a BCE's knowledge of evaluation procedures and ensures consistent, good quality crew evaluators are available year round. The BCE must evaluate four exercises a month, in the COFT, using the same type clocks or timing boards and score sheets that are used during device and crew gunnery.

Section IV
AFTER-ACTION REVIEWS

After-action reviews summarize gunnery events by using feedback from all participants. The AAR process identifies where a crew, section, or platoon proficient is in relation to Army standards. AARs provide commanders, leaders, and training managers the focus for future training events. BCEs and senior evaluators aid in the AAR discussions. Formal AARs are conducted for BT II (BCPC) and all live-fire gunnery events. These AARs must be planned and prepared before they are conducted.

9-18. AAR PLANNING

Successful AARs require planning. This planning includes all resources needed to conduct the AAR. Commanders and training managers are responsible for this planning.

a. **Select Evaluators.** One of the most challenging tasks during the planning phase is selecting and scheduling qualified evaluators. The selection of evaluators depends on the type of evaluation needed—crew or section/platoon evaluation or internal or external evaluation.

(1) Crew or section/platoon evaluation.

(a) Evaluators required for crew gunnery events are BCEs. All companies/troops must have certified BCEs. This certification must be in accordance with this manual.

(b) Evaluators required for section/platoon events are personnel that have held the position of the element leader that he is observing such as platoon leader, platoon sergeant, or squad leader.

(2) Internal or external evaluation.

(a) Internal evaluations are normally supported by the company or troop that is conducting the training. Crews are evaluated using BCEs in the unit. Section or platoon events are evaluated by the company/troop commander with assistance from his executive officer and first sergeant. Examples of internally evaluated events are crew, section, or platoon device gunnery, crew practice, and Bradley platoon practice.

(b) External evaluations are supported by battalion or squadron or higher organizations. Crews are evaluated using BCEs from organizations outside of their battalion or squadron. Section or platoon evaluations are conducted by the battalion or squadron commanders and their staffs. Assistant evaluators and observer-controllers are used as needed. Examples of externally evaluated events are crew, cavalry team, and Bradley platoon qualifications.

b. **Develop Evaluation Records.**

(1) Crew gunnery evaluations are recorded on DA Form 7354-R Bradley Crew Score Sheet. These score sheets provide the BCE with a record of each engagement the he can reference during the AAR.

(2) Section and platoon evaluations are recorded using T&EOs from the appropriate ARTEP mission training plan. Gunnery penalty assessments are recorded on evaluation sheets developed for the gunnery scenario. These evaluation sheets must provide the evaluator a means to record the task, targets presented, targets killed, and penalties assessed. The evaluation packet should have a cover sheet that provides the section or platoon identification, date, and summary of task results.

c. **Select the AAR Site.** The location of the AAR site is a major consideration when organizing the training event. The AAR site should be near the training area. This avoids long delays between conducting the training and reviewing the training results. However, the AAR site should be far enough away from the training area to avoid the distractions of other elements conducting training; for example, vehicles firing guns or vehicle traffic. The site should provide shelter from the elements and should be large enough to accommodate all participants comfortably.

d. **Select Training Aids.** Training aids should provide evaluators and participants a means to reenact the training event and encourage discussion. At a minimum, a range diagram of the area should be used. Training aids to use during AARs are—

- Charts or drawings depicting the scenario, routes, and targets with any operational graphics that support the AAR. (This allows all participants to review actions while following the prescribed scenario.)

- Sand tables that depict the topographical features of the area. (These tables should be constructed to scale and depict the scenario, routes, and targets with any operational control measures that apply to the training. This allows the evaluator to guide the discussions while focusing on the particular place the action occurred.)
- Tape recorders to play back fire commands and radio net traffic. (Recorders allow the crew to hear their fire commands and review their responses.)
- Thru-sight video allows the evaluator to play back real time video of live-fire gunnery engagements and fire commands. (This provides are-look of engagement techniques and identifies errors that can be corrected before the next training event.)
- Precision gunnery system AAR computer to review gunnery data during device-based exercises. (The system allows the evaluator and crew members to see the placement of each round in relation to the target and its corresponding data.)

9-19. AAR PREPARATION

Before conducting an evaluation and an AAR, the evaluator must prepare himself and the AAR site.

a. **Review the Scenario.** Before evaluating a crew or platoon, evaluators must know the scenario and the mission and its collective tasks and the terrain of the training area. Once he knows the scenario and mission, he must ensure he knows the doctrine that applies. An evaluator cannot conduct a quality AAR if he does not know the task and its standards.

b. **Observe Training.** The evaluator must place himself in the best position to observe the task being conducted. For crew gunnery, this is on the crew's vehicle. For platoon gunnery, this is shadowing the element while mounted or dismounted. He must record observations as they happen. If he waits to record observations he may forget key actions that happened.

c. **Collect Information.** After the event, the evaluator must collect information from other observers. During crew gunnery events, he collects information such as target kill times from the tower observers. During section or platoon events, he collects information from assistant observers and target controllers. This information can be observations of dismounted squad's reactions to a particular event or the number of targets not killed by a section or platoon during an engagement and penalties assessed.

d. **Develop a Discussion Outline.** The evaluator must develop an outline he wants to follow during the AAR. He should identify the key areas he wants

the participants to discuss. This should include both strong points and weak points. During this time, he should decide how he is to accomplish his goal for the AAR. As an example, he should list key questions to ask that will give him the results he wants. He must determine any methods or techniques he will suggest to improve proficiency. If required, he should ask master gunners or more experienced personnel that can provide helpful tips to pass onto the crew or platoon.

e. **Rehearse.** Before participants arrive at the AAR site, the evaluator organizes his training aids, evaluation sheets, and seating arrangements. He should ensure the training aids are functioning and viewable by all participants. At a minimum, evaluators should rehearse the key points to be made.

9-20. CONDUCT OF THE AAR

Crew and platoon members normally have an idea of how well they performed before the AAR. What they may not know is why. The function of the evaluator conducting the AAR is to get the members to discuss what they did and guide them into discovering for themselves the why. After determining the why, the members should determine how to do it differently next time. The evaluator aids in these discussions and provides expertise when needed. When conducting AARs, the evaluator should use the following guidelines.

a. **Ensure all Participants are Present.** The evaluator should not begin the AAR until all participants are present. Anyone missing may have witnessed an event and may have something to contribute to the discussion that would otherwise be missed.

b. **Restate the Training Objectives.** The evaluator begins the AAR by restating the training objective of the training event and its major tasks.

(1) The evaluator restates the objectives for a crew gunnery exercise should begin by stating its title, "You just completed the day phase of Bradley Table VII. " The evaluator then highlights the major tasks involved, "This evaluated your ability to conduct four engagements. The first was a defensive engagement using the auxiliary sight, the second was an offensive engagement, the third was a defensive commander engagement in an NBC environment, and the fourth was a retrograde engagement while returning up range."

(2) The evaluator restates the objectives for a platoon gunnery, event should begin by stating its title, "You just completed the day phase of Bradley Table XI." The evaluator then highlights the major tasks involved, "This phase evaluated your ability to occupy an assembly area, conduct a movement to contact, and conduct a defend mission."

c. **Generate Discussion.** The evaluator begins the discussions by asking questions about the first event. For crew gunnery, "Who saw the target first?" Platoon gunnery, "Who were the first personnel to move into the assembly

area?" After one event is discussed, the evaluator asks questions about the next event. Events should be discussed in chronological order.

d. **Orient on Training Objectives.** As discussions move away from the objectives, the evaluator must bring the discussions back on track. The evaluator must not let discussions unrelated to the training waste valuable AAR time.

e. **Seek Maximum Participation.** Evaluators must ensure all participants are heard. Evaluators must not let one person take over discussions. If a member appears to be quiet and has not participated, the evauator asks him a direct question, "What were you doing during this time?"

f. **Summarize to Emphasize Key Learning Points.** As weaknesses are discovered and discussed, the evaluator summarizes the result and the solution; for example, "Let's review this point. Number 3 BFV missed a vehicle target during the defend mission because it was engaging troop targets 150 meters to its front, as a result of this, you have decided to include in your SOP, the dismounted squads will engage all troop targets inside 300 meters."

g. **Conduct an Overview of the Event.** The evaluator closes the AAR by conducting an overview of the strengths and weaknesses discussed and how they compare to Army standards. For example, (crew) "We have determined during the fourth engagement you never engaged the AP target, and this allowed the target the time to place a killing burst on your BFV. As a result of discussions here, you now know how to avoid this mistake in the future. According to FM 23-1 this gives you an assessment of 'U' for this engagement. The other three engagements are assessed as 'T.' Good Luck during the night phase."

CHAPTER 10

PRELIMINARY GUNNERY

Before conducting crew and tactical gunnery crews, squads, sections, and platoons must develop proficiency in individual and collective tasks. This proficiency is gained through specified elementary gunnery tasks and soldier skills. Preliminary gunnery introduces new crew members to BFV gunnery and sustains skills of experienced crew members. It is conducted year round at the home station, and it consists of classroom instruction and hands-on performance-oriented training. Dismount squad training should parallel Bradley preliminary gunnery training.

10-1. INSTRUCTION

Before crew members progress to hands-on training with vehicle systems, they must receive basic classroom instruction. Classroom subjects taught are BFV basic subjects, gunnery, and platoon training.

a. BFV Basic Subjects.

(1) Basic capabilities of the 25-mm 7.62-mm, and TOW.
(2) BFV range card.
(3) Gun theory and weapons system functions.
(4) Boresight and zero procedures.
(5) Target acquisition and range determination.
(6) Combat vehicle identification.
(7) Fire commands.
(8) Methods of engagement.
(9) Engagement techniques.

b. BFV Gunnery Training.

(1) Organization of gunnery training.
(2) Gunnery exercises and standards.
(3) Training devices.
(4) Direct-fire adjustment.
(5) TOW gunnery training.

c. Platoon Training.

(1) Sector sketches (section and platoon).
(2) Fire control and distribution.
(3) Platoon fire commands.
(4) Crew drills.
(5) Battle drills.

10-2. PERFORMANCE-ORIENTED TRAINING

Performance-oriented training allows crew members to apply what they learned during preliminary gunnery instruction. Crew members use their vehicles and equipment for hands-on training. (Thru-sight video can be used to provide more detail for the AAR.)

a. Introductory Manipulation Training. During introductory manipulation training crew members learn about the turret drive systems and handstations. Crew members learn how the turret responds to their use of the handstations in the power (normal and fast turret) mode and how it responds in the manual mode. Manipulation is a combination of eye-hand coordination and reinforcement training. There are two types of manipulation—gun lay and tracking.

(1) *Gun lay exercise.* Gun lay requires the BC to lay the turret weapons systems on the target, allowing the gunner to adjust onto target. Emphasis is on speed and accuracy of the lay. The gun lay exercise develops a BC's skill to use his handstation and to use oral direction terms for the gunner to lay the gun on the target while issuing a fire command.

(a) Task, conditions, and standards.

Task: Lay the BFV's turret weapons systems on a target.

Conditions: Given a fully operational BFV and a suitable exercise area with a minimum of 10 scaled targets.

Standards: The BC must correctly lay the weapons systems on 8 of 10 targets using the commander's handstation and 8 of 10 targets using oral direction terms. The BC must place each target within the gunner's field of view, in high magnification, within 5 seconds.

(b) Conduct of the exercise and evaluation procedures. The gun lay exercise may be conducted in any area that can meet the size requirements of 100 meters in depth and 50 meters in width.

Targets will accurately represent an enemy force. The recommended target model size is l/35-scale; however, if a larger area is available larger targets may be used.

The scaled targets are placed at ranges in accordance with the combat range versus scaled range, Table 10-1. Targets are numbered and lettered. Numbers must be visible to the naked eye. Letters will only be visible in high magnification.

The evaluator announces the target number to the BC. The BC lays the weapon on the target. The gunner announces "Identified" and the letter of the target in response to fire commands.

The gun exercise is done in both the power and manual modes, using the primary and auxiliary sights. The exercises progress in difficulty as the BC becomes more proficient.

COMBAT RANGE METERS	METERS 1/2-Scale	FEET 1/5-Scale	METERS 1/10-Scale	FEET 1/20-Scale	FEET 1/30-Scale	FEET 1/35-Scale	FEET 1/60-Scale
500	250	330	50	82	55	47	27
600	300	380	60	99	66	56	33
700	350	464	70	115	76	66	38
800	400	470	80	132	87	75	44
900	450	592	90	148	98	84	49
1,000	500	660	100	165	110	94	55
1,100	550	724	110	181	120	103	60
1,200	600	792	120	198	131	113	66
1,300	650	856	130	214	142	122	71
1,400	700	924	140	231	154	132	77
1,500	750	990	150	247	164	141	82
1,600	800	1,060	160	264	176	150	88
1,700	850	1,120	170	280	186	160	93
1,800	900	1,192	180	297	198	169	99
1,900	950	1,256	190	313	208	179	104
2,000	1,000	1,320	200	330	220	188	110
2,100	1,050	1,388	210	346	230	198	115
2,200	1,100	1,450	220	363	242	207	121
2,300	1,150	1,520	230	379	250	216	126
2,400	1,200	1,588	240	396	264	226	132
2,500	1,250	1,650	250	412	274	235	137
2,600	1,300	1,720	260	429	286	245	143
2,700	1,350	1,780	270	445	296	254	148
2,800	1,400	1,850	280	462	308	264	154
2,900	1,450	1,915	290	478	318	273	159
3,000	1,500	1,980	300	495	330	282	165

Table 10-1. Combat range versus scaled ranges.

(2) *Tracking exercise.* The tracking exercise requires the gunner and BC to move the sight reticle and TOW cross hair along a predetermined path. This path requires the gunner and BC to make horizontal and vertical changes while tracking. Emphasis is on tracking accuracy. The BC and gunner must track quickly and accurately in the power mode from the BC's and gunner's handstations and in the manual mode from the gunner's position.

(a) Task, conditions, and standards.

Task: Manipulate turret.

Conditions: Given a fully operational BFV, (tracking board (Figure 10-1) placed at the proper tracking line distance, in accordance with Table 10-2 (Bradley-to-target distance).

Standards: The BC and gunner must negotiate each tracking line, keeping the l-mil aiming circle or TOW cross hair between the parallel tracking lines, and within the time standards in Figure 10-1. The reticle aiming point or cross hair must not move outside the parallel lines more than three times on each tracking exercise. The exercise is conducted by both the BC and gunner from their handstations and by the gunner in the manual mode using the 25-mm reticle and TOW cross hair.

(b) Conduct of the exercise and evaluation procedures. The tracking exercise is conducted in any area that can meet the Bradley-to-target distance (Table 10-2).

Each crew member is evaluated separately. The evaluator watches and evaluates the exercise through an mailable sight (commander's sight extension or gunner's extension).

A sample score sheet for recording training and individual progress is in Figure 10-2, page 10-6.

As a crew member's proficiency increases, the advanced tracking pattern should be used (Figure 10-3, page 10-7). This pattern requires the crew member to manipulate the turret with all combinations of vertical and horizontal axes. Timing is based on the crew's previous performance of negotiating the pattern. This time is used as a standard for improvement.

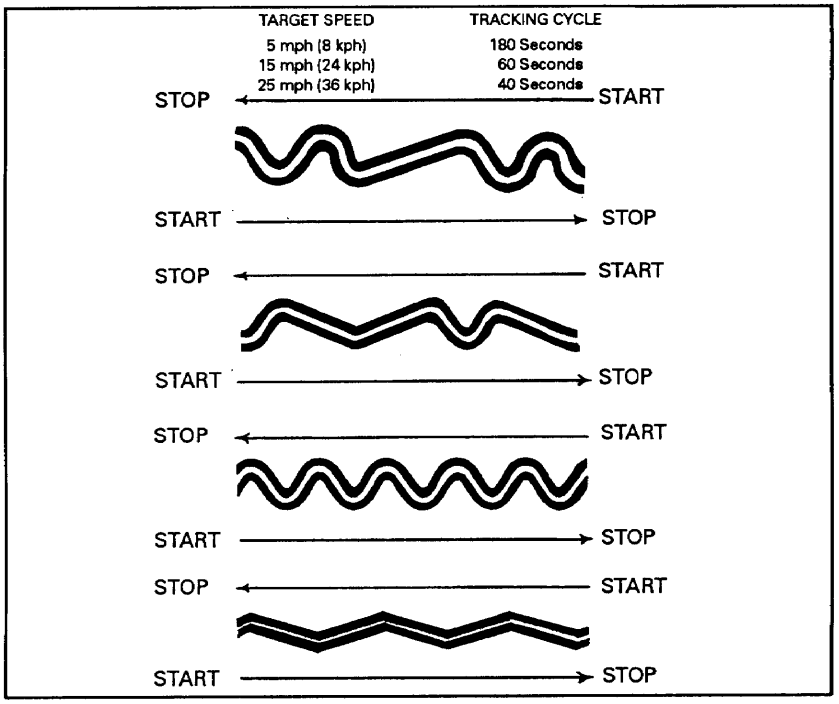


Figure 10-1. Manipulation tracking line (tracking board).

BRADLEY-TO-TRACKING LINE DISTANCE (METERS)	LENGTH OF TARGET LINE (METERS)	WIDTH BETWEEN PARALLEL LINES (MILLIMETERS)
5	1.67	14.7
10	3.33	29.4
15	5.00	44.1
20	6.67	58.8
25	8.33	73.5
30	10.00	88.2
35	11.67	102.9
40	13.33	117.6
45	15.00	132.3
50	16.67	147.0

Table 10-2. Bradley-to-target distance.

SAMPLE SCORE SHEET

RUNNING TIME	SECONDS 10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	TOTAL/ TIME	GNR/BC
POWER 25MM 180										X							X		173	SPEARS
					X										X				154	ST. JOHN
POWER TOW 180																				
POWER 25MM 60																				
POWER TOW 60																				
POWER 25MM 40																				
POWER TOW 40																				
MANUAL 25MM 180																				
MANUAL TOW 180																				
MANUAL 25MM 60																				
MANUAL TOW 60																				
MANUAL 25MM 40																				
MANUAL TOW 40																				

NOTE: The gunner was tracking a target at 2,200 meters using the 25-mm and turret power ON.
"X" indicates time frames when reticle was off target at various points as called out by evaluator/BC.

Figure 10-2. Sample score sheet.

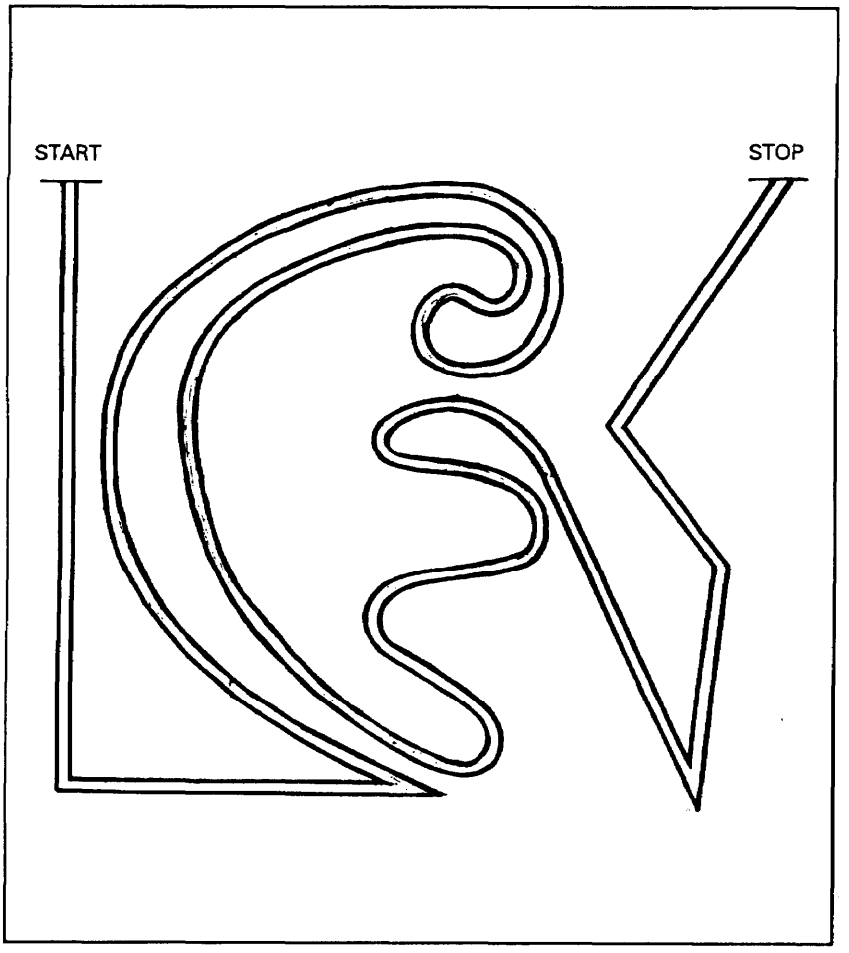


Figure 10-3. Advanced manipulation tracking line (tracking board).

b. Advanced Manipulation/Target Acquisition Training. Advanced manipulation/target acquisition training builds on skills developed during the tracking exercise. This is also the first time crews apply the target acquisition process. The conduct of fire trainer (COFT) incorporates 10 special-purpose exercises that assist in developing and reinforcing the crew's ability to detect, identify, and track moving targets. The task, conditions, and standards for these tasks are in IUH HB 23-1, Instructor's Utilization Handbook for the BFV Conduct of Fire Trainer.

EXERCISE NUMBER	TITLE
12251	Acquisition and manipulation—stationary BFV, stationary and moving targets (gunner, ISU, normal, day)
12252	Acquisition and manipulation—stationary BFV, stationary and moving targets (gunner, ISU, manual, day; malfunction: commander's power control handle)
12253	Acquisition and manipulation-moving BFV, stationary and moving targets (gunner, ISU, nomal, day)
12254	Acquisition and manipulation—stationary BFV, stationary and moving targets (gunner, auxiliary sight, normal, day, malfunction: ISU)
12281	Acquisition and manipulation—stationary BFV, moving helicopter targets (gunner, air defense reticle, normal, day)
12282	Acquisition and manipulation—stationary BFV, moving helicopter targets (gunner, air defense reticle, normal, night)
12255	Acquisition and manipulation—stationary BFV, stationary and moving targets (commander, commander's sight extension, normal, day, malfunction: gunner's power control handle)
12256	Acquisition and manipulation-moving BFV, stationary and moving targets (commander, commander's sight extension, normal, malfunction: gunner's power control handle)
12283	Acquisition and manipulation—stationary BFV, moving helicopter targets (commander, air defense reticle, normal, day)
12284	Acquisition and manipulation—stationary BFV, moving helicopter targets (commander, air defense reticle, normal, night)

c. Range Determination Training. During preliminary gunnery instruction, BCs and gunners are taught the various methods they can use to determine range. During the range determination exercise, the BC and gunner will apply some of these techniques.

(1) *Task, conditions, and standards.*

(a) Task: Determine range using Bradley common equipment.

(b) Conditions: Given a fully operational BFV, one set of M22 binoculars, and an exercise area with targets, and known distances to the targets.

(c) Standards: The BC and gunner will each determine the range to targets, within ± 100 meters. The BC determines the range to 4 of 5 targets using M22 binoculars. The gunner determines the range to 4 of 5 targets using the primary sight and 4 of 5 targets using the auxiliary sight.

(2) *Conduct of the exercise and evaluation procedures.* The range determination exercise can be conducted using the gun lay exercise site. Targets will accurately represent the enemy force. The recommended target model size is l/35-scale; however, if a larger training area is available, larger targets may be used.

d. Direct-Fire Adjustment Exercises. Direct-fire adjustment exercises train the assigned BC and gunner in the fundamentals of direct-fire adjustment. These exercises require the gunner and BC to use methods of fire adjustment. An error is induced into the fire control system, ensuring a first-round miss. Because the exercises are conducted in the COFT, improper range must be indexed before the crew begins the exercise. (Figures 10-4 through 10-7, pages 10-10 through 10-13.)

(1) *Task, conditions, and standards.*

(a) Task: Employ direct-fire adjustment techniques against stationary and moving targets, from a stationary and moving BFV.

(b) Conditions: Given a stationary and moving BFV (through COFT simulation), adjust fire from a first-round miss from the BC's and gunners' positions, using power and manual modes, and using the primary and auxiliary sights.

(c) Standards: The crew member must use correct adjustment techniques and hit the target with the second round to meet the minimum standards. Crew members must receive a rating of qualified on each task to receive a rating of qualified for the exercise.

(2) *Conduct of the exercise and evaluation procedures.* While using predetermined exercises, the IO must ensure the crew uses no more than 10 rounds for each 5-target task, two rounds per target. Offsetting the boresight knobs cannot be done in the COFT, unless boresighting. To induce an error in the system, the IO must either rely on the crew member being off in elevation or deflection or the BC incorrectly estimating range. To ensure a first round miss, crews index 600 meters for exercises in the defense and when engaging stationary targets. For moving BFV and moving target exercises, the crew indexes 1,200 meters.

			CONDITIONS		STANDARDS		
DATE	EX NO.	TASK	TARGET/ SITUATION	AMMO ROUNDS	HITS	CREW DUTIES	RATING
	53211	1. Apply direct-fire adjustment using the gunner's primary sight or aux sight.	5 Stationary targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	41211	2. Apply direct-fire adjustment using the CSE.	5 Stationary targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	53311	3. Apply direct-fire adjustment using the gunner's primary sight or aux sight.	5 Moving targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	41311	4. Apply direct-fire adjustment using the CSE	5 Moving targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	53221	5. Apply direct-fire adjustment using the gunner's primary sight	5 Stationary targets, night only	10	3-5 0-2	SAT UNSAT	Q U
	41221	6. Apply direct-fire adjustment using the CSE.	5 Stationary targets, night only	10	3-5 0-2	SAT UNSAT	Q U
	53321	7. Apply direct-fire adjustment using the gunner's primary sight.	5 Moving targets, night only	10	3-5 0-2	SAT UNSAT	Q U
	41321	8. Apply direct-fire adjustment using the CSE.	5 Moving targets, night only	10	3-5 0-2	SAT UNSAT	Q U

Figure 10-4. Direct-fire adjustment exercise, group 1.

			CONDITIONS		STANDARDS		
DATE	EX NO.	TASK	TARGET/ SITUATION	AMMO ROUNDS	HITS	CREW DUTIES	RATING
	53251	1. Apply direct-fire adjustment using the gunner's primary sight or aux sight.	5 Stationary targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	41231	2. Apply direct-fire adjustment using the CSE.	5 Stationary targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	53351	3. Apply direct-fire adjustment using the gunner's primary sight or aux sight.	5 Moving targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	41331	4. Apply direct-fire adjustment using the CSE	5 Moving targets, day only	10	3-5 0-2	SAT UNSAT	Q U
		5. Apply direct-fire adjustment using the gunner's primary sight	5 Stationary targets, night only	10	3-5 0-2	SAT UNSAT	Q U
		6. Apply direct-fire adjustment using the CSE.	5 Stationary targets, night only	10	3-5 0-2	SAT UNSAT	Q U
		7. Apply direct-fire adjustment using the gunner's primary sight.	5 Moving targets, night only	10	3-5 0-2	SAT UNSAT	Q U
		8. Apply direct-fire adjustment using the CSE.	5 Moving targets, night only	10	3-5 0-2	SAT UNSAT	Q U

Figure 10-5. Direct-fire adjustment exercise, group 2.

			CONDITIONS		STANDARDS		
DATE	EX NO.	TASK	TARGET/ SITUATION	AMMO ROUNDS	HITS	CREW DUTIES	RATING
	53411	1. Apply direct-fire adjustment using the gunner's primary sight or aux sight.	5 Stationary targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	41411	2. Apply direct-fire adjustment using the CSE.	5 Stationary targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	53511	3. Apply direct-fire adjustment using the gunner's primary sight or aux sight.	5 Moving targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	41511	4. Apply direct-fire adjustment using the CSE	5 Moving targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	53421	5. Apply direct-fire adjustment using the gunner's primary sight	5 Stationary targets, night only	10	3-5 0-2	SAT UNSAT	Q U
	41421	6. Apply direct-fire adjustment using the CSE.	5 Stationary targets, night only	10	3-5 0-2	SAT UNSAT	Q U
	53521	7. Apply direct-fire adjustment using the gunner's primary sight.	5 Moving targets, night only	10	3-5 0-2	SAT UNSAT	Q U
	41521	8. Apply direct-fire adjustment using the CSE.	5 Moving targets, night only	10	3-5 0-2	SAT UNSAT	Q U

Figure 10-6. Direct-fire adjustment exercise, group 3.

			CONDITIONS		STANDARDS		
DATE	EX NO.	TASK	TARGET/ SITUATION	AMMO ROUNDS	HITS	CREW DUTIES	RATING
	53451	1. Apply direct-fire adjustment using the gunner's primary sight or aux sight.	5 Stationary targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	41431	2. Apply direct-fire adjustment using the CSE.	5 Stationary targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	53351	3. Apply direct-fire adjustment using the gunner's primary sight or aux sight.	5 Moving targets, day only	10	3-5 0-2	SAT UNSAT	Q U
	41531	4. Apply direct-fire adjustment using the CSE	5 Moving targets, day only	10	3-5 0-2	SAT UNSAT	Q U
		5. Apply direct-fire adjustment using the gunner's primary sight	5 Stationary targets, night only	10	3-5 0-2	SAT UNSAT	Q U
		6. Apply direct-fire adjustment using the CSE.	5 Stationary targets, night only	10	3-5 0-2	SAT UNSAT	Q U
		7. Apply direct-fire adjustment using the gunner's primary sight.	5 Moving targets, night only	10	3-5 0-2	SAT UNSAT	Q U
		8. Apply direct-fire adjustment using the CSE.	5 Moving targets, night only	10	3-5 0-2	SAT UNSAT	Q U

Figure 10-7. Direct-fire adjustment exercise, group 4.

10-3. TOW TRAINING PROGRAM

TOW training program teaches the assigned crew how to engage, track, and destroy armored targets using the TOW missile system. The TOW training program must be conducted within 3 months (4 months for RC) before TOW live fire. The TOW training program consists of basic TOW gunnery tasks, tracking exercises (paragraph 10-2a(2)), and specified COFT exercises.

a. Basic TOW Task Training. Basic TOW tasks allow crew members to train hands-on, on their vehicles. Before firing a live missile, crew members must operate, load, fire, and apply immediate action on the TOW in a dry-fire mode.

(1) *Operate the TOW launcher in the power mode.*

(a) Task: Raise, elevate, depress, and lower the TOW launcher in the power mode.

(b) Conditions: Given an operational Bradley.

(c) Standards: Within 3 minutes, the crew member will raise, elevate, depress, and lower the TOW launcher.

(d) Performance measures:

1. Raised the TOW launcher.
   Moved turret power switch to ON.
   Moved turret drive switch to ON.
   Moved turret traverse drive select lever to power position.
   Moved LAUNCHER UP-DN switch to UP.
   Squeezed palm switches until launcher stopped moving and LAUNCHER UP indicator light came on.
   Released palm switches.
   Pressed TOW button.
2. Elevated TOW launcher.
   Squeezed and held palm switches.
   Rotated gunner's control handles toward himself until launcher reached desired position or stopped.
   Centered gunner's control handles and released palm switches.
3. Depressed TOW launcher.
   Squeezed and held palm switches.
   Rotated gunner's control handles away from himself until launcher reached desired position or stopped.
   Centered gunner's control handles and released palm switches.
4. Lowered the TOW launcher.
   Moved LAUNCHER UP-DN switch to DN.
   Squeezed palm switches until LAUNCHER UP indicator light went out and launcher stowed against turret.
   Released palm switches.
5. Completed the performance measures within 3 minutes.

(2) *Prepare the TOW launcher for loading.*

(a) Task: Perform the procedures for preparing the TOW launcher for loading.

(b) Conditions: Given an operational Bradley with the TOW launcher stowed.

(c) Standards: Within 1 minute, the crew member will prepare the TOW launcher for loading.

(d) Performance measures:

1. Prepared the TOW launcher for loading.
   Turned the turret power on.

Turned the turret drive on.
Raised TOW launcher.
Traversed to TOW LOAD position (5950 mils).
Elevated the launcher to 500 mils.
Set the turret travel lock.
Moved the turret drive switch to OFF.

2. Completed performance measures within 1 minute.

(3) *Load the TOW launcher.*

(a) Task: Perform the procedures for loading the TOW launcher on a BFV.

(b) Conditions: Given an operational Bradley with the TOW launcher prepared for loading, and dummy TOW rounds mounted in& vertical racks.

(c) Standards: Within 4 minutes, the crew member will load the TOW launcher

(d) Performance measures:

1. Loaded the TOW launcher.

Opened the cargo hatch cover to the second position.
Removed the dust cover from the launcher.
Pushed and held lock handles to the left, pulled down loading handles.
Removed any obstruction from the tubes.
Ensured the umbilical connectors were not extending down into the launch tubes.
Unstowed the TOW missiles from vertical stowage.
Removed the forward ring from the nose end.
Removed the electrical connector cover.
Inspected front and rear diaphragms for damage and humidity indicator color.
Loaded two TOW missiles into the launcher.
Ensured that the loading handles were locked.
Closed the cargo hatch, told the gunner loading was complete.

2. Completed performance measures within 4 minutes.

(4) *Fire and apply immediate action on a TOW.*

(a) Tasks: Fire and apply immediate action on a TOW.

(b) Conditions: Given an operational Bradley with the TOW launcher erect.

(c) Standards: Within 2 minutes, the crew member must—

• Prepare the TOW system for firing.

- Fire a TOW missile.
- Apply immediate action for a TOW misfire.

(d) Performance measures:

1. Fired a TOW missile.

Turned on turret power and turret drive.

Moved magnification switch to HIGH MAG.

Checked slope indicator to ensure it was within 10-degree tolerance.

Pressed the TOW button.

Checked TOW and TOW test indicator lights.

Checked that annunciator lights on the annunciator box and the TOW control box were off.

Pressed missile tube one or two button.

Moved ARM-SAFE-RESET switch to ARM.

Squeezed trigger and palm switches, released trigger and held palm switches for 5 seconds.

NOTE: Evaluator will announce "Your missile has failed to fire."

2. Applied immediate action on the TOW system.

Announced "Misfire TOW missile, attempting to fire again."

Resqueezed the trigger and palm switches, released trigger, held palm switches for 5 seconds. (If misfire still existed, continued with misfire procedures.)

Moved ARM-SAFE-RESET switch to RESET, then to SAFE.

Reselected TOW by pressing TOW button.

Checked TOW and missile indicators.

Reselected rnisfired TOW missile.

Checked that annunciator lights on the annunciator box and the TOW control box were off.

Moved ARM-SAFE-RESET switch to ARM.

Refired the misfired TOW missile.

3. Completed performance measures within 2 minutes.

(5) *Remove a misfired TOW missile from the TOW launcher.*

(a) Trek: Perform the procedures for removing a misfired missile from a TOW launcher.

(b) Conditions: Given an operational Bradley, TOW launcher erected, dummy TOW round inserted into tube 1, and a yellow flag.

(c) Standards: Within 10 minutes, the crew will prepare the vehicle, remove the misfired missile, and follow all safety procedures.

(d) Performance measures:

1. Removed the misfired TOW missile.

Moved the ARM-SAFE-RESET switch to RESET, then to SAFE.

Ensured ramp was raised and hatches were closed.

Pivoted hull to the 1600 or 4800 rnils, while turret stabilization was on.

Elevated the TOW launcher to maximum elevation.

Moved the turret power switch to OFF.

Climbed on top of the hull.

Unlocked the TOW launcher.

Removed the misfired missile from the launcher:

Held the TOW missile by the rear flange.

Carefully pulled the TOW missile straight out of the launcher.

Handed the TOW missile to the helper (driver).

Had the helper move the misfired TOW missile to a safe place, 200 meters away; marked the position with a stake and yellow flag.

Notified the chain of command of the location of the missile.

2. Completed the performance measures within 10 minutes.

(6) *Erect the TOW launcher using the manual mode.*

(a) Task: Perform the procedures for erecting the TOW launcher using the manual mode.

(b) Conditions: Given an operational Bradley with basic issue items.

(c) Standards: Within 10 minutes, the crew member will manually erect the TOW launcher.

(d) Performance measures:

1. Erected the TOW launcher using the manual mode.

Moved the gun elevation drive select lever to power position.

Moved the TOW elevation drive select lever to the manual position.

Removed the spring from the handle.

Manually depressed the TOW launcher to clear the stow pin from the saddle.

Manually raised the TOW launcher to the firing position.

2. Completed the performance measures within 10 minutes.

b. TOW Tracking. TOW tracking is part of the tracking exercise (paragraph 10-2a(2), page 10-3). Crew members are evaluated on their ability to move the TOW cross hair along a predetermined path.

c. TOW COFT Training. TOW COFT training allows crews to apply what they have learned during preliminary gunnery training. Crews must acquire, engage, track, and destroy threat armored targets within the simulated environment of the COFT. The task conditions, and standards for these exercises are in IUH HB 23-1, Instructor's Utilization Handbook for the Conduct of Fire Trainer.

EXERCISE NUMBER	TITLE
42122	Long range single stationary tank target, night, clutter
51133	Short range single stationary tank target, day, friendly and enemy fire
52133	Long range single stationary tank target, day, friendly and enemy fire
201	Advanced matrix, TOW certification exercise

CHAPTER 11

DEVICE GUNNERY TABLES

Device gunnery trains collective skills of crews, squads, sections, and platoon. Device gunnery consists of two parts—crew device gunnery and section/platoon device gunnery. Crew training is conducted in local training areas using MILES or PGS with LTID targetry or thru-sight video. Section/platoon training is conducted in local training areas using MILES and or PGS with LTID targetry and or thru-sight video or in a force-on-force scenario. An important part of this training is installation, boresighting, calibration, alignment, and removal of training devices.

Section I

CREW DEVICE GUNNERY

Crew device gunnery consists of Bradley Table I, Crew Defense; and Bradley Table II, Bradley Crew Proficiency Course. These tables train crews to engage stationary and moving targets using all weapon systems from a stationary and moving BFV, during day and night. Crews are required to engage targets using manual and power controls, gunner and commander handstations, integrated sight unit, and auxiliary sight. Table II (BCPC) is a prerequisite for fill-caliber live fire. All Bradley crews must perform Table II to standard within 3 months (4 months RC) before firing full caliber ammunition.

11-1. GUIDELINES

The following guidelines apply to crew device gunnery. MILES or coax subcaliber device may be used if PGS is not available. However, MILES does not allow crews to use proper engagement procedures (BOT, TOT, and lead). MILES must be used for TOW engagements when a coax subcaliber device is used.

a. All engagements and exercises are rated trained (T), needs practice (P), or untrained (U) in accordance with Chapter 9.

b. When engaging targets in the offense, battlesight fire commands must be used. When engaging targets in the defense, precision fire commands must be used.

c. All defensive engagements begin with the firing vehicle in a defilade position. The vehicle moves to a hull-down position to engage the target(s). On ranges where this cannot be done or defilade positions do not exists, units

will train using simulated positions. Vehicles must move at least one vehicle length in any of these positions.

d. All offensive and retrograde engagements are fired from a moving BFV using the stabilization system.

e. The total target exposure time is established using the target exposure time matrixes in Chapter 12.

f. When the target array consists of more than one target, simultaneous target exposure must be used. A simultaneous target exposure occurs when all targets for the task are presented at the same time, requiring crews to use proper engagement techniques.

g. If moving targets are not available, a stationary frontal target of the same type and at the same range is used. If a stationary target is used, target conditions must be adjusted (that is, one less condition).

h. Scaled targets maybe used; 1:10-scale is recommended and supported with PGS (Chapter 7).

11-2. BRADLEY TABLE I, CREW DEFENSE

The crew defense table allows the driver to be integrated into the crew's coordination by moving the vehicle into and out of firing positions during day and night engagements (Table 11-1.) This table trains crews to engage targets with training devices and introduces them to training in a gunnery environment during day and night. Crew defense consists of 10 engagements. These 10 engagements are conducted during the day and conducted again at night.

BFV	CONDITIONS	TARGET TYPE/POSTURE
Stationary	Gunner, Auxiliary Sight*	AP Stationary
Stationary	Gunner, ISU, Manual	HE Stationary
Stationary	Commander, CSE	AP Stationary, Coax
Stationary	Gunner, ISU	AP Moving, Coax
Stationary	Gunner, ISU, NBC	AP Moving, AP Stationary
Stationary	Gunner, ISU	TOW Moving, HE Stationary
Stationary	Gunner, ISU	Aerial
Stationary	Commander, CSE, NBC	TOW Stationary
Stationary	Gunner, ISU	HE Area
Stationary	Commander, CSE	AP Moving, HE Stationary
* At night, ISU is used.		

Table 11-1. Bradley Table I, Crew Defense.

11-3. BRADLEY TABLE II, BRADLEY CREW PROFICIENCY COURSE

The BCPC introduces crews to moving BFV engagements. This table develops the driving skills of the driver, while the crew engages targets on the move. Crews engage moving and stationary targets from a moving and stationary BFV. The BCPC consists of 6 day engagements and 6 night engagements (Table 11-2.)

DAY ENGAGEMENTS		
BFV	CONDITIONS	TARGET TYPE/POSTURE
Stationary	Gunner, ISU	TOW Moving
Stationary	Gunner, ISU, Manual	HE Stationary
Moving	Gunner, ISU	AP Moving, HE Stationary
Stationary	Gunner, Auxiliary Sight	HE Stationary, Coax Point
Moving	Commander, CSE	AP Stationary, Coax Point
Stationary	Gunner, ISU, NBC	AP Moving, Coax Area
NIGHT ENGAGEMENTS		
BFV	CONDITIONS	TARGET TYPE/POSTURE
Stationary	Gunner, ISU	TOW Stationary
Stationary	Gunner, ISU	AP Stationary, Coax Area
Moving	Gunner, ISU	AP Moving, HE Stationary
Stationary	Gunner, ISU	HE Moving, Coax Area
Moving	Commander, CSE	HE Stationary
Stationary	Gunner, ISU, NBC	AP Stationary, Coax Point

Table 11-2. Bradley Table II, Bradley Crew Proficiency Course.

Section II

SECTION/PLATOON DEVICE GUNNERY

Section/platoon device gunnery consists of Bradley Table III, Bradley Squad/Section Exercise; and Bradley Table IV, Bradley Platoon Proficiency Course. These tables train and evaluate collective squad/section and platoon tasks. These exercises are conducted using MILES and or PGS with LTID targets or in a force-on-force scenario. All evaluations are in accordance with ARTEP 7-8-MTP, ARTEP 7-7J-DRILL, FM 7-7J, and Chapter 9 of this manual. Table IV (BPPC) is a prerequisite for Bradley platoon

live fire, and BPPC must be conducted a minimum of one time during the day and one time at night, within six months of Bradley platoon live fire.

11-4. GUIDELINES

The following guidelines apply to section/platoon device gunnery.

a. Company commanders select squad collective tasks to be conducted during Table III (BSSE).

b. Battalion commanders with their S3 determine which additional platoon collective tasks are to be evaluated during the Table IV (BPPC).

c. Company commanders with their master gunner develop operational scenarios, operation orders, and evaluation packets that support the squad collective tasks.

d. Battalion S3's with their master gunner develop operational scenarios, operation orders, and evaluation packets&t support the platoon collective tasks.

e. Target exposure times are in accordance with Chapter 12.

f. If force-on-force scenarios are used, OPFOR requirements and standards are in accordance with ARTEP 7-8-MTP.

g. Gunnery task penalty matrix, Chapter 9, is used for assessing penalties if using a range targetry scenario.

11-5. BRADLEY TABLE III, BRADLEY SQUAD/SECTION EXERCISE

Bradley Table III (BSSE) integrates the dismounted squad with their vehicle section, while conducting squad collective tasks. Mounted, dismounted, and crew drills trained before BSSE provide the fundamental integration development needed for this training. Units develop the BSSE scenario to support their METL and training emphasis. All squad and section members must participate in a realistic scenario that requires them to conduct battle-focused squad collective tasks that integrate at a minimum the following.

a. **Crew Drills.**

(1) Dismount the Vehicle.

(2) Mount the Vehicle.

(3) (Fire team member) Load the 25-mm Ammunition Ready Box (HE or AP).

b. **Battle Drills.**

(1) React to Contact (Mounted).

(2) Break Contact (Mounted).

c. **Tasks.**

(1) Prepare a Section Sector Sketch

(2) Prepare a Squad Sector Sketch

11-6. BRADLEY TABLE IV, BRADLEY PLATOON PROFICIENCY COURSE

Bradley Table IV (BPPC) integrates the mounted and dismounted elements of the platoon, while conducting platoon collective tasks. Units develop the BPPC scenario based on their METL and training emphasis. All platoon members participate in a realistic scenario that requires the platoon to conduct battle-focused platoon collective tasks that integrate at a minimum the following tasks.

- Perform Overwatch/Support by Fire.
- Assault Mounted.
- Execute Defend.
- Prepare a Platoon Sector Sketch.

CHAPTER 12

CREW LIVE-FIRE GUNNERY TABLES

Crew live-fire gunnery trains and evaluates single vehicle crews' abilities to engage stationary and moving, single and multiple targets with turret-mounted weapon systems. This training is conducted during day and night or other limited visibility conditions from stationary and moving firing vehicles using full-caliber ammunition. Each series of actions and engagements replicate potential battlefield conditions. Assessments of preliminary and device gunnery identify weaknesses to improve on during crew gunnery. A tactical scenario may be used; however, these are not tactical exercises. An example is "Move from battle position 1 to battle position 2; enemy reported to your front. "Situation reports, spot reports, and NBC 1 reports may be used but are not part of crew gunnery evaluations. Reduced fire commands and wingman techniques will not be used in crew gunnery exercises. These tables train and evaluate single vehicle crew proficiency. Crew gunnery tables are as follows:

- *Bradley Table V, Crew Practice 1.*
- *Bradley Table VI, Crew Practice 2.*
- *Bradley Table VII, Crew Practice 3.*
- *Bradley Table VIII, Crew Qualification.*

12-1. TABLE DEVELOPMENT

Crew gunnery outlined in this chapter establishes an Army standard for training and evaluation while allowing division commands to tailor engagements for their particular contingency missions and training emphasis. This chapter idetifies engagement tasks, conditions, and standards. Division commands identify specific threat target types and engagement distances or range bands. Target exposure timing matrixes (Table 12-1, pages 12-4 through 12-6) provide this flexibility while maintaining a standard thoughout the Army. Crew gunnery evaluation procedures and standards are in Chapter 9.

a. Requirement.

(1) Bradley Tables V through VII are building-block steps for BT VIII, Crew Qualification. Training resources may prohibit firing BTs V through VII as prescribed in this chapter. BT VIII must be fired in accordance with the standards in this manual.

(2) Division commands will provide range scenarios for BT VIII, Crew Qualification, to include specifying most-dangerous versus least-dangerous targets, and battlecarry based on threat analysis and or training emphasis.

(3) All offensive and retrograde engagements will be fired from a moving BFV using the stabilization system.

(4) All defensive engagements begin with the firing vehicle in the turret-defilade position, then moving to a hull-down position to engage the target(s). On ranges where this cannot be done or defilade positions do not exist, units will train using simulated positions. Vehicles must move at least one vehicle length in any of these positions.

(5) BT VIII, Crew Qualification, has a total of four swing tasks: two day and two night. Swing tasks provide commanders and master gunners with the flexibility to adjust the number of tasks fired during day or night to match available light conditions. For example, during a season when there are more hours of darkness than daylight, four day tasks and six night tasks may be used. Swing tasks cannot be substituted with each other. Only swing tasks can be moved to either day or night scenarios. No other tasks can be used as a swing task.

(6) BT VIII, Crew Qualification, scenarios must contain a minimum of 1 day engagement and 1 night engagement at 600 meters or less and 1 day target and 1 night target at 1,400 meters or beyond.

b. Targetry.

(1) All targets must be constructed in accordance with TC 25-8.

(2) When the target array consists of more than one target, simultaneous target exposure must be used. A simultaneous target exposure occurs when all targets for the task are presented at the same time, requiring crews to use proper engagement techniques.

(3) For offensive and retrograde engagement total target exposure time is established using the applicable timing matrix (Table 12-1, pages 12-4 through 12-6). The master gunner uses the individual target conditions and range to determine the specific target's exposure time.

NOTE: Target exposure time begins when the target is fully exposed. Total target exposure time does not include target lift time.

(4) For defensive engagements, the standard total target exposure time for all targets is 50 seconds. However, the BFV cannot remain exposed beyond the BFV exposure timing matrixes in accordance with Chapter 9.

(5) For area target engagement area targets will be 100 meters wide and 50 meters deep and divided into eight 25-meter-square blocks.

(6) For coaxial machine gun—

(a) Point target engagements:

- RPG or ATGM teams will be three E-type silhouettes placed on line or in a wedge formation. They will not be more than 5 meters apart or 10 meters deep.
- Unarmored targets within 900 meters can be designated a coax point target. However, these targets must have a unique design easily identifiable to the crew (silhouette or thermal image). This reduces confusion as to what ammunition type is used to engage that target.

(b) Area target engagements: Area target arrays will be seven E-type silhouettes placed on line, column, or in a wedge formation. Targets will not be more than 5 meters apart and will not extend beyond 30 meters in width or 20 meters in depth

LIGHT-ARMORED/UNARMORED VEHICLE TARGETS				
	TARGET CONDITIONS			
RANGE (METERS)	NORMAL (Seconds)	1 CONDITION (Seconds)	2 CONDITIONS (Seconds)	3 CONDITIONS (Seconds)
400	11	12	16	17
500	12	13	17	18
600	13	14	18	19
700	14	15	19	20
800	14	17	20	21
900	15	18	21	22
1,000	16	19	22	24
1,100	17	20	23	25
1,200	18	21	24	26
1,300	18	22	26	28
1,400	19	23	27	29
1,500	20	24	28	30
1,600	21	25	29	32
1,700	22	26	30	33
1,800	22	28	31	35
1,900	23	29	32	36
2,000	24	30	33	37
2,100	25	31	34	38
2,200	26	32	36	40
2,300	26	33	37	41
2,400	27	34	38	42
2,500	28	35	39	43
NOTE: Beyond 2,000 meters, the M910A1 round should be used.				

Table 12-1. Target exposure timing matrixes.

AERIAL TARGETS				
	TARGET CONDITIONS			
RANGE (METERS)	NORMAL (Seconds)	1 CONDITION (Seconds)	2 CONDITIONS (Seconds)	3 CONDITIONS (Seconds)
400	9	10	12	16
500	10	11	12	16
600	10	11	13	17
700	10	11	13	17
800	10	11	13	18
900	10	12	14	18
1,000	11	12	14	19
1,100	11	12	14	19
1,200	11	13	15	19
1,300	11	13	15	20
1,400	11	13	15	20
1,500	12	13	15	21
1,600	12	14	15	21
1,700	12	14	16	21
1,800	12	14	16	22
1,900	13	14	16	22
2,000	13	14	16	23
2,100	13	15	16	23
2,200	13	15	17	23
2,300	14	15	17	24
2,400	14	15	17	24
2,500	14	16	17	24
NOTE: Beyond 2,000 meters, the M910A1 round should be used.				

Table 12-1. Target exposure timing matrixes (continued).

DISMOUNTED TROOP TARGETS			
RANGE (Meters)	TARGET CONDITIONS		
	NORMAL (Seconds)	1 CONDITION (Seconds)	2 CONDITIONS (Seconds)
300	8	10	13
400	9	10	14
500	9	11	14
600	9	11	15
700	10	12	16
800	10	12	16
900	11	13	16
1,000	11	13	16
1,100	12	14	17
1,200	12	14	17
1,300	12	15	18
1,400	13	15	19
1,500	13	16	19
1,600	14	17	20
1,700	14	17	21
1,800	15	18	21
1,900	15	18	22
2,000	16	19	23
2,100	16	19	23
2,200	16	20	24
2,300	17	20	25
2,400	17	21	25
2,500	18	21	26

Table 12-1. Target exposure timing matrixes (continued).

c. Ammunition.

(1) *25-mm gun.*

- 8 rounds of TPDS-T per AP point target.
- 20 rounds of TPDS-T per aerial point target.
- 8 rounds of TP-T per HE point target.
- 25 rounds of TP-T per HE area target.

(2) *Coaxial machine gun.*

- 50 rounds of 7.62-mm per RPG or ATGM team or unarmored target.
- 100 rounds of 7,62-mm per area target.

Note: When crews are provided with only one type of 25-mm ammunition the designated amount of ammunition, based on scenario target types, must be uploaded into the appropriate ready boxes (HE or AP ready box).

d. Allowable Variations.

(1) Division commanders may add friendly targets to BT VIII, Crew Qualification, tasks.

(2) Battalion/squadron commanders may modifiy the number of tasks fired on BTs V through VII.

(3) Battalion/squadron commanders may add friendly targets to BTs V through VII.

(4) Battalion/squadron commanders may add smoke and obscurants on BTs V through VII.

(5) Company commanders may modify the type of tasks to fire on BTs V through VII to improve unit weaknesses.

(6) If a moving target is not available, a stationary frontal target of the same type and at the same range is used. If a stationary target is used, target coalitions must be adjusted (that is, one less condition).

(7) If the firing vehicle's stabilization system fails, the crew must report it immediately to the range controllers. The engagement will be terminated, and the vehicle will not conduct any offensive engagements until the system is corrected.

12-2. PREREQUISITES

Crew members must meet the following prerequisites Here crew gunnery:

a. Qualified BGST within 3 months (reserve component, within 4 months).

b. Certified on BT II (Bradley Crew Proficient Course) within 3 months (reserve component within 4 months).

12-3. BRADLEY TABLE V, CREW PRACTICE 1

BT V, Crew Practice 1, introduces crews to a live-fire gunnery environment (Table 12-2.) This table uses the 7.62-mm coax machine gun, in the single-shot mode, as a subcaliber device replicating main gun engagernent. Due to the limited engagement range of the coax, half-scale targets are placed at half the engagement distance; for example, for a 1,200-meter engagement requirement, a half-scale target is placed at 600 meters. Gunners must use the actual straight-line distances when engaging targets (600 meters for a replicated 1,200-meter target).

Ammunition requirements for this table are—

7.62-mm tracer 160 rounds

DAY ENGAGEMENTS		
BFV	**CONDITIONS**	**TARGET TYPE/POSTURE**
Defense	Gunner, ISU, Manual	HE Stationary
Offense/ Retrograde	Gunner, ISU	AP Moving, HE Stationary
Defense	Gunner, Auxiliary Sight	HE Stationary
Offense/ Retrograde	Commander, CSE	AP Moving, HE Stationary
Defense	Gunner, ISU, NBC	AP Moving
NIGHT ENGAGEMENTS		
BFV	**CONDITIONS**	**TARGET TYPE/POSTURE**
Defense	Gunner, ISU	AP Stationary, HE Stationary
Offense/ Retrograde	Gunner, ISU, NBC	AP Moving
Defense	Commander, CSE	AP Stationary, HE Stationary
Offense/ Retrograde	Commander, CSE	AP Moving, HE Stationary
Defense	Gunner, ISU	AP Moving, HE Stationary

Table 12-2. Bradley Table V, Crew Practice 1.

12-4. BRADLEY TABLE VI, CREW PRACTICE 2

BT VI, Crew Practice 2, is the first table that requires the crew to fire with full-caliber ammunition using the 25-mm gun and the 7.62-mm coax burst techniques (Table 12-3.) Elements are fired from a baseline position. BT VI uses combat ranges to train BFV crew 25-mm and 7.62-mm coax engagement techniques during daylight and darkness against stationary and moving targets and against point and area targets.

Ammunition requirements for this table are—

TPDS-T	32 rounds
TP-T	24 rounds
7.62-mm	350 rounds

DAY ENGAGEMENTS		
BFV	**CONDITIONS**	**TARGET TYPE/POSTURE**
Defense	Gunner, ISU, Manual	AP Stationary (Frontal)
Defense	Gunner, Auxiliary Sight	AP Stationary (Frontal)
Defense	Commander, CSE	AP Stationary (Frontal), Coax Area
Defense	Gunner, ISU, NBC	AP Moving (Flank), Coax Area
NIGHT ENGAGEMENTS		
BFV	**CONDITIONS**	**TARGET TYPE/POSTURE**
Defense	Gunner, ISU	HE Stationary (Frontal), Coax Area
Defense	Commander, CSE	HE Moving (Flank)
Defense	Gunner, ISU, NBC	HE Stationary (Frontal), Coax Point

Table 12-3. Bradley Table VI, Crew Practice 2.

12-5. BRADLEY TABLE VII, CREW PRACTICE 3

BT VII, Crew Practice 3, is the first table that requires the BFV crew to conduct offensive engagements with full-caliber ammunition at combat ranges (Table 12-4.) BT VII trains the Bradley crew to engage moving and stationary targets during daylight and darkness from a stationary and a moving firing vehicle.

Ammunition requirements for this table are—

TPDS-T	56 rounds
TP-T	24 rounds
7.62-mm	400 rounds

DAY ENGAGEMENTS		
BFV	**CONDITIONS**	**TARGET TYPE/POSTURE**
Defense	Gunner, Auxiliary Sight	AP Moving (Flank) AP Stationary (Frontal)
Offense/ Retrograde	Gunner, ISU	HE Stationary (Frontal) Coax Area
Defense	Commander, CSE, NBC	HE Stationary (Frontal) Coax Point
Offense/ Retrograde	Gunner, ISU	AP Moving (Flank) HE Stationary (Frontal)

Table 12-4. Bradley Table VII, Crew Practice 3.

NIGHT ENGAGEMENTS		
BFV	CONDITIONS	TARGET TYPE/POSTURE
Defense	Gunner, ISU	AP Moving (Flank) Coax Point
Offense/ Retrograde	Commander, CSE	AP Stationary (Frontal)
Defense	Gunner, ISU, NBC	AP Stationary (Frontal) Coax Area
Offense/ Retrograde	Gunner, ISU	AP Moving (Flank) Coax Area

Table 12-4. Bradley Table VII, Crew Practice 3 (continued).

12-6. BRADLEY TABLE VIII, CREW QUALIFICATION

BT VIII, Crew Qualification, is a single-vehicle qualification table (Table 12-5.) This table evaluates the crew's ability to acquire and engage targets during various firing conditions. Units are encouraged to fire on ranges that can accommodate dual scenarios. However, firing vehicles will not assist each other acquiring targets. Firing crew members (excluding battalion and company master gunners) will not conduct inspections (reconnaissance) of range targetry during crew qualification. Crews may receive a range orientation of the downrange area and limit markers, but no targets will be presented. The range briefing will not contain task sequences or detail the location of particular tasks that will be fired. If BT VIII is conducted on the same range as BT VII, Table VIII range scenarios (target array) will not be the same as BT VII.

Ammunition requirements for this table are—

TPDS-T	48 rounds
TP-T	48 rounds
7.62-mm	450 rounds

DAY ENGAGEMENTS		
BFV	CONDITIONS	TARGET TYPE/POSTURE
Defense	Gunner, ISU, Manual (Swing)	HE Stationary (Frontal)
Offense/ Retrograde	Gunner, ISU (Swing)	AP Moving (Flank) HE Stationary (Frontal)
Defense	Gunner, Auxiliary Sight	HE Stationary (Frontal) Coax Point
Offense/ Retrograde	Commander, CSE	AP Stationary (Frontal) Coax Point
Defense	Gunner, ISU, NBC	AP Moving (Flank) Coax Area

Table 12-5. Bradley Table VIII, Crew Qualification.

NIGHT ENGAGEMENTS		
BFV	**CONDITIONS**	**TARGET TYPE/POSTURE**
Defense	Gunner, ISU (Swing)	AP Stationary Coax Area
Offense/ Retrograde	Gunner, ISU, NBC	AP Moving (Flank) HE Stationary (Frontal)
Defense	Gunner, ISU (Swing)	HE Moving (Flank) Coax Area
Offense/ Retrograde	Commander, CSE	HE Stationary (Frontal)
Defense	Gunner, ISU	AP Stationary (Frontal) Coax Point

Table 12-5. Bradley Table VIII, Crew Qualification (continued).

CHAPTER 13

CAVALRY/TEAM GUNNERY TABLES

This chapter contains the evaluation procedures and standards used to evaluate the cavalry/team advanced gunnery tables. Advanced gunnery combines gunnery and tactical training at team level. Advanced gunnery tables train and evaluate a team's ability to execute its METL, as well as engage and destroy stationary and moving multiple targets with turret weapons and indirect fires during good and limited visibility. Each series of tactical and gunnery tasks replicates potential battlefield conditions. Team gunnery consists of—

- *Bradley Table IX, Scout Team Training.*
- *Bradley Table X Scout Team Qualification.*

These tables combine mission training plan (MTP) operations and gunnery tasks in ARTEP 17-57-10-MTP.

Section I
SCOUT TEAM GUNNERY TABLES

All scout platoons perforrn reconnaissance and security missions. Each of these missions consists of unit and individual tasks. Gunnery tables provide the commander with the opportunity to evaluate his scout team's ability to execute tactical and gunnery tasks. A successful team gunnery program trains all tasks required to support the unit's METL. Due to limited range resources, individual and collective tasks must be trained before gunnery tables. ARTEP I7-57-10-MTP outlines the steps needed for a unit to establish a successful training program for all tasks that support the unit's METL. When developing the team's gunnery program, the commander should remember the training principles in FM 25-100:

- Train as you will fight or support.
- Make commanders/leaders the primary trainers.

- Train using appropriate doctrine.
- Use performance-oriented training.
- Use mission-oriented training.
- Train to fight and support as a combined arms and services team.
- Train to sustain proficiency.
- Train to challenge.

The scout team gunnery tables train and evaluate Bradley-equipped-scout teams. These gunnery tables test the scout team's ability to conduct reconnaissance and security missions and to engage stationary and moving targets. In any tactical scenario, the focus must be on the scout's primary mission of information collecting and reporting. The scout's ability to effectively use his combat resources (direct- and indirect-fire assets) while remaining undetected on the battlefield must also be evaluated.

The scenarios for scout team gunnery are examples only. Using the following information as a guide, the commander can design his own tables based on resources available and the unit's training needs. This flexibility ensures that each unit receives the training required for its scout team to function effectively.

To maintain tactical emphasis throughout the scout team tables, there are nine mandatory combat critical tasks in each table. Both tables contain these nine combat critical tasks and a minimum of three commander-selected tactical tasks (see Figure 13-1 for task list). The tactical tasks make up 60 percent of each table; the remaining 40 percent consists of Bradley gunnery tasks. Teams are formally evaluated on tactics and gunnery tasks.

ARTEP 17-57-10-MTP is the primary source for developing the performance checklists used during the tactical portions of the tables. Unit SOPs and other FMs may be used to develop performance checklists not addressed in ARTEP 17-57-10-MTP.

NOTE: The scout team gunnery tables were developed by the US Army Armor School. Changes for improving this chapter should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded to Commander, US Army Armor School, ATTN: ATSB-SBE-E, Fort Knox, KY 40121-5000.

REQUIRED COMBAT CRITICAL TASKS	SAMPLE TACTICAL TASKS
Execute actions on contact.	Coordinate with adjacent platoon-size elements.
Collect/report information—SALUTE.	Perform an area reconnaissance.
Call for/adjust indirect fire.	Perform a route reconnaissance.
Conduct tactical movement.	Perform reconnaissance by fire.
Control scout team fires.	Prepare overlays for route reconnaissance reports.
Conduct a screen.	Emplace and retrieve a hasty minefield.
Perform a passage of lines.	Execute a dismounted patrol.
Select firing positions.	Supervise the preparation of a team's defensive position.
Perform a zone reconnaissance.	Consolidate and reorganize a team following enemy contact (defense).
	Initiate unmasking procedures.
	Cross a chemically contaminated area.
	Prepare and submit an NBC-4 report.
	Prepare and submit an NBC-1 report.
	Calculate and designate placement of timber-cutting charges.
	Calculate and designate placement of steel-cutting charges.
	React to indirect fire.

Figure 13-1. Combat critical tasks and sample tactical tasks.

13-1. EVALUATION PROCEDURES AND STANDARDS FOR SCOUT TEAM TABLES

The following evaluation procedures and standards apply to team gunnery. The evaluation procedures allow teams to train and practice the skills normally performed in combat. Evaluators use after-action reviews to critique teams upon completion of the tables. Crew duties are not rated on these tables; however, a team is penalized if an individual scout squad fails to perform sound tactical maneuvering or achieve target hits.

a. Evaluation Procedures Evaluators will use the performance checklists in ARTEP 17-57- 10-MTP to evaluate scout teams on tactics. If a commander selects tactical tasks not listed in Figure 13-1, he must develop a performance checklist for each task and base each checklist on ARTEP 17-57-10-MTP.

(1) *Start time.* Engagement times are used to provide the evaluator with a tool to critique team engagements. Engagement start time begins—

- When the first team vehicle, on the move, is exposed to the threat.
- When the first team vehicle, in the defense, stops in a hull-down position or fires the first round. Depending on the tactical scenario, target exposure times should allow the team to report and determine the most desirable course of action (that is, indirect fire).

(2) *Stop time.* The following conditions determine engagement stop times:

- The team leader announces CEASE FIRE, and all team vehicles have returned to the defilade position.
- All targets are killed.
- All team vehicles return to defilade positions for the final time.

(3) *Alibi criteria.* Chapter 9, paragraph 9-9 addresses alibi criteria. No other alibi criteria can be used.

b. Evaluation Standards. Terrain, weather, and distance between engagements dictate course time. Tactical tasks can be conducted at a nearby training area and combined with the gunnery portion if range areas are not extensive enough to allow tactical maneuvering; however, this is an exception. Commanders should integrate the tactical and gunnery tasks to maximize the training effectiveness of these tables.

(1) The team must achieve, as a minimum, a GO on 70 percent of the tactical tasks on the scout team tables—an equivalent of 420 points on each table.

(2) The team must achieve, as a minimum, a 70 percent target kill rate on gunnery tasks during each table—an equivalent of 280 points on each table.

13-2. SCORING PROCEDURES

Each table uses a 1,000-point system for the areas of tactics and gunnery. The breakdown of scoring is as follows.

a. *Tactics* is worth 60 percent or a total of 600 points. Evaluators will use the performance checklists in ARTEP 17-57-10-MTP. These checklists may be modified by the commander to more accurately reflect their METL. Commanders can use the formula illustrated in Figure 13-2 for determining total tactical points or, at the commander's option based on METL importance, point values can be assigned for each task. Total cumulative tactical points will not exceed 600.

Divide the number of tactical tasks passed by the number of tactical tasks possible to establish a percentage:

TASKS PASSED	TASKS POSSIBLE	PERCENTAGE
29	31	93%

Convert the percentage to a decimal and multiply the decimal by 600 possible tactical points:

.93 X 600 = 558

The resulting number is the points awarded for the tactical evaluation of the tables.

Figure 13-2. Tactical evaluation scoring formula.

b. *Gunnery* is worth 40 percent or a total of 400 points. To determine the number of gunnery points awarded, the evaluator uses the target destruction matrix in Table 13-1, page 13-6. The target destruction matrix can be used for all target presentations to include BFV-mounted weapons, indirect-fire, and dismounted engagements in accordance with established destruction criteria for each weapon system.

	TARGETS DESTROYED							TARGETS PRESENTED																												
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
5	334	286	250	224	200	182	166	154	142	132	124	118	110	104	100	96	90	86	84	80	76	74	72	68	66	64	62	60	58	56	54	52	51	50	50
6	400	343	300	268	240	218	200	184	172	160	150	142	132	126	120	114	108	104	100	96	92	88	84	82	80	78	74	72	70	68	66	64	62	60	60
7		400	350	312	280	254	234	214	200	186	174	164	156	148	140	132	126	122	116	112	108	104	100	96	92	90	88	84	82	80	78	76	74	72	70
8			400	356	320	290	266	245	228	214	200	188	178	168	160	152	146	140	132	128	124	118	114	110	106	102	100	96	94	92	88	86	84	82	80
9				400	360	328	300	276	258	240	226	212	200	190	180	172	164	156	150	144	138	132	128	124	120	116	112	108	106	102	100	96	94	92	90
10					400	364	334	308	286	266	250	234	222	210	200	190	182	174	166	160	154	148	142	138	132	128	124	122	118	114	112	108	106	102	100
11						400	366	338	314	294	276	258	244	232	220	210	200	192	184	176	170	162	158	152	146	142	138	132	130	126	122	118	116	112	110
12							400	370	342	320	300	282	266	252	240	228	218	208	200	192	184	178	172	166	160	154	150	146	142	136	132	130	126	122	120
13								400	372	346	326	306	288	274	260	248	236	226	216	208	200	192	186	180	176	168	162	158	152	148	144	140	136	132	130
14									400	374	370	330	312	294	280	266	254	244	234	224	216	208	200	194	186	180	176	170	164	160	156	152	148	144	140
15										400	376	352	334	316	300	286	272	260	250	240	230	222	214	206	200	194	188	182	176	172	166	162	158	154	150
16											400	376	366	336	320	304	290	278	266	256	246	238	228	220	214	206	200	184	188	182	178	172	168	164	160
17												400	378	358	340	334	312	296	284	272	262	252	242	234	226	220	212	206	200	194	188	184	178	174	170
18													400	378	360	342	328	314	308	288	276	266	258	248	240	232	226	218	212	206	200	194	190	184	180
19														400	380	362	346	330	316	304	292	282	272	262	254	246	238	230	224	218	212	206	200	194	190
20															400	380	364	348	334	320	300	296	286	276	266	258	250	242	236	228	222	216	210	206	200
21																400	382	366	350	336	324	312	300	290	280	270	262	254	248	240	234	228	222	216	210
22																	400	382	366	352	338	326	314	304	294	284	276	266	258	252	244	238	232	226	220
23																		400	384	368	354	340	328	318	306	296	288	278	270	262	256	248	242	236	230
24																			400	384	370	356	342	332	320	310	300	290	282	274	266	260	252	246	240
25																				400	384	370	358	344	334	322	312	304	294	286	278	270	264	256	250
26																					400	386	372	358	346	336	326	316	306	298	288	282	274	266	260
27																						400	386	372	360	348	338	328	318	308	300	292	284	276	270
28																							400	386	374	362	350	340	330	320	312	302	294	288	280
29																								400	386	374	362	352	342	332	322	314	306	298	290
30																									400	388	376	364	352	342	334	324	316	308	300
31																										400	388	376	364	354	344	336	326	318	310
32																											400	388	376	366	356	346	336	328	320
33																												400	388	378	366	356	348	338	330
34																													400	388	378	368	358	348	340
35																														400	388	378	368	358	350
36																															400	390	378	370	360
37																																400	390	380	370
38																																	400	390	380
39																																		400	390
40																																			400

Table 13-1. Target destruction matrix.

13-3. RATINGS

Teams will be rated by the following standards:

- **Distinguished** - Combined score of 900 points or higher that must include a minimum of 420 (70 percent) tactical and 280 (70 percent) gunnery points.
- **Superior** - Combined score of 800 to 899 points that must include a minimum of 420 (70 percent) tactical and 280 (70 percernt) gunnery points.
- **Qualified** - Combined score of 700 to 799 points must include a minimum 420 (70 percent) tactical and 280 (70 percent) gunnery points.
- **Unqualified** - Combined score of 699 points or less, or team fails to achieve 420 (70 percent) tactical points or 280 (70 percent) gunnery points.

13-4. TARGETS

Target arrays should be consistent with the type of threat forces a team will normally encounter. FM 17-98 describes these forces in detail for both reconnaissance and security missions. Based on the mission-essential task list, the commander determines the number and types of targets to be engaged. At no time will the number of targets exceed the number of rounds allocated by DA Pam 350-38. Additionally, no fewer than three 25-mm targets per live-firing vehicle per table phase will be presented because of the loading requirements of the M242 25-mm automatic gun.

a. Thermal Targets. In all cases, thermal targets should be used to represent accurate thermal signatures of threat vehicles.

b. Target Signature. When appropriate to the scenario, hostile fire simulators can be used to simulate the threat vehicle(s) firing at the team.

c. Target Exposure Time. The following target exposure times are used for tables:

(1) Indirect-fire engagements will be presented for 90 seconds.

(2) All offensive (direct-fire) engagements will be presented for 50 seconds (day) or 60 seconds (night).

(3) Ml defensive (direct-fire) engagements will be presented in depleting target arrays for 40 seconds (day) and 50 seconds (night).

NOTE: If troop targets are presented in a defensive engagement, they will be presented in the final target array.

Section II
BRADLEY TABLE IX, SCOUT TEAM TRAINING

The team training table trains and evaluates scout team tactical and gunnery skills in preparation for scout team qualification. At the commander's discretion, the team training table may be conducted in a live-fire or Iaser-fire mode. The team training table must contain, as a minimum, the nine combat critical tasks, three commander-selected tactical task, and the required percentage of gunnery tasks (Figures 13-3 and 13-4.).

13-5. PREREQUISITES

The scout team must meet the following conditions before firing a team training table.

a. Each crew in the team must have qualified on crew qualification within six months of firiing the team training table (paragraph 13-2). Due to crew turnover, the team training and qualification tables should be fired immediately after completing crew qualification. If a crew member leaves the team before team gunnery, that crew member's vehicle may negotiate the course in a dry-fire status.

b. Each vehicle crew member must have passed the Bradley gunnery skills test in accordance with Appendix A, paragraph A-1).

TASK	CONDITION/TARGET/ SITUATION	TARGET HIT	TACTICAL TASKS
1. Conduct a zone reconnaissance.	Scout team conducts zone reconnaissance.		Conduct passage of lines. Perform a zone reconnaissance. Control techniques of movement.
2. Scout team detects a combat outpost.	Scout team observes two BMPs, 800 to 1,000 meters.		Perform a zone reconnaissance. Execute actions on contact. Call for fire. Send a spot report.
3. Scout team engages an outpost.	Scout team engages one BMP, 800 to 1,000 meters.	0 1	Execute actions on contact. Send a spot report. Select firing positions. Control scout team fires. Perform a zone reconnaissance.
4. Establish an OP.	On order, team establishes an OP and conducts a patrol.		Establish a screen. Execute actions on contact. Plan and conduct a patrol.

Figure 13-3. Example scout team training table (day).

TASK	CONDITION/TARGET/ SITUATION	TARGET HIT	TACTICAL TASKS
1. Conduct a zone reconnaissance.	Scout team conducts a zone reconnaissance to a screen position.		Issue the order. Perform a zone reconnaissance.
2. Conduct a screen.	Scout team conducts a screen and receives an order to perform a patrol.		Establish a screen. Plan and conduct a patrol.
3. Conduct a screen.	Scout team engages two BMPs, 800 to 1,000 meters.	0 1 2	Call for fire. React to indirect fires. Displace to subsequent screen line. Send a spot report. Select firing positions. Control scout team fires. Conduct a passage of lines.

Figure 13-4. Example scout team training table (night).

13-6. REQUIREMENT

Each scout team must receive a passing score on the team training table before firing the team qualification table. Scoring procedures are in paragraph 13-2.

13-7. TASK

The scout team conducts a reconnaissance and or security mission and acquires, reports, and employs accurate direct and indirect fires to engage targets in a tactical array.

13-8. CONDITIONS

The scout team uses reconnaissance and engagement techniques against threat targets. Moving and stationary targets appear individually and simultaneously. At least one NBC engagement and one auxiliary sight engagement must be planned in the table.

13-9. STANDARDS

Gunnery points are awarded in accordance with Table 13-1. Crews wilI be critiqued on engagement techniques. Tactical standards are in accordance with ARTEP 17-57-10-MTP.

13-10. CONDUCT OF THE RANGE

Depending on the availability of maneuver area and range time, scout teams can fire the scout team training table in a local training area with the multiple-integrated laser engagement system (MILES), precision gunnery system (PGS), or at a range facility with full-caliber gunnery. The commander must decide, based on range time availability and his design of the team tables, the most appropriate location to conduct the table: MILES-or PGS-conducted tables, force-on-force engagements, or target lift mechanisms with laser target interface device.

a. Tactical Tasks. The unit commander must select a minimum of three METL tasks to train and evaluate with the nine combat critical tasks. A friendly and threat scenario must then be developed to evaluate these tasks within a realistic tactical training setting. The minimum recommended area for this training is 1 kilometer by 2 kilometers Performance checklists are used to record tactical evaluation.

b. Gunnery Tasks. The gunnery tasks for the scout team training table can be a live-fire table, a MILES table, or a PGS table. In either case, the number of targets presented in the scenario or rounds allocated per engagement will not exceed the total number of rounds resourced by DA Pam 350-38.

(1) Live-fire gunnery is preferred; however, range and maneuver area constraints may dictate conducting separate tactical and gunnery portions. Commanders should integrate tactical and gunnery tasks whenever possible.

(2) Units may use device-based gunnery to train before a major gunnery table. Available resources of time, training area, range facilities, and ammunition will determine the commander's method of training.

c. Resources. To assist the commander in identifying resources needed for table execution, a recommended list for live-fro gunnery is in Figure 13-5 and a recommended list for device-based gunnery is in Figure 13-6 page 13-12.

(1) Live-fire gunnery requires a multilaned range facility, such as a multipurpose range complex (MPRC), that allows at least two vehicles to maneuver as a team. Local range SOPs will dictate support requirements.

(2) Device-based gunnery requires the use of MILES. A scout team is easy to equip with MILES; however, inattention to detail and failure to follow boresight and check-out procedures seriously degrades training. Including MILES in a precombat evaluation helps identify and correct shortcomings. Whenever MILES is used, the master gunner makes sure the mounting and check-out procedures are in accordance with TM 9-1265-375-10.

(3) Both device-based and live-fire gunnery tables require evaluator support. Evaluators (selected from troop level) are identified, trained, and scheduled before conducting the table. A scoring packet containing performance checklists, scenarios, operation orders, and sequence of events list are given to each evaluator. Internal evaluation is acceptable; however, external evaluation is the preferred method.

Multipurpose range complex or suitable facility allowing two vehicles to maneuver as a team.

Class V consisting of, but not limited to—
- 25-mm AP/TP-T
- 7.62-mm 4:1 ball/tracer
- Artillery simulators
- Smoke pots
- Red smoke grenades
- White smoke grenades
- Green smoke grenades
- Red star clusters
- White or green star clusters

Evaluators and support packages consisting of—
- Performance checklists
- Sequence of events
- OPORD
- Scenario
- Dual net radio capability
- Night vision devices

Wheeled/tracked vehicles for evaluators and support packages.

Medical support as required by local SOP.

Any items required by the supporting range facility SOP.

References:
- FM 17-98
- ARTEP 17-57-10-MTP

Figure 13-5. Recommended resource list for live-fire gunnery.

M2/M3 MILES equipment for each vehicle consisting of—

- TM 9-1265-375-10
- 25-mm/coax machine gun laser transmitters
- TOW laser transmitter
- Belt #7 and belt #8 detector assemblies
- Man-worn helmet and torso harness detector assemblies
- Combat vehicle kill indicator
- Control console
- Battery box assembly
- TOW simulator
- FLASHWESS

Target-holding mechanisms with MILES target interface devices, OPFOR with MILES, or vehicles modified to represent OPFOR.

MILES controller guns.

Class V consisting of, but not limited to—

- 5.56-mm blank
- 7.62-mm blank
- Hoffman devices
- ATWESS cartridges
- Artillery simulators
- Smoke pots
- Red smoke grenades
- White smoke grenades
- Green smoke grenades
- Red star clusters
- White or green star clusters

Training area 1 kilometer by 2 kilometers or larger. Evaluators and support package as follows:

- Performance checklists
- Scenario
- Sequence of events
- OPORD
- Night vision devices
- Dual radio net capability

Figure 13-6. Recommended resource list for device-based gunnery.

d. After-Action Review. An after-action review for the entire team is conducted on completion of the table. During the AAR, the evaluator and members of the team discuss the team's strengths and weaknesses and how to improve. Videotaped tables provide positive and negative visual feedback to the team and should be used whenever possible.

Section III

BRADLEY TABLE X, SCOUT TEAM QUALIFICATION

Scout team qualification evaluates the scout team's tactical and gunnery proficiency in a realistic tactical and live-fire scenario (Figures 13-7 and 13-8, page 13-14).

13-11. PREREQUISITES

The scout team must meet the following conditions before firing the scout team qualification table:

a. Each scout team must have received a passing score on the scout team training table (paragraph 13-2) within three months before firing the scout team qualification table.

b. Each vehicle crew member must have passed the Bradley gunnery skills test (in accordance with Appendix A, paragraph A-l).

TASK	CONDITION/TARGET/ SITUATION	TARGET HIT	TACTICAL TASKS
1. Scout team conducts a route reconnaissance.	Scout team conducts reconnaissance of a route.		Perform a passage of lines. Reconnoiter a route specified in OPORD. Report all obstacles. Report trafficability. Complete mission within 1 hour.
2. Conduct a zone reconnaissance.	On order, scout team conducts a zone reconnaissance.		Conduct a zone reconnaissance. Coordinate with adjacent unit. Control a technique of movement.
3. Scout team detects a security outpost.	Scout team detects one BMP, 800 to 1,000 meters.		Execute actions on contact. Send a spot report. Call for fire.
4. Scout team detects elements of a combat outpost.	Scout team detects two BMPs, 800 to 1,000 meters.		Execute actions on contact. Send a spot report. Call for fire.
5. Scout team is engaged by a security outpost.	Scout team engages two BMPs, 800 to 1,000 meters and two infantry squads, 400 to 600 meters.	0 1 2 3 4	Execute actions on contact. Send a spot report. Call for fire. Select firing positions. Control scout team fires. Targets killed within 35 seconds.
6. Scout team detects a combat outpost.	Scout team detects three BTRs, one T-64, 1,800 to 2,200 meters.		Execute actions on contact. Send a spot report. Call for fire.

Figure 13-7. Example scout team qualification (day).

TASK	CONDITION/TARGET/ SITUATION	TARGET HIT	TACTICAL TASKS
7. Scout team is engaged by elements of a combat outpost.	Scout team engages two BMPs, 600 to 1,000 meters and two infantry squads, 400 to 600 meters.	0 1 2 3 4	Execute actions on contact. Send a spot report. Call for fire. Select firing positions. Control scout team fires. Targets killed within 30 seconds.
8. Scout team establishes a screen Engages division reconnaissance patrol elements.	On order, team establishes a screen. Team engages two BMPs, 800 to 1,200 meters and two infantry squads, 400 to 600 meters.	0 1 2 3 4	Execute actions on contact. Send a spot report. Call for fire. Select firing positions. Control scout team fires. Targets killed within 35 seconds.

Figure 13-7. Example scout team qualification (day) (continued).

TASK	CONDITION/TARGET/ SITUATION	TARGET HIT	TACTICAL TASKS
1. Scout team engages elements of a regimental reconnaissance patrol.	Scout team engages three BMPs, 800 to 1,000 meters and one infantry squad, 400 to 600 meters.	0 1 2 3 4	Execute actions on contact. Send a spot report. Call for fire. Select firing positions. Control scout team fires. Targets killed within 35 seconds.
2. Scout team engages elements of a motorized rifle company.	Scout team engages three BMPs, 800 to 1,000 meters and one infantry squad, 400 to 600 meters.	0 1 2 3 4	Execute actions on contact. Send a spot report. Call for fire. Select firing positions. Control scout team fires. Targets killed within 35 seconds.

Figure 13-8. Example scout team qualification (night).

13-12. REQUIREMENTS

Each scout team must qualify on the scout team qualification table. As a minimum, the team must be rated GO on 70 percent of the tactical tasks and achieve target kills on 70 percent of the gunnery tasks.

13-13. TASK

The scout team conducts a reconnaissance and or security mission and acquires, reports, and employs accurate direct and indirect fires to engage targets in a tactical array.

13-14. CONDITIONS

The scout team uses reconnaissance and engagement techniques against threat targets. Moving and stationary targets appear individually and simultaneously. At least one NBC engagement and one auxiliary sight engagement must be planned in the table.

13-15. STANDARDS

Gunnery points are awarded in accordance with Table 13-1. Crews are critiqued on engagement techniques. Tactical standards are in accordance with ARTEP 17-57-10-MTP.

13-16. CONDUCT OF THE RANGE

Scout team qualification tasks should be similar in content to the scout team training table. Scout team qualification is a full-caliber gunnery table for a multilaned range facility. When range facilities permit free maneuvering the tactical tasks and the gunnery tasks should be conducted at the same time. When free maneuvering cannot be performed on a range facility, the tactical tasks of scout team qualification can be conducted on a separate l-kilometer by 2-kilometer training area. Practice runs are not permitted on scout team qualification. Day firing should precede night firing whenever possible.

a. Local range SOPs dictate the conduct of the range. Scenarios for firing should be developed and approved well in advance of the conduct of team qualification. At least three 25-mm targets per vehicle per table should be presented, but in no case will the number of targets exceed the number of engagements resourced by DA Pam 350-38. Figures 13-5 and 13-6 contain recommended resources for qualification.

b. The tactical tasks of scout team qualification require a free-maneuver range facility or a separate l-kilometer by 2-kilometer training area. OPFOR or target lift mechanisms can be used in the training area to reinforce acquisition, reporting and call-for-fire procedures.

c. The gunnery tasks of a scout team qualification require a multilaned facility that allows two vehicles to maneuver as a team. Range support packages are dictated by local range SOPs.

d. Evaluator support is necessary for the tactical and gunnery tasks of scout team qualification. Commanders identify, train, and schedule evaluators (troop level) before the conduct of the table. Evaluators are given a scoring packet containing performance checklist scenarios, operation orders, and a sequence of events. Internal evaluation is acceptable; however, external evaluation is the preferred method.

CHAPTER 14

BRADLEY STINGER FIGHTING VEHICLE AIR DEFENSE GUNNERY TABLES

Air defense aerial gunnery tasks are linked directly to the squad doctrine and operations in FM 44-43, ARTEP 44-177-14-MTP (supplemented by ARTEP 44-117-11-MTP) and the combat drills in ARTEP 44-177-14-DRILL (supplemented by ARTEP 44-117-1 I-DRILL). Each task has been selected and developed to support the commander based on the unit's METL. BSFV aerial gunnery tasks/live-fire tasks are integrated and refined to train a BSFV squad. BSFV squads are evaluated on their collective ability to shoot, move, communicate, and sustain. BSFV AD gunnery training consists of—

- *Bradley Table IXA. BSFV Squad Aerial Practice.*
- *Bradley Table XA. BSFV Squad Aerial Qualification.*

Section I
BSFV SQUAD AERIAL GUNNERY

Gunnery events progress from single crew gunnery (Bradley Tables I through VIII) to single crew and squad aerial gunnery (Bradley Tables IXA and XA). ARTEP 44-177-14-DRILL (supplemented with ARTEP 44-117-11-DRILL) and this chapter describe the specific times that each element of the BSFV squad executes tasks. The BSFV squad consists of the vehicle crew (BSFV commander/squad leader, gunner, driver) and the Stinger team (Stinger chief and Stinger gunner). This training is a live-fire and fire control distribution event.

14-1. TASKS

One engagement must be executed in NBC conditions. One task must be a multiple engagement. Emphasis should focus on passing of targets from the BSFV commander to the Stinger chief, command and control, early warning and supporting fire from the BSFV for the Stinger crew. Other critical tasks that should be practiced include those tasks that exercise BSFV crew coordination. BSFV commander's threat assessment and engagement

decisions, such as how best to handle multiple aerial engagements, are also critical and must be practiced. BSFV commanders must practice target threat level in accordance with Chapter 2. Commanders must determine the threat level of the targets from the most dangerous to the least dangerous.

14-2. CONDITIONS

The crew uses proper engagement techniques against stationary and moving, area and point targets. The crew engages from a stationary and a moving firing vehicle during normal and NBC environments (MOPP4), using primary sights. Scenarios that include equipment malfunctions should also be trained. BSFVs will engage aerial and ground targets using the 25-mm, coax, and Stinger missiles. Conditions should replicate what is expected on the battlefield. BSFV events consist of 10 tasks each-five offensive and five defensive. Bradley Table IXA, BSFV Squad Aerial Practice, has 13 engagements (Table 14-1, page 14-7); Bradley Table XA, BSFV Squad Aerial Qualification, has 14 engagements (Table 14-2, page 14-10). Offensive tasks include single engagements of UAVs, rotary-wing and fixed-wing aircraft, ground targets, and one multiple engagement. Defensive tasks include two multiple engagements. Tactical maneuver scenarios and retrograde operations are practiced in a CALFEX or FTX setting. Treks should be woven together so they create an exercise scenario that portrays a combat situation.

14-3. STANDARDS

Units will fire a minimum of 10 engagements per BSFV squad (at least four Stinger and four 25-mm engagements). These engagements maybe configured in as many tasks as the commander chooses, but they should include offensive and defensive tasks. The commander may also include multiple engagements. The commander uses the tasks listed in the events to tailor the tasks and engagements for his unit. This tailoring of tasks and engagements will take into account the range limitations, time constraints, and unit gunnery weaknesses.

14-4. SCORING PROCEDURES

Scores will be assessed as a total BSFV squad score and divided by the number of engagements when there are multiple or simultaneous Stinger missile and 25-mm engagements within a single task (that is, all engagements are scored separately). If there are two engagements, the scores are added and the sum is divided by two; the result is the score for the BSFV squad on that particular task. The key to a high combined score is overall fire control and distribution by the BSFV commander.

a. Squad Ratings. Squad ratings will use a point system. A score of 100 points is given for a Stinger hit, 0 points for a miss. A score of 100 points is given for a 25-mm or coax kill, 0 points for a miss. The Bradley crew evaluator uses the BFV exposure timing matrixes (Chapter 9, Tables 9-3 through 9-6) to score that task. The Stinger evaluator uses the appropriate ARTEP drills. BSFV squad ratings are—

- **Distinguished** - Combined score of at least 900 points on the exercise and 7 of 10 tasks must have at least 50 points.
- **Superior-** Combined score of 800 to 899 points on the exercise and 7 of 10 tasks must have at least 50 points.
- **Qualified** - Combined score of 700 to 799 points on the exercise and 7 of 10 tasks must have at least 50 points.
- **Unqualified** - Combined score of 699 points or less on the exercise or 4 of 10 tasks have less than 50 points.

b. Scorn Sheet. Unit score sheets must include the date, scorer's signature, vehicle number, BSFV commander's name, gunner's name, BSFV squad aerial practice, points, score, overall rating (circle one): distinguished/superior/qualified/unqualified.

c. Timing.

(1) Time to kill standard for the BSFV is in Chapter 9, BFV exposure timing matrixes Tables 9-3 through 9-6.

(2) Time to kill standard for a Stinger team (dismounted) is in ARTEP 44-177-11 DRILL.

(3) Timing starts when one of the following occurs:

- For an offensive engagement—
  - — All targets are fullly exposed.
  - — The first round is fired from a Bradley weapon system.
  - — The ramp hits the ground (for a mounted Stinger team).
- For a defensive engagement—
  - — All targets are fully exposed and the BSFV is stopped in the hull-defilade position.
  - — The first round is fired from a Bradley weapon system.
  - — "Dynamite Dynamite" alert is given to dismounted Stinger team.

(4) Timing stops when one of the following occurs:

- For an offensive engagement—
  - — All targets have been destroyed.
  - — Target exposure time has expired.

- For a defensive engagement—
  - — All targets have been destroyed.
  - — Target exposure time has expired.

14-5. REFIRES FOR QUALIFICATION

A crew(s) that failed to qualify must refire only the engagements in which the crew failed and only the number of engagements needed to obtain a qualified rating. The highest rating that a refiring crew can obtain is qualified (700 points rating).

14-6. ALIBIS

Battalion and squadron commanders are the deciding authority on alibis. All alibi engagements will be retired. Alibis are only given for the following conditions:

a. Target failures or malfunctions.

b. Equipment failures that are not the result of crew error.

c. Unsafe conditions not related to the firing vehicle or crew.

14-7. TARGETS

Targets should represent the actual threat arrays a squad could encounter. Each BSFV squad will engage a realistic array of aerial targets consisting of single and multiple aerial threats. Ground targets should be included to practice ground self-defense during aerial engagements. Friendly aircraft and vehicles may be added to emphasize the importance of fratricide training.

a. Aerial target speeds should be in accordance with the assigned mission. Typical speed for a Hind-type helicopter in an attack profile is 100 to 150 knots. For UAV targets, the speed is 80 to 100 knots (for propeller type) or .7 to .8 Mach for high-performance UAVs. The SU-25 represents a fixed-wing aircraft ("leaker") presented at speeds of 450 to 480 knots when in an attack mode. For target exposure times, evaluators use Chapter 12, Table 12-1.

b. Example targets are specified in the event. However, other targets that provide realistic portrayals may be used. Pop-up targets must be presented off the ground. Targets for BSFV 25-mm should be l/5-scale targets equipped for MILES and smoke. Radio-controlled miniature aerial targets (RCMATs) or Streaker-towed sleeve targets may be used to replicate the UAV threat.

c. Targets for Stinger may consist of Streaker-towed sleeve targets, RCMATS, ballistic aerial targets (BATs), or l/5-scale targets equipped for smoke and MILES. If Stinger live firing can be accommodated on the range along with the BSFV, it should be done.

d. Targets should use a signature device (such as a Hoffman, eight each) to simulate enemy fires. Targets should also be equipped with MILES and or a thermal signature so Stinger teams may acquire them. Devices, such as

Stinger training launch simulator (STLS) or ATWESS, should be used whenever possible to provide a credible Stinger signature.

e. For offensive and retrograde engagements, total target exposure time is established using the applicable timing matrix (Chapter 12, Table 12-1). The master gunner uses the individual target conditions and range to determine the specific target's exposure time.

f. For defensive engagements, the standard total target exposure time for all targets is 50 seconds. However, the BSFV cannot remain exposed beyond the BSFV exposure timing matrixes in accordance with Chapter 9, Tables 9-3 through 9-6.

g. All target ranges used must be constructed in accordance with TC 25-8. The type of targets required for aerial gunnery practice and qualification are the RCMAT 1/9, l/5-scale fixed-wing or rotary-wing IRTT, MQM107, and BATs with scoring devices except for missile firing. (For more information, see DA PAM 350-38.)

h. Allowable variations:

(1) Battalion commanders may add friendly targets to Bradley Table IXA, BSFV Squad Aerial Practice.

(2) Battalion commanders may modify the type of task to fire on Bradley Table IXA, BSFV Squad Aerial Practice; and Bradley Table XA, BSFV Squad Aerial Qualification.

14-8. CONDUCT OF THE RANGE

Units must fire 10 engagements per crew to qualify. At least four engagements must be Stinger engagements and four must be 25-mm aerial engagements. Commanders can configure the engagements in any amount of tasks as long as there is one NBC and one multiple engagement. All target ranges must be constructed in accordance with TC 25-8.

a. All defensive and stationary engagements will begin with the firing vehicle in a turret-defilade position and then move to a hull-defilade position to engage the target(s). On a range where this cannot be done or defilade positions do not exist, units will train using simulated positions. BSFVs must move at least one vehicle length in any of the positions.

b. Offensive engagements maybe fired from a short halt.

c. All defensive and stationary Stinger engagements will begin with the BSFV in a turret-defilade position.

d. Stinger firing can be simulated using any target or Stinger simulator that will provide realistic training. Stinger members must be evaluated on target acquisition, tracking, engagement, and identification. Realistic feedback is necessary to determine training errors and engagement outcome. Tracking head trainers (THTs) or MILES can be used to simulate Stinger rounds.

e. AARs are conducted at the end of offensive tasks and defensive tasks. There must be sufficient evaluators to thoroughly observe and evalluate the squad's performance. The should be two evaluators per squad. One evaluates the Stinger member; the other evaluates the vehicle crew. The evaluators observe overall BSFV commander tasks, dismounted task execution, fire control, fire distribution, and target classification The squad evaluators should be of equal or of greater rank than the crew members and have BSFV squad or Stinger member experience, as appropriate. The evaluators provide input to the senior evaluator for the AAR. Evaluators follow the squad in a suitable vehicle.

f. BT IXA is a building block used to train for the qualification table (BT XA). The table can be modified by the firing unit to train specific unit weaknesses.

Section II

BRADLEY TABLE IXA, BSFV SQUAD AERIAL PRACTICE

Bradley Table IXA, BSFV Squad Aerial Practice, is a live-fire aerial gunnery event. This table may be conducted using MILES/PGS and Stinger simulation devices. This event is the "walk" phase of BSFV squad collective training. The practice should be executed as situational training exercises (STX) of short duration.

BT IXA is an aerial, single-crew practice exercise. This table evaluates the crew's ability to properly detect, locate, identify, acquire, and engage targets during various firing conditions. This is not a tactical event. However, normal combat-oriented procedures (such as reporting) should be used. Commanders may superimpose a tactical scenario on the gunnery event. Further, a commander may, conduct section gunnery with a command and control element. The primary focus remains aerial marksmanship.

14-9. PREREQUISITES

All BSFV crewman must have qualified on the BGST (in the position he is occupying) within the previous three months (Appendix A). Reserve Component BSFV crewmen must have qualified on the BGST within the previous four months. All BSFV crews must have qualified by position on Bradley Table VIII within the previous six months. Also, the Stinger members (14Rs) must be qualified on rnoving target simulator (MTS) or improved moving target simulator (IMTS).

14-10. AMMUNITION REQUIREMENTS

Ammunition allocations per aerial target are 25 rounds (25-mm), or one Stinger round per rotary-wing aircraft, fixed-wing aircraft, or UAV, as applicable; TPDS-T is listed, but any 25-mm ammunition may be used.; 50 rounds (7.62-mm) are used to engage the ground target. Ammunition requirements for BT IXA, BSFV Squad Aerial Practice, are as follows:

Ammunition Type	Quantity Rounds
25-mm TPDS-T	125
7.62-mm	50
Stinger (Simulator)	7
ATWESS/STLS	7

TASKS	CONDITIONS TARGET/SITUATION	AMMO	STANDARDS
1. Engage multiple BSFV targets (offensive air defense) (moving).	Pop-up helicopter .5 to 1.5 km. Moving helicopter .5 to 1.5 km. Primary sight, Bradley gunner's position.	50 rds TPDS-T	Hit each helicopter with a minimum of 5 rounds each, use the threat-base matrixes in Chapter 9.
2. Engage BSFV coax target and a Stinger target (offensive air defense) (stationary).	One RPG-16 team 400 to 600 meters. Primary site, Bradley gunner's position. Incoming UAV 2 to 4 km. Stinger gunner has a misfire; team chief completes engagement.	50 rds 7.62-mm 1 THT	Hit one target and suppress using the Z pattern (RPG-16). Use the threat-base matrixes in Chapter 9. Team uses correct Stinger engagement techniques.
3. Engage a single Stinger target (offensive air defense) (stationary).	Stinger team deploys from BSFV. Moving helicopter 1 to 2 km. Stinger gunner's engagement.	1 THT	Stinger team uses correct Stinger engagement techniques.
4. Engage a single Stinger target (offensive air defense) (stationary).	Stinger team deploys from BSFV. Incoming high-performance aircraft, 2 to 4 km. Stinger gunner's engagement.	1 THT	Stinger team uses correct Stinger engagement techniques.

Table 14-1. Bradley Table IXA, BSFV Squad Aerial Practice.

TASKS	CONDITIONS TARGET/SITUATION	AMMO	STANDARDS
5. Engage a BSFV target (offensive air defense) (moving).	Crossing UAV .5 to 1.5 km. Primary sight, Bradley gunner's position.	25 rds TPDS-T	Hit UAV with a minimum of 5 rounds. Use threat-base matrixes in Chapter 9.
6. Engage a BSFV target (defensive air defense) (stationary).	Moving from a defilade to hull-defilade position, BSFV engages pop-up helicopter .5 to 1.5 km. Primary sight, Bradley gunner's position.	25 rds TPDS-T	Hit helicopter with a minimum of 5 rounds. Use threat-base matrixes in Chapter 9.
7. Engage a Stinger target (defensive air defense) (stationary).	Stinger team deploys. Pop-up helicopter 1 to 3 km. Stinger gunner's engagement.	1 THT	Stinger team uses correct Stinger engagement techniques.
8. Engage a Stinger target (defensive air defense) (stationary).	Stinger team deploys moving helicopter 2 to 3 km. Stinger gunner's engagement.	1 THT	Stinger team uses correct Stinger engagement techniques.
9. Engage a BSFV target (defensive air defense) (stationary).	Moving from a defilade to hull-defilade position, BSFV engages incoming UAV .5 to 1.5 km. Primary sight Bradley gunner's position.	25 rds TPDS-T	Hit UAV with a minimum of 5 rounds. Use threat-base matrixes in Chapter 9.
10. Engage multiple Stinger targets (defensive air defense) (stationary).	Stinger team deploys incoming UAV 1 to 3 km. Crossing UAV 2 to 4 km. Stinger gunner and team chief engagements.	2 THTs	Stinger team uses correct Stinger engagement techniques.

Table 14-1. Bradley Table IXA, BSFV Squad Aerial Practice (continued).

Section III

BRADLEY TABLE XA, BSFV SQUAD AERIAL QUALIFICATION

Bradley Table XA, BSFV Squad Aerial Qualification, is alive-fire aerial gunnery event. This table may be conducted using a combination of live 25-mm and 7.62-mm with Stinger simulation devices. BT XA is the "run" phase of BSFV squad collective training. The table should be executed as situational training exercises (STX) of short duration.

BT XA is a marksmanship, single-squad event. This table evaluates the squad's ability to detect, identify, acquire, and engage targets during various firing conditions. This is not a tactical event. However, normal combat-oriented procedures, such as reporting should be used. Commanders may superimpose a tactical scenario in the gunnery event. Further, a commander may conduct section gunnery with a command and control element. The primary focus remains aerial marksmanship.

14-11. PREREQUISITES

All BSFV crewmen must have qualified on the BGST (in the position he is occupying) within the previous three months (Appendix A) and have qualified on BT IXA. Reserve Component BSFV crewmen must have qualified on the BGST within the previous four months. All BSFV crews must have qualified on crew qualification (Chapter 12, BT VIII) within the previous six months. Also, the Stinger members (14Rs) must be MTS/IMTS qualified.

14-12. AMMUNITION REQUIREMENTS

Amminition allocations per aerial target 25 rounds of 25-mm, and one Stinger round per rotary-wing aircraft, fixed-wing aircraft, or UAV, as applicable. TPDS-T is listed, but any 25-mm ammunition may be used. 50 rounds (7.62-mm) are used to engage the ground target. Ammunition requirements for Bradley Table XA, BSFV Squad Aerial Qualification, are as follows:

Ammunition Type	Quantity Rounds
25-mm TPDS-T	125
7.62-mm	50
Stinger (Simulator)	8
ATWESS	8

TASKS	CONDITIONS TARGET/SITUATION	AMMO	STANDARDS
1. Engage a Stinger target (offensive air defense) (stationary).	Stinger team deploys from BSFV. Incoming UAV 2 to 4 km. Stinger gunner's engagement.	1 THT	Stinger team uses correct Stinger engagement techniques.
2. Engage a BSFV aerial target (offensive air defense) (moving).	Moving pop-up helicopter .5 to 1.5 km. Primary sight, Bradley gunner's position.	25 rds TPDS-T	Hit helicopter with a minimum of 5 rounds. Use threat-base matrixes in Chapter 9.
3. Engage a Stinger target (offensive air defense) (stationary).	Stinger team deploys from BSFV. Crossing high-performance aircraft 2 to 5 km. Stinger gunner's engagement.	1 THT	Stinger team uses correct Stinger engagement techniques.
4. Engage multiple BSFV targets (offensive air defense) (moving).	Incoming or crossing UAV .5 to 1.5 km. Coax engages RPG-16 team 400 to 900 meters. Primary sight, Bradley gunner's position.	25 rds TPDS-T 50 rds 7.62-mm	Hit UAV with a minimum of 5 rounds. Hit one target and suppress using the Z pattern (RPG-16). Use threat-base matrixes in Chapter 9.
5. Engage BSFV aerial target and a Stinger target (offensive air defense) (stationary).	Incoming moving helicopter .5 to 1.5 km. Primary sight, Bradley gunner's position. Stinger team deploys from BSFV; moving helicopter 2 to 5 km, Stinger gunner's engagement.	25 rds TPDS-T 1 THT	Hit helicopter with a minimum of 5 rounds. Use threat-base matrixes in Chapter 9. Stinger team uses correct Stinger engagement techniques.
6. Engage a single Stinger target (defensive air defense) (stationary).	Stinger team deploys. Incoming helicopter 2 to 4 km. Stinger gunner has a misfire; team chief completes the engagement.	1 THT	Stinger team uses correct engagement techniques.

Table 14-2. Bradley Table XA, BSFV Squad Aerial Qualification.

TASKS	CONDITIONS TARGET/SITUATION	AMMO	STANDARDS
7. Engage BSFV aerial target (defensive air defense) (stationary).	Moving from defilade to hull-defilade position, BSFV engages incoming UAV .5 to 1.5 km. Primary sight, Bradley gunner's position.	25 rds TPDS-T	Hit UAV with a minimum of 5 rounds. Use threat-base matrixes in Chapter 9.
8. Engage Stinger target (defensive air defense) (stationary).	Stinger team deploys. Incoming high-performance UAV 2 to 4 km. Stinger gunner's engagement.	1 THT	Stinger team uses correct Stinger engagement techniques.
9. Engage multiple Stinger targets (defensive air defense) (stationary).	Stinger team deploys. Crossing UAV 2 to 4 km; Stinger gunner's engagement. Crossing UAV 3 to 5 km; team chief's engagement.	2 THTs	Stinger team uses correct Stinger engagement techniques.
10. Engage a BSFV aerial target and a Stinger target (defensive air defense) (stationary).	BSFV engages pop-up helicopter .5 to 1.5 km. Primary sight, Bradley gunner's position. Stinger team deploys; incoming high-performance aircraft, 3 to 5 km. Stinger gunner's engagement.	25 rds TPDS-T 1 THT	Hit helicopter with a minimum 5 rounds. Use threat-base matrixes in Chapter 9. Stinger team uses correct Stinger engagement techniques.

Table 14-2. Bradley Table XA, BSFV Squad Aerial Qualification (continued).

CHAPTER 15

BRADLEY INFANTRY PLATOON GUNNERY TABLES

In previous chapters, individual, tactical and gunnery skills training and evaluation for crew, squad, section, and platoon were discussed. This training develops the necessary skills needed for platoon gunnery Platoon gunnery trains and evaluates vehicle and dismounted infantry integration and fire control and distribution. Platoons perform tactical collective tasks with integrated live-fire using all weapons organic to the platoon, during day, night, and limited visibility conditions. Platoon gunnery consists of Bradley Table Xl, Bradley Platoon Practice and Bradley Table XII, Qualification.

Platoon collective tasks are directly linked to the seven platoon operations in the MTP and combat drills in FM 7-7J and ARTEP 7- 7J-DRILL. Tactical operations are selected and developed by the unit commander based on his METL and contingency area of operation. lnfantry squad and vehicle crew gunnery tasks are integrated in support of the tactical scenario. Overall performance assessments are determined by using the MTP training and evaluation outlines (T&EOs). Evacuation procedures and required personnel are in Chapter 9 and the MTP. All platoon exercises are conducted according to the procedures as outlined in this chapter and Chapter 9, Section II. Guidelines and procedures in this chapter can be used in establishing Bradley Table III, Bradley Squad/Section Exercise; and Bradley Table IV, Bradley Platoon Proficiency Course, for device-based gunnery exercises.

15-1. EXERCISE DEVELOPMENT

The MTP and the platoon gunnery exercises in this chapter establish an Army standard for training and evaluation, while allowing unit commands to tailor tactical and gunnery tasks based on their particular missions and training emphasis. This chapter identifies the required gunnery target presentations to support platoon collective tasks. Units determine specific threat targets types and engagement distances or range bands. Platoon gunnery evaluation procedures and standards are in Chapter 9 and MTP. The following guidelines apply to both platoon practice and qualification.

a. General Requirements.

(1) Bradley platoon practice is a building block for Bradley platoon qualfication. Both exercises are fully resourced with ammunition; however, other training resource constraints may prohibit firing platoon practice as prescribed. Platoon qualification should not be the first time a platoon collectively conducts a live-fire. Platoon qualification will be conducted in accordance with the guidelines and standards in this chapter and Chapter 9.

(2) The battalion commander and his S3 determine which MTP mission(s) will be conducted based on the unit's METL and specific command guidance.

(3) The S3 identifies the collective tasks to be performed and evaluated based on the operational missions in accordance with the MTP.

(4) The S3 identifies which collective tasks will be conducted live fire.

(5) Platoon gunnery will be conducted in two phases-one during the day and one at night.

(6) The S3 and battalion master gunner develop scenarios that require the platoon to conduct tactical missions and their respective collective tasks. Live-fire gunnery presentations are incorporated into the identified collective tasks. The number and type of targets identified in this chapter are the minimum live-fire requirements and must be accomplished during qualification. However, units may add additional targets based on availability of resources.

(7) The S3, S2, and battalion master gunner select vehicle and troop arrays that represent threat forces of contingency areas or required training emphasis. They also identifiy specific threat target types, engagement distances or range bands, and specify most dangerous verses least dangerous targets based on threat analysis and or training emphasis. The result is a threat template for platoon gunnery exercises.

(8) Different target types are combined to create target presentations. A target presentation should be designed to force fire control and distribution.

(9) The S3 develops an operation order that supports the execution of the missions.

(10) The battalion master gunner prepares evaluation packets for each platoon containing T&EOs from the MTP and gunnery summery sheets. The packet is arranged in collective task sequence.

(11) The battalion master gunner coordinates all necessary resources and personnel to support the gunnery exercises (see Chapter 9).

(12) The platoon uses all organic equipment and weapon systems.

(13) TOW, Javelin, and Dragon firing may be replicated with MILES or PGS using LTIDs. AT4 firing may be replicated with MILES or 9-mm subcaliber device.

b. Live-Fire Requirements.

(1) The live-fire collective tasks are conducted on a range complex that provides the best available target and maneuver area.

(2) Platoon practice and platoon qualification maybe conducted on the same range. However, target presentation will not be in the same sequence.

(3) All targets in a target presentation must be presented simultaneously. Simultaneous target exposure occurs when all targets are presented at the same time. This requires the firing element to use proper fire control and distribution.

(4) All 31A1 IRETS targets are individually addressed by the computer for scoring. IRETS will not be linked together to create multiple kills.

(5) No more than two targets are presented at one time per firing vehicle.

(6) No more than two dismount squads are presented at one time per firing squad.

(7) A minimum of two NBC engagements are conducted by the dismount element and two NBC engagements by the vehicle elements. Combined dismount and vehicle engagements are credited for this requirement. One NBC engagement must be conducted during the day phase, and one NBC engagement during the night phase. Commanders may increase the number of NBC tasks. The entire platoon is in MOPP4 for all NBC tasks.

(8) The use of indirect-fire support is incorporated in the scenario whether simulated or live-fire. If mortars are used for illumination, this can credit the use of fire support. Indirect fires may not be used to engage any of the required targets. Indirect-fire targets are additional target presentations that are determined based on threat template. This task is evaluated according to the MTP.

c. Scenario Enhancement.

(1) Pyrotechnics and simulators (weapons effect) should be used for effect and to cue the platoon to certain events.

(2) CS and CSS should be included in the scenario.

(3) Vehicles and soldiers should be equipped with specific MILES components that do not interfere with live-fire. This allows the evaluators imposing penalties to rapidly enforce vehicle and personnel penalties.

(4) All individual soldiers should receive MILES casualty cards. These cards will replicate casualty status during live-fire tasks when penalties are imposed. Only vehicle commanders and drivers should receive return-to-duty cards for safe movement of vehicles.

(5) Friendly targets should be incorporated into the scenario.

(6) Unit SOPs are given to the evaluators for implementation into the evaluation.

(7) The firing platoon's company commander should follow the platoon for command and control purposes. The use of simulated radio traffic

enhances the effects of the tactical scenario. Company commanders receive all platoon reports and issue instructions and FRAGOs based on the established scenario.

(8) Target presentations occur based on the platoon tactical employment. The platoon should react rather than anticipate target presentations.

d. Targetry and Ammunition.

(1) *Targetry.* All targets are constructed in accordance with TC 25-8. (See Chapter 12 for 25-mm, coax area and point targetry.)

(a) BFV target engagements. (See Chapter 12.)

(b) Dismount weapons.

- ATGM and bunker target engagements:
- Vehicle targets are depicted in the same manner as described for BFVs. RPG or ATGM teams are no more than three E-type silhouettes placed linear, in depth, or in a wedge formation, no more than 5 meters apart or 10 meters in depth.
- Dismount squad and trench line target engagements:

Targets in realistic arrays are no more than seven and no less than four E-type silhouettes placed on a linear or in a wedge formation; targets are not more than 5-meters apart and not extend beyond 30 meters in width or 20 meters in depth. (Example: 14 IRETS equal 2 separate dismount squad targets.)

(c) Minimum required targets:

AP - Point — 24
HE-Area — 2
HE - Point — 18
Coax - Area — 6
Coax - Point — 4
Dismount —112
TOW — 1

Note: Three HE point targets can be substituted for an HE area target if range facilities do not support an HE area target. The rule of no more than two targets per firing vehicle per engagement still applies.

(2) *Ammunition.* Ammunition is allocated according to DA Pam 350-38. Platoon practice and qualification are fully resourced for BFVs. Dismounted weapons are resourced using squad and platoon LFX allocations. If resources are available and extra targets are added, platoons will only receive additional ammunition based on allocated rounds per additional target type. Platoons will receive and internally distribute ammunition for the entire exercise (day and night phases). (See Chapter 12 for ammunition allocation per BFV targets—25-mm, TOW, and coax.

ALLOCATED AMMUNITION

AP	— 192 rds
HE	— 194 rds
7.62	— 800 rds
Dismount	— Based on STRAC
TOW	— 1 missile (or PGS/MILES)

e. BFV's Target Exposure time. Each target will have a different target exposure time. To determine this exposure time, the master gunner needs to know the type of engagement, target type, target conditions, and target distance. Threat-based target exposure time is determined using procedures in crew gunnery Chapter 12.

f. Dismount's Target Exposure Time. Dismount troop targets are exposed four times, for 5 seconds each with 10 seconds between intervals.

g. Allowable Variations.

(1) Battalion commanders may add friendly targets to platoon qualification.

(2) Smoke and other obscurants may be added to enhance the scenario's effects.

15-2. PREREQUISITES

The following prerequisites must be accomplished before conducting any live-fire platoon gunnery exercise.

a. All BFV crewmen (including the platoon leader's backup crewman) must have qualified on the BGST within the previous three months for AC units and four months for RC units.

b. All crews that will live-fire must have qualified on crew qualification within the previous six months. Platoons must maintain platoon integrity; crews from other platoons may not negotiate platoon live-fire gunnery exercises as part of another platoon.

c. All squad members must have qualified on their individual weapons (M16, M203, M249) within the previous six months.

d. All squads must have completed a squad live-fire exercise to ARTEP standards within the previous six months.

e. Platoons must have completed BPPC (BT IV) within 6 months of platoon live-fire exercises.

15-3. BRADLEY TABLE XI, BRADLEY PLATOON PRACTICE

This table prepares the platoon for qualification. This is the first time that BFV and dismounted infantry conduct live-fire at platoon level. The objective is to practice BFV and infantry squad integration and coordination to form a platoon collective effort.

a. The platoon should practice fire control and distribution techniques they will use during qualification.

b. Exercise development, standards, evaluation ammunition, and target considerations are the same for platoon qualification.

c. This table is resourced for full-caliber ammunition, but can be modified for vehicle subcaliber, 7.62-mm coax. Training devices, such as MILES or PGS, may be used if ammunition or range constraints prohibit live-fire execution.

15-4. BRADLEY TABLE XII, BRADLEY PLATOON QUALIFICATION

Platoon qualification is the evaluation of the platoon's ability to execute collective tasks in a tactical live-fire environment. Collective task evaluations measure the platoon's combat proficiency. Mounted and dismounted infantry are integrated and evaluated on their ability to fight as a cohesive BFV platoon. This is the focus of Bradley gunnery.

a. Scenario development guidelines must be adhered to as outlined in paragraph 15-1.

b. Ammunition and target guidelines must be adhered to as outlined in paragraph 15-1.

c. Standards, scoring, and evaluation procedures must be adhered to as outlined in Chapter 9.

d. All prerequisites must be adhered to as outlined in paragraph 15-2.

e. Bradley platoon qualification must be conducted live-fire using full-caliber ammunition.

APPENDIX A

BRADLEY GUNNERY SKILLS TEST ADMINISTRATION GUIDE AND PERFORMANCE CHECKLISTS

The Bradley gunnery skills test (BGST) evaluates the crew member's ability to perform gunnery-related skills. It does not replace tasks in the 11M, 19D, or 14R soldier's manuals.

Section I

BRADLEY GUNNERY SKILLS TEST

The BGST provides the unit with an evaluation tool that determines readiness to train and evaluate crew tasks and to conduct live-free gunnery to meet the prescribed training levels.

A-1. ADMINISTRATION

As a minimum the Bradley gunnery skills test must be administered—

- Two times yearly.
- When crew members have changed positions.
- Before gunnery qualification, unless qualified within the past three months (four months for RC) in current vehicle positions.

a. The BCs and gunners of M2/M3, M2A2/M2A20DS, and M3A2/M3A20DS crews must achieve a GO on all tasks to receive an overall GO.

b. Additionally, all other members of an M3/M3A2/M3A20DS scout crew and the infantry squad leaders and the fire team leaders of an M2/M2A2/M2A20DS platoon should take the test. This assists in cross training of additional crew members.

c. The BGST is administered using tasks conditions and standards, as well as administrative guidelines and performance checklists in Section II.

d. The BGST should also be used as a diagnostic tool to determine the level and effectiveness of cross training throughout the infantry squad.

e. Battalion commanders may add tasks to the BGST for a more comprehensive evaluation but at no time will any tasks be deleted from the BGST. Once basic proficiency has been attained, commanders should include NBC conditions in BGST training.

A-2. EVALUATION

The BGST is evaluated in accordance with the following procedures.

a. **Evaluators.** BGST may be evaluated by either internal or external evaluators; however, external evaluation is recommended. All evaluators must have been BGST qualified within one year of testing. Evaluators must have achieved a GO on the task they are to evaluate within 30 days of testing.

b. **Evaluation Criteria.** The crew member must complete all actions outlined in the performance checklist and within a specified time limit to achieve a GO for the task.

(1) To achieve an overall GO on the BGST, the crew member must receive a GO on all tasks.

(2) At the conclusion of each task, any crew member failing to meet the prescribed standards will be critiqued to include an explanation of mistakes and what to do to correct them. Retesting will be in accordance with the local SOP.

c. **Scoring.** The unit's performance score sheet must include the following:

- Date
- Soldier's name
- Grade
- Unit
- Duty position
- Evaluator's name
- Overall score: GO/NO-Go
- Remarks

Personnel receive either a GO or a NO-GO on each task. NO-GOs are scored for—

- Failing to complete the task.
- Incorrectly performing tasks steps.
- Failing to meet time standards.

d. **Prerequisites.** Preliminary gunnery training should be conducted before administering the Bradley gunnery skills test.

e. **Performance Checklists.** The performance checklists for all stations must be cross-referenced with the latest TMs. In all instances, the TM procedures take precedence for scoring criteria. Additionally, an attempt to further cross-reference with the applicable soldier's manuals should be made to ensure standardization in training and testing.

Section II

ADMINISTRATIVE GUIDE AND PERFORMANCE CHECKLISTS

This section provides the test administration guide and recommended performance checklist format for each station. A sample BGST evaluation work sheet is in Figure A-1.

	GO	NO-GO	RETEST
STATION 1, Clear, remove, disassemble, assemble, and install an M242 25-mm gun			
STATION 2, Load an M242 25-mm gun feeder			
STATION 3, Apply immediate action on an M242 25-mm gun			
STATION 4, Unload and clear an M242 25-mm gun feeder			
STATION 5, Install an M240C coax machine gun			
STATION 6, Load, fire, and apply immediate action on an M240C coax machine gun			
STATION 7, Clear an M240C coax machine gun and unload 7.62-mm ammunition			
STATION 8, Remove an M240C coax machine gun			
STATION 9, Disassemble (field strip) and assemble an M240C coax machine gun			
STATION 10, Boresight turret weapons systems			
STATION 11, Load and unload the 25-mm HE ready box			
STATION 12, Load and unload the 25-mm AP ready box			
STATION 13, Prepare a Bradley Range Card			
STATION 14, Identify Combat Vehicles			

Figure A-1. Sample BGST evaluation work sheet.

A-3. STATION 1, CLEAR REMOVE, DISASSEMBLE, ASSEMBLE, AND INSTALL AN M242 25-MM GUN

a. **Tasks.** Clear, remove, disassemble, assemble, and install an M242 25-mm gun.

b. **Conditions.** Given a Bradley with an installed 25-mm gun.

c. **Standards.** The crew member will—

- Within 10 minutes, clear, remove, and disassemble the 25-mm gun.
- Within 10 minutes, assemble and install the 25-mm gun so that it functions properly.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station, the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion performance checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- TM 9-2350 -252-10-2 or TM 9-2350-284-10-2.
- FM 23-1.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11M, 19D, or 14R sergeant or below.

f. **Pretest Preparation.**

(1) Place trim vane in work-stand position (M2/M3 only).
(2) Remove 25-mm gun and ensure all parts are present.
(3) Replace all unserviceable or missing parts.
(4) Install M242 25-mm automatic gun.

g. **Pretest Conditions for Each Examinee.**

(1) Place gun elevation to zero elevation.
(2) Ensure master and turret power switches are off.
(3) Ensure turret is in manual mode.
(4) Ensure gun guard and gas bag are removed.

(5) If weapon is not properly installed after each test, the weapon must be removed checked and properly installed before another examinee can be tested.

h. **Test Planning Time.**

Administrative:	5 minutes
Test	20 minutes
Total:	25 minutes

i. **Instruction to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO REMOVE AND INSTALL THE M-TWO-FORTY-TWO, TWENTY-FIVE-MILLIMETER GUN. BEFORE THE HELPER WILL ASSIST YOU IN REMOVING THE GUN BARREL, YOU MUST UNLOCK AND BEGIN THE REMOVAL OF THE BARREL. DURING REASSEMBLY THE HELPER WILL ASSIST YOU BY LIFTING THE GUN BARREL, BUT YOU ARE RESPONSIBLE FOR GUIDING AND LOCKING THE BARREL IN PLACE. YOU WILL HAVE TEN MINUTES TO REMOVE AND DISASSEMBLE THE TWENTY-FIVE-MILLIMETER GUN, AND TEN MINUTES TO ASSEMBLE AND INSTALL THE TWENTY-FIVE-MILLIMETER GUN. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE TEN MINUTES TO COMPLETE EACH TEST." Pause, then say "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed each task after the appropriate time, announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examinee is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 1

TASKS: Clear, remove, disassemble, assemble, and install an M242 25-mm gun

PERFORMANCE MEASURES:

1. Cleared removed and disassembled the 25-mm gun.
   a. Removed feeder.

Note: Steps 1 through 10 must be completed in sequence.

(1) Checked to ensure bolt and bolt position indicator were in SEAR.
(2) Ensured manual safety handle was in SAFE.
(3) Raised feeder handle.
(4) Removed power cable.
(5) Lowered feeder handle.
(6) Removed link chutes.
(7) Removed feed chutes.
(8) Pulled out straight drive shaft handle.
(9) Raised feeder handle.
(10) Removed feeder.
(11) Removed feeder from turret to crew area
(12) Removed any ammunition from the gun rotor.
(13) Verified the timing of the feeder.
(14) Placed feeder on a clean flat surface with feeder handle lowered.
(15) Pushed in the straight drive shaft handle on receiver.
(16) Ensured breach, ejection port and bolt surface were cleared of all spent casings or live ammunition.

b. Removed barrel.
(1) Unlocked gun barrel.
(2) Removed gun barrel.

c. Removed bolt and track.
(1) Pulled out the straight drive shaft handle.
(2) Cycled bolt out of SEAR position.
(3) Removed track and bolt assembly.
(4) Inserted the straight drive shaft handle.

d. Removed receiver.
(1) Unlocked 25-mm gun receiver.
(2) Removed receiver from turret to crew area.

e. Disassembled bolt and track assembly.
(1) Removed bolt carrier from track assembly.
(2) Unlocked bolt from forward locking position
(3) Removed firing pin sleeve keeper.

(4) Removed firing pin sleeve and firing pin from bolt and separated the pin and sleeve.
(5) Removed cam pin.
(6) Removed bolt from bolt carrier.

f. Completed performance measures within 10 minutes.

2. Assembled and installed the 25-mm gun.

a. Assembled track and bolt assembly.
(1) Slid bolt into bolt carrier.
(2) Inserted cam pill.
(3) Inserted firing pin and sleeve into bolt.
(4) Inserted firing pin sleeve keeper.
(5) Locked bolt in forward position.
(6) Placed bolt and carrier on track assembly.

b. Installed bolt and track assembly.
(1) Pulled out the straight drive shaft handle.
(2) Inserted bolt and track assembly into receiver.
(3) Locked track latch handle.
(4) Moved bolt to SEAR position.
(5) Pushed in the straight drive shaft handle.

c. Installed receiver.
(1) Pulled antirotation latch handle out.
(2) Installed receiver into trunnion.
(3) Locked receiver in place.

d. Installed barrel.
(1) Installed barrel into barrel support.
(2) Locked into place.

e. Installed feeder.
(1) Verified feeder timing.
(2) Pulled out drive shaft handle.
(3) Ensured 25-mm gun bolt was in SEAR position.
(4) Raised feeder handle.
(5) Positioned finder on receiver.
(6) Lowered feeder handle.
(7) Inserted and locked drive shaft.
(8) Installed feed chutes.

(9) Installed link eject chutes.
(10) Raised feeder handle.
(11) Installed power cable.
(12) Lowered feeder handle.

f. Completed performance measures within 10 minutes.

A-4. STATION 2, LOAD AN M242 25-MM GUN FEEDER

a. **Task.** Load a 25-mm gun feeder.

b. **Conditions.** Given a Bradley with 25-mm ammunition loaded in the AP and HE ready boxes.

c. **Standards.** Within 5 minutes, the crew member will load the 25-mm gun so that it is ready to fire.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station, the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion scoring checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- TM 9-2350-252-10-2 or TM 9-2350-284-10-2.
- FM 23-1.
- Stopwatch.

- Clipboard with pen.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.
- 90 rounds of 25-mm dummy ammunition.

f. **Pretest Preparation.**

(1) Ensure all power is off.
(2) Inspect and load 45 rounds of dummy ammunition in both AP and HE ready boxes.
(3) Clear the 25-mm gun
(4) Inspect for presence and damage of HE and AP feed chutes.
(5) Set travel lock.
(6) Ensure ammunition is in the AP/HE forwarder.
(7) Ensure bolt and bolt position indicator are in SEAR.

g. **Pretest Conditions for Each Examinee.**

(1) Ensure all turret power is off.
(2) Ensure travel lock is set.
(3) Ensure 14-mm loading wrench is in stowage position.
(4) Ensure bolt and bolt position indicator are in SEAR.

h. **Test Planning Time.**

Administration:	5 minutes
Test:	5 minutes
Total:	10 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO LOAD THE TWENTY-FIVE-MILLIMETER GUN FEEDER. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE FIVE MINUTES TO COMPLETE THIS TEST." Pause, then say "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed the task after 5 minutes, announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examinee is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 2

TASK: Load a 25-mm gun feeder.

PERFORMANCE MEASURES:

1. Loaded the 25-mm gun feeder.
   a. Ensured that the bolt and bolt position indicator were in the SEAR position.
   b. Ensured manual safe handle was in safe position.
   c. Pulled out feed select solenoid to HE position.
   d. Forwarded HE ammunition to 25-mm gun feeder.
   e. Loaded the 25-mm gun feeder with two rounds of HE ammunition.
   f. Released tension off HE ammunition.
   g. Pushed feed select solenoid to AP position.
   h. Forwarded AP ammunition to 25-mm gun feeder.
   i. Loaded 25-mm gun feeder with one round of AP ammunition.
   j. Released tension off AP ammunition.
2. Completed performance measures within 5 minutes.

A-5. STATION 3, APPLY IMMEDIATE ACTION ON AN M242 25-MM GUN

a. **Tasks.** Apply immediate action on a 25-mm gun.

b. **Conditions.** Given a Bradley with 25-mm ammunition loaded, basic issue items, and a 25-mm gun that fails to fire.

c. **Standards.** Within 1 minute, the crew member will apply immediate action so that the 25-mm gun will fire.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station, the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion scoring checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist he receives a NO-GO. When a crew member receives a NO-GO he must be critiqued to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOI..

e. **Personnel, Equipment and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- TM 9-2350 -252-10-2 or TM 9-2350-284-10-2.
- FM 23-1.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.
- 90 rounds of 25-mm dummy ammunition.

f. **Pretest Preparation.**

(1) Master power on.
(2) Turret power and turret drive on
(3) Ensure turret tools are present and stowed properly.
(4) Ensure 25-mm feeder is loaded.

Note: Turret power and turret drive will not be turned on until the examinee has entered the turret.

g. **Pretest Conditions for Each Examinee.**

(1) Ensure all power is on (see note above).
(2) Ensure bolt and bolt position indicator are in SEAR position.

h. **Test Planning Time.**

Administrative:	5 minutes
Test:	1 minute
Total:	6 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO PERFORM MISFIRE PROCEDURES

ON THE TWENTY-FIVE-MILLIMETER GUN. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE ONE MINUTE TO COMPLETE THIS TEST." Pause, then say "TIME BEGINS WHEN YOU SQUEEZE THE TRIGGER."

Begin timing when the examinee squeezes the trigger. If the examinee has not completed the task after 1 minute, announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examinee is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 3

TASK: Perform misfire procedures on a 25-mm gun

PERFORMANCE MEASURES:

1. Performed misfire procedures on the 25-mm gun
   a. Ensured ARM-SAFE-RESET switch was in ARM position.
   b. Announced 25-MM MISFIRE to the crew.
   c. Released trigger switches and waited 5 seconds.
   d. Pressed SS of ammunition selected.
   e. Pressed misfire button.
   f. Squeezed trigger switches.
   g. Ensured sear indicator light was on.
2. Completed performance measures within 1 minute.

A-6. STATION 4, UNLOAD AND CLEAR AN M242 25-MM GUN FEEDER

a. **Tasks.** Unload and clear a 25-mm gun feeder.

b. **Conditions.** Given a Bradley with basic issue items, 25-mm gun installed, loaded with dummy ammunition (M794).

c. **Standards.** Within 10 minutes, the crew member will unload and clear the 25-mm gun feeder.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station, the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion scoring checklist for this task.

The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO he must be critiqued, to include an explanation of his mistakes what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- TM 9-2350-252-10-2 or TM 9-2350-284-10-2.
- FM 23-1.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.
- 90 rounds of 25-mm dummy ammunition.

f. **Pretest Preparation.**

(1) Ensure turret power is on.

(2) Ensure both ready boxes are loaded with 45 rounds of dummy ammunition

(3) Ensure the feeder is loaded with one round of AP and two rounds of HE.

(4) Set turret travel lock.

(5) Set ARM-SAFE-RESET switch to ARM and select ammunition.

g. **Pretest Conditions for Each Examinee.**

(1) Ensure master power is on.

(2) Ensure turret tools are in proper stowage position.

(3) Ensure feeder is loaded with ammunition.

(4) Ensure ARM-SAFE-RESET switch is set to ARM and ammunition is selected.

h. **Test Planning Time.**

Administmtive:	5 minutes
Test:	10 minutes
Total:	15 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO UNLOAD AND CLEAR THE TWENTY-FIVE-MILLIMETER GUN FEEDER. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE TEN MINUTES 10 COMPLETE THIS TEST." Pause then say "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed the task after 10 minutes announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examinee is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 4

TASKS: Unload and clear a 25-mm gun feeder.

PERFORMANCE MEASURES:

1. Unloaded the 25-mm gun feeder.
   a. Moved ARM-SAFE-RESET switch to RESET, then to SAFE.
   b. Turned turret power off.
   c. Moved manual safe to SAFE.
   d. Disconnected link eject chutes and removed links.
   e. Unloaded HE ammunition.
   f. Unloaded AP ammunition.
   g. Removed feed chutes.
   h. Raised feeder handle
   i. Removed power cable.
   j. Pulled out straight drive shaft handle.
   k Removed feeder.
   1. Removed any ammunition from the gun rotor.
   m. Verified the timing of the feeder.
   n. Removed any rounds or expended casings from receiver and ejection port.
2. Completed performance measures within 10 minutes.

A-7. STATION 5, INSTALL AN M240C COAX MACHINE GUN

a. **Task.** Install an M240C coax machine gun.

b. **Conditions.** Given a Bradley with basic issue items, and a cleared M240C machine gun.

c. **Standards.** Within 2 minutes, the crew member will install the M240C machine gun.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station, the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion scoring checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment and Material Required.**

Qualified 1lM, 19D, or 14R sergeant or above.

- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- TM 9-2350-252-10-2 or TM 9-2350-284-10-2.
- FM 23-1.
- Operational M240C coax.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.

f. **Pretest Preparation.**

(1) Ensure front and rear mounting brackets are present and operational.

(2) Ensure that the M240C coax mounts properly.
(3) Place turret in manual mode.

g. **Pretest Conditions for Each Examinee.**
(1) Ensure mounting brackets are not damaged.
(2) Ensure M240C coax is not damaged.
(3) Ensure turret power and drive are off.
(4) Ensure coax access doors are closed.

h. **Test Planning Time.**

Administrative:	5 minutes
Test	2 minutes
Total:	7 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO INSTALL THE M-TWO-FORTY-C COAX MACHINE GUN. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE TWO MINUTES TO COMPLETE THIS TEST." Pause, then say "BEGIN."

Begin timing when the command "BEGIN" is given If the examinee has not completed the task after 2 minutes, announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examime is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 5

TASK: Install an M240C coaxial machine gun

PERFORMANCE MEASURES:

1. Elevated gun to 200 mils.
2. Installed M240C coax machine gun
   a. Opened coax access doors.
   b. Mounted the coax.
      (1) Old mount (M2/M3):
         (a) Placed coax in plenum onto the mount.
         (b) Aligned alignment lugs with cradle mount.
         (c) Pushed coax all the way in.
         (d) Ensured coax was fully seated.

(2) New mount (M2A2/M2A20DS/M3A2/M3A20DS):
(a) Pulled retaining pins out.
(b) Placed coax in plenum.
(c) Pushed coax all the way in.
(d) Ensured coax was fully seated.
(e) Pushed in retaining pins fully.
(f) Ensured that the retaining pins were locked in position by pulling on the rear of coax.

c. (Old mount.) Joined and secured rear mount to coax.
d. (Old mount.) Installed solenoid cable plug on plenum jack.
e. Closed coax access doors.

3. Completed performance measures within 2 minutes.

A-8. STATION 6, LOAD, FIRE, AND APPLY IMMEDIATE ACTION ON AN M240C COAX MACHINE GUN

a. **Tasks.** Load, fire, and apply immediate action on an M240C coax machine gun.

b. **Conditions.** Given a Bradley with basic issue items and an M240C machine gun installed and 300 rounds of dummy 7.62-mm ammunition loaded into the ready box.

c. **Standards.** Within 6 minutes, the crew members will—
Load the coax machine gun.
Fire the coax machine gun.
Apply immediate action to the coax machine gun.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion scoring checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated

on the checklist he receives a NO-GO. When a crew member receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment and Material Required.**

- Qualified llM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2iM3A20DS with basic issue items.
- TM 9-1005-313-10.
- TM 9-2350-252-10-2 or TM 9-2350-284-10-2.
- FM 23-1.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.
- M240C coax machine gun
- Ammunition-300 rounds dummy 7.62-mm.

f. **Pretest Preparation.**

(1) Clear the weapon.
(2) Disassemble and assemble the weapon to ensure that all parts are present and serviceable.
(3) Ensure rounds do not bind in feed chute.
(4) Remove rounds from feed chute.

g. **Pretest Conditions for Each Examinee.**

(1) Ensure all power is off.
(2) Ensure M240C machine gun bolt is forward.
(3) Ensure manual safe is set to FIRE position.

h. **Test Planning Time.**

Administrative:	5 minutes
Test:	6 minutes
Total:	11 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO LOAD, FIRE, AND APPLY IMMEDIATE ACTION TO THE

M-TWO-FORTY-C MACHINE GUN. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE SIX MINUTES TO COMPLETE THIS TEST." Pause then say "BEGIN."

Begin timing when the command "BEGIN" is given. If the exa.mince has not completed the task after 6 minutes, announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examinee is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 6

TASKS: Load, fire, and apply immediate action on an M240C coax machine gun.

PERFORMANCE MEASURES:

1. Loaded the M240C coax machine gun.
   a. Opened forwarder access door. (M2/M3 only.)
   b. Opened coax machine gun access doors.
   c. Charged coax machine gun.
   d. Set manual safety on coax to SAFE.
   e. Opened cover assembly and feed tray.
   f. Inspected chamber for rounds.
   g. P1aced ammunition in forwarder.
   h. Closed forwarder access door. (M2/M3 only.)
   i. Forwarded ammunition to the feed tray.
   j. Closed feed tray.
   k. Installed ammunition belt on feed tray.
   1. Closed cover assembly.
   m. Closed coax machine gun access doors.
2. Fired coax machine gun.
   a. Ensured turret drive system switch was off.
   b. Opened coax machine gun access doors.
   c. Pushed manual safety to fining position.
   d. Closed coax machine gun access doors.
   e. Moved turret drive switch to ON.
   f. Pressed 7.62 ammunition button.

g. Moved ARM-SAFE-RESET switch to ARM.
h. Fired coax machine gun.

3. Applied immediate action procedures to the M240C coax machine gun.
   a. Moved ARM-SAFE-RESET switch to SAFE.
   b. Announced COAX MISFIRE to crew.
   c. Moved turret drive system switch to OFF.
   d. Opened coax access doors.
   e. Pulled charger handle back until bolt locked to the rear.
   f. Closed coax access doors.
   g. Turned turret drive system switch to ON.
   h. Moved ARM-SAFE-RESET switch to ARM.
   i. Squeezed palm switch and trigger switch on commander's control handle.
4. Completed performance measures within 6 minutes.

A-9. STATION 7, CLEAR AN M240C COAX MACHINE GUN AND UNLOAD 7.62-MM AMMUNITION

a. **Tasks.** Clear a coax machine gun and unload 7.62-mm ammunition.

b. **Conditions.** Given a Bradley with basic issue items, coax machine gun loaded with 300 rounds of 7.62-mm dummy ammunition.

c. **Standards.** Within 4 minutes, the crew member will—

Clear the M240C.

Unload the ammunition from the forwarder, and stow the ammunition in the ammunition can.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion scoring checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment, and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- TM 9-1005-313-10.
- TM 9-2350 -252-10-2 or TM 9-2350-2S4-10-2.
- FM 23-1.
- Operational M240C coax (installed).
- Ammunition—300 rounds dummy 7.62-mm.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11M, 19D, or 14R sergeant or below.

f. **Pretest Preparation.**

(1) Clear the weapon.
(2) Disassemble and assemble the weapon to ensure that all parts are present and operational.
(3) Install the M240C.
(4) Load the M240C coax with dummy 7.62-mm ammunition.

g. **Pretest Conditions for Each Examinee.**

(1) Turn on master power.
(2) Turn on turret power and turret drive.
(3) Select and arm M240C coax.

h. **Test Planning Time.**

Administrative:	5 minutes
Test:	4 minutes
Total:	9 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO CLEAR THE M-TWO-FORTY-C COAX MACHINE GUN AND UNLOAD THE SEVEN-POINT-SIX-TWO-MILLIMETER AMMUNITION. THIS TEST WILL BE SCORED IN SEQUENCE. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE FOUR MINUTES TO COMPLETE THIS TEST." Pause, then say "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed the task after 10 minutes announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examinee is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 7

TASKS: Clear a coax machine gun and unload 7.62-mm ammunition.

PERFORMANCE MEASURES:

1. Cleared the coax machine gun.
   a. Moved ARM-SAFE-RESET switch to SAFE.
   b. Turned turret drive switch to OFF.
   c. Opened coax machine gun access doors.
   d. Pulled charger handle back firmly.
   e. Moved manual safety up to SAFE position
   f. Opened cover assembly.
   g. Removed ammunition belt from feed tray.
   h. Opened feed tray.
   i. Checked to see if chamber was clear of ammunition.
   j. Closed feed tray.
   k. Closed cover assembly.
   1. Moved manual safety to FIRE position.
   m. Dry fired coax machine gun by riding the bolt forward.
   n. Pulled charger handle back firmly.
   o. Dry fired coax machine gun by riding the bolt forward.
   p. Closed coax machine gun access doors.

2. Unloaded 7.62-mm ammunition.
   a. Opened forwarder access door. (M2/M3 only.)
   b. Removed coax ammunition from feed chute and forwarder (M2/M3 only.)
   c. Removed coax ammunition from feed chute.
   d. Closed forwarder access door. (M2/M3 only.)
3. Completed performance measures within 4 minutes.

A-10. STATION 8, REMOVE AN M240C COAX MACHINE GUN

a. **Task.** Remove an M240C machine gun.

b. **Conditions.** Given a Bradley with basic issue items, and a cleared coax.

c. **Standards.** Within 2 minutes, the crew member will remove the coax machine gun.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion scoring checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment, and Material Required.**

- Qualified 11M, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- TM 9-2350 -252-10-2 or TM 9-2350-284-10-2.
- FM 23-1.

- M240C machine gun (installed).
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.

f. **Pretest Preparation.**

(1) Ensure that the master power is off.
(2) Ensure turret drive system is in manual.
(3) Ensure turret drive system is off.

g. **Pretest Conditions for Each Examinee.**

(1) Ensure that the weapon is cleared.
(2) Ensure that the turret power is off.
(3) Ensure that the turret drive is off.

h. **Test Planning Time.**

Administrative:	5 minutes
Test:	2 minutes
Total:	7 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO REMOVE THE M-TWO-FORTY-C COAX MACHINE GUN. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds then say "YOU WILL HAVE TWO MINUTES TO COMPLETE THIS TEST." Pause, then say "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed the task after 2 minutes, announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examinee is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 8

TASK: Remove an M240C coax machine gun.

PERFORMANCE MEASURES:

1. Removed M240C coax machine gun.
   a. Opened coax machine gun access doors.

b. Removed solenoid cable plug from plenum jack (old mount).
c. Disconnected rear mount pin handle from mount pinhole.
d. Removed coax machine gun from plenum.
e. Closed coax machine gun access doors.

2. Completed performance measures within 2 minutes.

A-11. STATION 9, DISSEMBLE (FIELD STRIP) AND ASSEMBLE AN M240C COAX MACHNE GUN

a. **Tasks.** Disassemble (field strip) and assemble an M240C machine gun.

b. **Conditions.** Given an M240C coax machine gun, placed on a flat surface, and cleared of ammunition.

c. **Standards.** The crew member will—

Within 2 minutes, disassemble the M240C machine gun.

Within 2 minutes assemble the M240C machine gun.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion scoring checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment, and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- TM 9-1005-313-10.

- FM 23-1.
- Stopwatch.
- M240C machine gun.
- Clipboard with pen.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.

f. **Pretest Preparation.**

(1) Ensure that the equipment is operational.
(2) Ensure that the weapon is removed from vehicle.
(3) Ensure that the weapon is cleared.

g. **Pretest Conditions for Each Examinee.**

(1) Ensure that the weapon is placed on a flat surface.
(2) Ensure that the weapon is cleared of ammunition.

h. **Test Planning Time.**

Administrative:	5 minutes
Test	4 minutes
Total:	9 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO DISASSEMBLE AND ASSEMBLE THE M-TW0-FORTY-C MACHINE GUN. THE WEAPON HAS BEEN CLEARED. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE FOUR MINUTES 10 COMPLETE THIS TEST." Pause, then say "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed the task after 4 minutes, announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examine is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 9

TASKS: Disassemble (field strip) and assemble an M240C coax machine gun.

PERFORMANCE MEASURES:

1. Disassembled (field stripped) M240C coax machine gun.
   a. Depressed barrel locking latch and held.
   b. Turned barrel release to upright position.
   c. Removed barrel.
   d. Depressed trigger pin spring and removed pin.
   e. Pulled tigger housing assembly down and back.
   f. Pulled charger handle through cable guide.
   g. Pulled back plate latch and lifted buffer straight up.
   h. Pressed driving spring in, then up, and pulled out.
   i. Depressed cover latches and raised cover assembly.
   j. Pulled charger handle back, pulled out the bolt and operating rod assembly.
   k. Closed cover, pushed out spring pin and removed.
   1. Pressed latches and removed cover assembly and feed tray.
2. Reassembled M240C coax machine gun.
   a. Positioned feed tray and cover assembly, pushed cover. assembly forward; closed cover and inserted spring pin.
   b. Inserted spring pin from right side.
   c. Opened cover assembly.
   d. Set bolt operating rod assembly on top of rails (receiver).
   e. Extended bolt to unlocked position, then pushed assembly all the way in.
   f. Closed and locked cover.
   g. Inserted driving spring in the operating rod, pushed in fully and lowered it to seat the stud in the hole of the receiver.
   h. Installed buffer and made sure it latched.
   i. Slid charger handle through cable guide and positioned trigger housing assembly in place.
   j. Inserted pin.
   k. Inserted barrel fully into socket, pushed barrel release to the right as far as it would go (not less than two, or more than seven, clicks).
   1. Conducted function checks of the M240C.
3. Completed performance measures within 4 minutes.

A-12. STATION 10, BORESIGHT TURRET WEAPONS SYSTEMS

a. **Tasks.** Boresight turret weapons systems.

b. **Conditions.** Given an operational Bradley with basic issue items, operational boresight kit with 25-mm gun adapter, coax installed, and TM 9-2350-252-10-2 or TM 9-2350-284-10-2. This is the only BGST task that requires the use of the technical manual.

c. **Standards.** Within 25 minutes (30 minutes for M2A20DS/M3A20DS), the crew member will boresight—

25-mm gun (day and night).

Auxiliary sight.

M240C coax.

TOW launcher.

Laser range finder (M2A20DS/M3A20DS only).

d. **Evaluation Procedures.**

(1) *Administration process.* At the station, the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion scoring checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training, Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment, and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- TM 9-2350-252-10-2 or TM 9-2350-284-10-2.

FM 23-1.

- Boresight kit.
- Boresight panel (1,200 meters distant).
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.

f. **Pretest Preparation.**

(1) Ensure boresight telescope is operational.
(2) Ensure trim vane is down (M2/M3 only).
(3) Ensure engine is off.
(4) Ensure master power is on.
(5) Ensure all drive select levers are in power mode.
(6) Ensure turret drive system is off.
(7) Ensure vehicle is parked on level ground.
(8) Ensure ballistic sight covers are closed.
(9) Ensure driver and cargo hatches are closed.

g. **Pretest Conditions for Each Examinee.**

(1) Ensure ARM-SAFE-RESET switch is at SAFE position.
(2) Ensure thermal sight is off.
(3) Ensure magnification is set at low.
(4) Ensure range index is at 12.
(5) Ensure reticle brightness is off.
(6) Offset day and night 25-mm boresight knobs.
(7) Offset coax mount azimuth elevation knobs.
(8) Offset TOW boresight screen.
(9) Move turret out of target area.
(10) Ensure travel lock is engaged.
(11) Ensure turret shield door is closed.

h. **Test Planning Time.**

Administrative:	5 minutes
Test:	25 minutes (30 minutes for M2A20DS/M3A20DS)
Total:	30 minutes (35 minutes for M2A20DS/M3A20DS)

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO BOREFIGHT THE M-TWO-FORTY-TWO, TWENTY-FIVE-MILLIMETER AUTOMATIC GUN, THE M-TWO-FORTY-C COAX MACHINE GUN, THE AUXILIARY SIGHT, AND THE TOW LAUNCHER. FOR M2A20DS/M3A20DS MODELS, YOU MUST ALSO BORESIGHT THE LASER RANGE FINDER DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE TWENTY-FIVE MINUTES (THIRTY MINUTES FOR M2A20DS/M3A20DS MODELS) TO COMPLETE THIS TEST." Pause, then say "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed the task after 25 minutes (30 minutes for M2A20DS/M3A20DS), announce loud enough for the examinee to hear, "STOP."

Notes: 1. If it appears that the examinee is going to damage the equipment or inqiure himself, announce "STOP."

2. Any time the helper installs the boresight telescope, the red streamer must be attached.

PERFORMANCE CHECKLIST, STATION 10

TASKS: Boresight turret weapons systems.

PERFORMANCE MEASURES:

1. Boresighted turret weapons systems.
   a. Turned on turret power.
   b. Moved night vision power switch to ON.
   c. Opened ballistic sight cover doors.
   d. Moved range control knob to 0.
   e. Moved magnification switch to HIGH.
   f. Moved sensor select to CLEAR or NEUTRAL.
   g. Foresighted M242 25-mm automatic gun:
      (1) Pressed AP SS button.
      (2) Ensured that AP appeared on status indicator.
      (3) Adjusted reticle brightness knob.
      (4) Moved turret traverse drive select lever to manual position.

(5) Moved gun elevation drive select lever to manual position.
(6) Moved TOW elevation drive select lever to power position.
(7) Centered gun reticle on aiming point of target.
(8) Helper installed 25-mm boresight adapter and boresight telescope on the muzzle end of the 25-mm barrel.
(9) Helper focused boresight telescope on target.
(10) Helper aligned elevation cross hair in boresight reticle on aiming point of target.
(11) Helper aligned azimuth cross hair in boresight reticle on aiming point of target.
(12) Helper checked accuracy of boresight telescope.
(13) Aligned gun reticle on aiming point of target.
(14) Helper and gunner switched positions and verified alignment.
(15) Removed boresight telescope and 25-mm boresight adapter from 25-mm gun barrel.

h. Foresighted the laser range finder (M2A20DS/M3A20DS only).
(1) Moved magnification switch to HIGH.
(2) Moved laser switch to ON.
(3) Engaged and fully locked boresight prism.
(4) Located laser reticle.
(5) Aligned laser reticle in center of the gun reticle circle.
(6) Disengaged and locked boresight prism.
(7) Moved laser switch to OFF.

i. Boresighted the auxiliary sight.
(1) Positioned auxiliary sight to the commander's position.
(2) Focused auxiliary sight.
(3) Looked at aiming point image in auxiliary sight reticle.
(4) Peformed elevation linkage adjustment.
(5) Loosened horizontal adjustment lock screw.
(6) Centered aiming point image.
(7) Locked horizontal adjustment lock screw.
(8) Checked aiming point image.

j. Foresighted the M240C coax machine gun.
(1) Pressed 7.62 button.

(2) Ensured that 7.62 appeared in status indicator.
(3) Ensured alignment of gun reticle on aiming point of target.
(4) Moved to commander's seat.
(5) Helper installed boresight adapter and boresight telescope in muzzle end of M240C coax machine gun.
(6) Helper focused boresight telescope on boresight panel.
(7) Helper aligned azimuth cross hair reticle on aiming point of target.
(8) Helper aligned elevation cross hair in boresight reticle on aiming point of target.
(9) Helper removed boresight telescope and boresight adapter.

k. Aligned nightsight.
(1) Moved sensor select switch to NIGHT.
(2) Aligned elevation cross hair and azimuth cross hair on gun reticle on aiming point of target.
(3) Moved sensor select switch to CLEAR or NEUTRAL.
(4) Ensured alignment of gun reticle on aiming point of target.

1. Prepared turret for power operation.
(1) Moved gun elevation drive select lever to POWER.
(2) Moved turret traverse drive select lever to POWER.

m. Boresighted TOW system.
(1) Turned on turret drive and raised TOW launcher.
(2) Turned off turret drive.
(3) Hung red streamer on turret drive system switch.
(4) Pressed TOW button.
(5) Ensured that TOW appeared on status indicator.
(6) Moved TOW elevation drive select lever to manual position.
(7) Moved gun elevation drive select lever to power position.
(8) Moved turret traverse drive select lever to manual position.
(9) Helper installed boresight telescope and hung red streamer on boresight telescope.
(10) Aligned azimuth cross hair of TOW reticle on aiming point of target.
(11) Adjusted the TOW launcher for azimuth, if necessary.

(12) Helper aligned elevation cross hair of boresight telescope reticle on aiming point of target.

(13) Aligned elevation cross hair of TOW reticle on aiming point of target.

(14) Helper removed boresight telescope and red streamer from TOW launcher. Gunner visually inspected.

(15) Removed red streamer from turret drive system switch.

(16) Moved TOW elevation drive select lever to POWER.

(17) Moved turret traverse drive select lever to POWER.

(18) Moved turret drive switch to ON.

(19) Lowered TOW launcher.

(20) Moved turret drive system switch to OFF.

2. Completed performance measures within 25 minutes (30 minutes for M2A20DS/M3A20DS models).

A-13. STATION 11, LOAD AND UNLOAD THE 25-MM HE READY BOX

a. **Tasks.** Load and Unload the HE ready box.

b. **Conditions.** Given a Bradley with the turret positioned at HE load and 75 M794 dummy rounds.

c. **Standards.** The crew member will—

Within 6 minutes, load 75 rounds in the HE ready box.

Within 6 minutes, unload 75 rounds from the HE ready box, and separate ammunition into five 15-round belts.

d. **Evaluation Procedures.**

(1) *Administration process.* At the station, the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion performance checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member

receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment, and Material Required.**

- Qualified 11M, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- 75 rounds of 25-mm dummy ammunition.
- TM 9-2350 -252-10-2 or TM 9-2350-284-10-2.
- FM 23-1.
- Stopwatch.
- Clipboard with pen.
- One helper, qualified 11M, 19D, or 14R sergeant or below.

f. **Pretest Preparation.**

(1) Position turret at HE load position with travel lock engaged.
(2) Place five 15-round belts of M794 ammunition on the floor of the hull to the rear of the turret shield door.
(3) Inspect HE ready box door for serviceability, replace all unserviceable or missing parts.

g. **Pretest Conditions for Each Examinee.**

(1) Turret position is in HE load position
(2) Master power and turret power are off.
(3) HE ready can door is secured.
(4) Ammunition selector lever is in AP position.
(5) Turret shield door is closed.
(6) Ammunition is in five belts of 15 rounds each.

h. **Test Planning Time.**

Administmtive:	6 minutes
Test:	12 minutes
Total:	18 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO LOAD AND UNLOAD THE HE READY BOX. YOU WILL HAVE SIX MINUTES TO LOAD THE HE READY BOX, AND SIX

MINUTES TO UNLOAD THE READY BOX AND RETURN THE AMMUNITION TO FIVE FIFTEEN-ROUND BELT CONFIGURATION. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say, "YOU WILL HAVE SIX MINUTES 10 COMPLETE EACH TEST." Pause, then say, "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed each task after the appropriate time, announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examinee is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 11

TASKS: Load and unload HE ready box.

PERFORMANCE MEASURES:

1. Loaded the HE ready box.
   a. Inspected belts for misaligned rounds.
   b. Belted the five 15-round belts together.
   c. Knocked on turret shield door and announced "LOADING HE."
   d. Opened turret shield door.
   e. Removed HE ready box door.
   f. Hung first five rounds, double link end frost.
   g. Hung 19th, 24th, and 25th rounds.
   h. Counted out 25 rounds and hung 24th and 25th rounds, and continued process until rounds were loaded.
   i. Replaced HE ready box door.
   j. Ensured ammunition selector lever was in HE position.
   k. Closed turret shield door and announced HE loaded.
   1. Completed performance measures within 6 minutes.
2. Unloaded HE ready box.
   a. Knocked on turret shield door and announced "UNLOADING HE."
   b. Opened turret shield door.
   c. Removed HE ready box door.
   d. Removed ammunition.
   e. Replaced HE ready box door.

f. Closed turret shield door and announced "HE UNLOADED."

g. Separated ammunition into five 15-round belts.

h. Completed performance measures within 6 minutes.

A-14. STATION 12, LOAD and UNLOAD THE 25-MM AP READY BOX

a. **Tasks.** Load and unload the AP ready box.

b. **Conditions.** Given a Bradley with the turret positioned at AP load and 45 M794 dummy rounds.

c. **Standards.** The crew member will—

Within 6 minutes, load 45 rounds in the AP ready box.

Within 6 minutes, unload 45 rounds from the AP ready box, and separate ammunition into three 15-round belts.

d. **Evaluation Procedures.**

(1) *Administrative process.* At the station, the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion performance checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- 45 rounds of M794 ammunition.
- TM 9-2350 -252-10-2 or TM 9-2350-284-10-2.
- FM 23-1.

- Stopwatch.
- Clipboard with pen.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.

f. **Pretest Preparation.**

(1) Position turret at AP load position with travel lock engaged.

(2) Place three 15-round belts of M794 ammunition on the floor of the hull to the rear of the turret shield door.

(3) Inspect AP ready box door for serviceability, replace all unserviceable or missing parts.

g. **Pretest Conditions for Each Examinee.**

(1) Turret position in AP load position.

(2) Master power and turret power are off.

(3) AP ready can door is secured.

(4) Ammunition selector lever is in HE position.

(5) Turret shield door is closed.

(6) Ammunition is in three belts of 15 rounds each.

h. **Test Planning Time.**

Administrative:	6 minutes
Test	12 minutes
Total:	18 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO LOAD AND UNLOAD THE AP READY BOX. YOU WILL HAVE SIX MINUTES TO LOAD THE AP READY BOX, AND SIX MINUTES TO UNLOAD THE READY BOX AND RETURN THE AMMUMTION TO THREE FIFTEEN-ROUND BELT CONFIGURATION. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say, "YOU WILL HAVE SIX MINUTES TO COMPLETE EACH TEST." Pause, then say, "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed each task after the appropriate time, announce loud enough for the examinee to hear, "STOP."

Note: If it appears that the examinee is going to damage the equipment or injure himself, announce "STOP."

PERFORMANCE CHECKLIST, STATION 12

TASKS: Load and unload AP ready box.

PERFORMANCE MEASURES:

1. Loaded AP ready box.
   a. Inspectd belts for misaligned rounds.
   b. Belted the three 15-round belts together.
   c. Knocked on turret shield door and announced "LOADING AP."
   d. Opened turret shield door.
   e. Removed AP ready box door.
   f. Hung first round double link end first.
   g. Hung 25th and 26th round.
   h. Placed single link end of belt and forwarded ammunition above the forwarder enough that the rounds stay up above the forwarder.
   i. Replaced AP ready box door.
   j. Ensured ammunition selector lever was in AP position.
   k. Closed turret shield door and announced AP loaded.
   1. Completed performance measures within 6 minutes.

2. Unloaded the AP ready box.
   a. Knocked on turret shield door and announced "UNLOADING AP."
   b. Opened turret shield door.
   c. Removed AP ready box door.
   d. Removed ammunition.
   e. Replaced AP ready box door.
   f. Closed turret shield door and announced "AP UNLOADED."
   g. Separated ammunition into three 15-round belts.
   h. Completed performance measures within 6 minutes.

A-15. STATION 13, PREPARE A BRADLEY RANGE CARD

a. **Task.** Prepare a Bradley range card

b. **Conditions:** Given a fully operational Bradley, a sector of fire, compass, paper, pencil, a map (1:50,000), three marking stakes, and a standard range card form (DA Form 5517-R).

c. **Standards:** Within 15 minutes the crew will prepare a range card that depicts the target area to include—

- Weapon symbol.
- Circle value.
- Sectors of fire.
- Target reference points/reference points.
- Dead space.
- Weapon reference point.
- Magnetic north.
- Identification data.
- Target/sector data.

d. **Evaluation Procedures**

(1) *Administrative process.* At the station the evaluator logs crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in the manner outlined in this guide. The evaluator must use the criterion performance checklist for this task. The evaluator informs the crew member of his performance on this task and directs him either to the next station or to further training. Only one crew member at a time can be tested.

(2) *Administrative procedures for personnel receiving a NO-GO.* If the crew member does not achieve the standard indicated on the checklist, he receives a NO-GO. When a crew member receives a NO-GO, he must be critiqued, to include an explanation of his mistakes and what he must do to correct them. The crew member will be retested in accordance with the local SOP.

e. **Personnel, Equipment and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Operational M2/M2A2/M2A20DS or M3/M3A2/M3A20DS with basic issue items.
- FM 23-1.
- Stopwatch.
- Compass.
- Clipboard with pen.

- Three stakes per vehicle.
- One helper, qualified 1lM, 19D, or 14R sergeant or below.

f. **Pretest Preparation.**

(1) Ensure equipment is operational.
(2) Ensure turret is positioned at 6400 mils.
(3) Ensure travel lock is engaged.

g. **Pretest Conditions for Each Examinee.**

(1) A blank range card is issued.
(2) A pencil and a compass are issued.
(3) Turret power and turret drive are turned on.
(4) Left and right limits and referenced point are pointed out.

h. **Test Planning Time.**

Administrative:	5 minutes
Test:	15 minutes
Total:	20 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO PREPARE A BRADLEY RANGE CARD. DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say, "YOU WILL HAVE FIFTEEN MINUTES TO COMPLETE EACH TEST." Pause, then say, "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed each task after the appropriate time, announce enough for the examinee to hear "STOP."

PERFORMANCE CHECKLIST, STATION 13

TASKS: Prepare a Bradley range card.

PERFORMANCE MEASURES:

1. Prepared a Bradley range card

a. Indicated identification data.

- Indicated unit identification.
- Indicated magnetic north.

b. Filled in sketch portion.

- Indicated weapon position by proper symbol.

- Indicated left and right limits.
- Indicated circle value.
- Indicated TRPs/RPs.
- Indicated dead space.
- Indicated maximum engagement lines.
- Indicated weapon reference point.

c. Filled in data section.

- Indicated position identification.
- Indicated vehicle type/bumper number.
- Indicated circle value in meters.
- Indicated target information.
  — Indicated left and right limits.
  — Indicated TRPs.
  — Indicated RPs.
  — Indicated WRPs.
- Indicated data/time.

2. Completed performance measures within 15 minutes.

A-16. STATION 14, IDENTIFY COMBAT VEHICLES

a. **Tasks.** Identify combat vehicles.

b. **Conditions.** Given a classroom with a 35-mm slide projector screen, slide tray with forty 35-mm slides of combat vehicle exposures; stopwatch, chair; desk or clipboard; and pencil.

c. **Standards.** The crew member will identify 90 percent (36) of the 40 vehicles by nomenclature. Of the 40 vehicle slides, 15 will be tanks; 17 will be a mix of IFVs, APCs reconnaissance vehicles and ATGM vehicles; and 8 will be a mix of trucks and SP artillery, ADA, and engineer vehicles. No more than 30 percent (12) of the 40 vehicles will be US or allied.

d. **Evaluation Procedures.**

This task requires the soldier to identify combat vehicles from the front side oblique, or rear using day and thermal vehicle exposures.

(1) *Training standards.* Soldiers will be trained on all of the vehicles listed in Figure A-2, page A-44. The forty slides selected for testing do not have to be 40 different vehicles. The same vehicle may be used more than once in a test. However, a different angle exposure of the vehicle will be med. The same vehicles regardless of angle, cannot be shown more than three times.

(2) *Administration process.* At the station, the evaluator logs the crew member's information on a roster. The evaluator provides the crew member with all materials and equipment and displays them in a manner outlined in this guide. The evaluator must use the criterion performance checklist for this task. The evaluator informs the soldier of his performance on this task and directs him to the next station or to further training. The number of soldiers to be tested at one time depends on the classroom seating without compromising test procedures.

(3) *Administrative procedures for personnel receiving a NO-GO.* If the soldier does not achieve the standard indicated on the checklist, he receives a NO-GO. When a soldier receives a NO-GO, he must be critiqued, to include an explanation of vehicles that were incorrectly identified. The soldier will be retested with a second set of slides showing the same vehicles in a different view or a different order.

e. **Personnel, Equipment, and Material Required.**

- Qualified 1lM, 19D, or 14R sergeant or above.
- Forty 35-mm slides of combat vehicles. These forty slides will be selected from the combat vehicle list in Figure A-2.
- Classroom.
- Slide-projector with screen.
- Stopwatch.
- Performance checklist (one for each soldier).
- Chair, desk, or clipboard (one for each soldier).
- Pencil (one for each soldier).

f. **Pretest Preparation.**

Forty slides will be selected from the prescribed list in Figure A-2. The station evaluator must ensure the slide projector is

operational and the slides can be recognized from all locations in the classroom. Some projectors have an automatic setting for exposure of each slide; if used this feature must be checked for accuracy.

g. **Pretest Conditions for Each Examinee.**

The slide projector will be on, but slides will not be exposed.

h. **Test Planning Time.**

Administrative:	5 minutes
Test:	20 minutes
Total:	25 minutes

i. **Instructions to Examinee.**

"LET ME HAVE YOUR ATTENTION. AT THIS STATION, YOU WILL BE TESTED ON YOUR ABILITY TO IDENTIFY COMBAT VEHICLES. YOU MUST CORRECTLY IDENTIFY THIRTY-SIX OF FORTY VEHICLES BY NOMENCLATURE. YOU WILL HAVE TWENTY SECONDS TO VIEW EACH SLIDE AND TEN SECONDS BETWEEN EACH SLIDE TO WRITE YOUR ANSWER ON THE PERFORMANCE CHECKLIST PROVIDED. BE SURE YOU DO NOT GET OUT OF SEQUENCE OR YOUR ANSWERS WILL BE INCORRECT DO YOU UNDERSTAND THESE INSTRUCTIONS?"

Pause for 5 seconds, then say "YOU WILL HAVE THIRTY SECONDS TO COMPLETE EACH TASK." Pause, then say "BEGIN."

Begin timing when the command "BEGIN" is given. If the examinee has not completed the task after the appropriate time, announce loud enough for the examinee to hear, "STOP."

PERFORMANCE CHECKLIST, STATION 14

TASK: Idenify combat vehicles by nomenclature.

PERFORMANCE MEASURES:

Identified vehicle slides No. 1 through No. 40.

LIGHT AND MAIN BATTLE TANKS

1. **M1-series main battle tank.**
   a. M1.
   b. M1A1.
   c. M1A2.
2. **M60-series main battle tank.**
   a. M60A1
   b. M60A3.
3. **XM8 armored gun system (AGS).**
4. **Challenger-series main battle tank.**
   a. Challenger 1.
   b. Challenger 2.
5. **Leopard-series main battle tank.**
   a. Leopard 1.
   b. Leopard 1A1A1.
   c. Leopard 1A4.
   d. Leopard 2.
6. **AMX-30.**
7. **Leclerc.**
8. **M48A5.**
9. **T-80-series main battle tank.**
   a. T-80.
   b. T-80U.
10. **T-72-series main battle tank.**
    a. T-72.
    b. T-90.
11. **T-62-series main battle tank.**
    a. T-62.
    b. T-62 modernized.
12. **T-54/55-series main battle tank.**
    a. T-54/55.
    b. T-54/55 modernized.
13. **PT-76 light amphibious series tank.**
    a. PT-76.
    b. M-1985 (North Korea).
14. **Type 88 main battle tank (South Korea).**
15. **Chieftain Mk-5 main battle tank.**

Figure A-2. Combat vehicle list.

IFV/APC/RECONNAISSANCE VEHICLES

1. **Light armored vehicle (LAV) family.**
   a. LAV-25.
   b. LAV antitank.
   c. LAV 81-mm mortor carrier.
2. **M2/M3-series armored fighting vehicle.**
   a. M2/M3.
   b. M2A2/M3A2.
   c. M2A2ODS/M3A2ODS.
3. **M113-series armored personnel carrier.**
   a. M113A1.
   b. M113A2.
   c. M113A3.
   d. M577.
   e. M901 improved TOW vehicle.
4. **LVTP-7 (AAV7A1).**
5. **M-88 armored recovery vehicle.**
6. **Saxon.**
7. **Warrior infantry fighting vehicle.**
8. **FV-432.**
9. **Marder-series infantry fighting vehicle.**
   a. Marder 1.
   b. Marder 1A2.
10. **VAB-series.**
    a. VAB 4x4.
    b. VAB 6x6.
11. **AMX-10P.**
12. **BTR-series.**
    a. BTR-60PB.
    b. BTR-70.
    c. BTR-80.
13. **BTR-152.**
14. **BMP-series infantry fighting vehicle.**
    a. BMP-1.
    b. BMP-2.
    c. BMP-3.
15. **BMD-series airborne combat vehicle.**
    a. BMD-1
    b. BMD-2.
    c. BMD-3.
    d. BTR-D.
    e. 259.

Figure A-2. Combat vehicle list (continued).

IFV/APC/RECONNAISSANCE VEHICLES (continued).

16. **BTR-50PK.**
17. **MTLB multipurpose tracked vehicle.**
18. **BRDM-series.**
    a. BRDM-2 with Sagger.
    b. BRDM-2 with Spandrel.
    c. BRDM-1.
    d. BRDM-2.
    e. BRDM-2U.
19. **Scorpion-series reconnaissance vehicle.**
    a. Scorpion.
    b. Scimitar.
20. **Fox NBC reconnaissance vehicle.**
21. **AMX-10RC.**
22. **EE-9 Cascavel.**

TRUCKS/SP ARTILLERY/ADA/ENGINEER VEHICLES

1. **HEMTT-series truck.**
    a. M978 fueler.
    b. M977 cargo.
2. **M998 HMMWV.**
3. **M92582 (5-ton).**
4. **M163 Vulcan.**
5. **M998 Avenger.**
6. **ZSU-23-4.**
7. **ZSU-57-2.**
8. **2S6.**
9. **SA-9 Gaskin.**
10. **Gepard.**
11. **M-270 multiple launch rocket system (MLRS).**
12. **M-109 SP artillery series.**
    a. M-109A6 Paladin.
    b. M-992 FAASV.
13. **2S1.**
14. **2S3.**
15. **M60 AVLB.**
16. **M-728 CEV.**
17. **M-9 ACE.**

Figure A-2. Combat vehicle list (continued).

APPENDIX B

BORESIGHT EQUIPMENT TESTING PROCEDURES

First-round accuracy with the 25-mm gun requires accurate boresighting and zeroing. Boresighting is performed first to align the sights (integrated sight unit and auxiliary sight) with the aiming point of the 25-mm gun bore. Zeroing then aligns the sights with the point of round impact. With accurate boresighting, zeroing can be performed with only minor sighting adjustments and a minimum number of rounds.

Accurate boresighting will be critical in combat situations that make it difficult or impossible to zero. In that case, the level of sighting accuracy will depend on the accuracy of boresighting procedures and equipment. Boresight equipment must be tested for accuracy to ensure that only the most accurate equipment is used.

B-1. BORESIGHT EQUIPMENT

A 25-mm gun is boresighted with a boresight telescope (National Stock Number 493340-8674607) and a 25-mm adapter. The adapter fits into the gun bore, and the telescope is inserted into the adapter.

a. Boresight Telescope. The reticle of the telescope is shown in Figure B-1. The reticle has cross hairs, a 2-mil circle, and a 10-mil circle. The azimuth cross hair is the vertical line, while the elevation cross hair is the horizontal line. The 2-mil circle is used to test the accuracy of the 25-mm boresight kit.

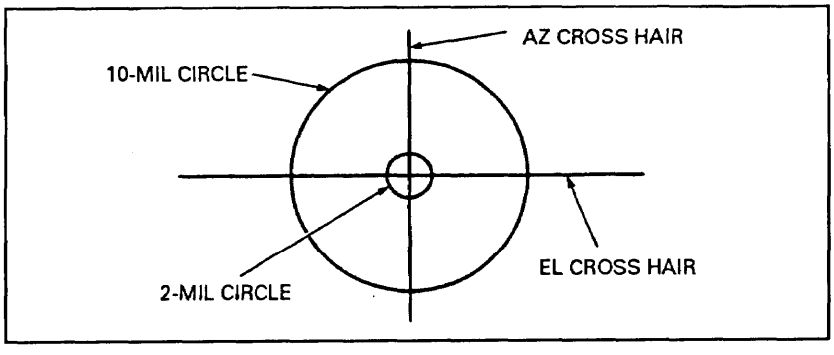


Figure B-1. Reticle.

(1) The telescope has a magnification of 5 power and can be focused on a target at distances from 5 meters to infinity. When properly focused, the aiming point of the reticle does not change even when the user moves his head while viewing through the eyepiece.

(2) The telescope has two focusing rings—reticle focus and target objective focus (Figure B-2). These rings must be adjusted in the correct order.

(a) First, the reticle focus ring is used to focus the reticle. Point the telescope toward the sky or any other evenly lit field of view; this prevents focusing on a target instead of the reticle. To focus, turn the reticle focus ring until the reticle appears sharp and clear.

(b) The target objective focus ring (called the vernier focus dial in TM 9-2350-252-10-2) is then used to focus the target. To adjust the target objective focus, turn the ring back and forth until the aiming point of the reticle does not change as the user moves his head back and forth above the eyepiece.

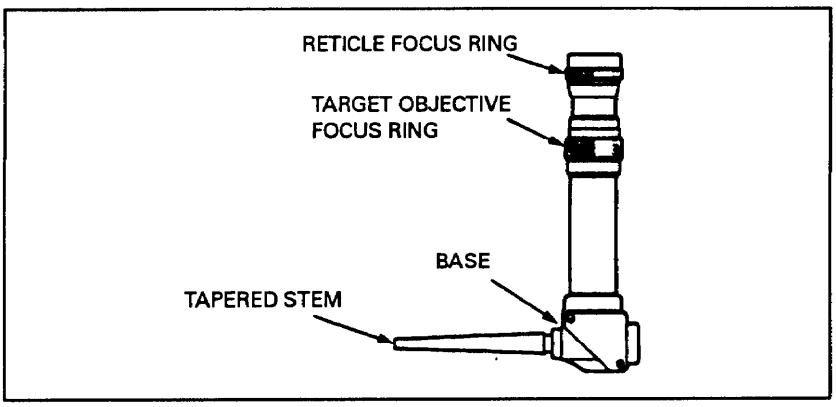


Figure B-2. Reticle focus ring and target objective focus ring.

(3) Parts of the telescope should not be unscrewed or disassembled. The telescope is not waterproof. If the telescope gets wet, it should be dried immediately. Water inside the telescope causes a foggy view.

(4) A plate on the base of the telescope contains information that includes the Federal Ordnance Number and serial number. The serial number is the bottom number listed on the base.

b. 25-mm Adapter. A drawing of the 25-mm adapter (part number 12524010) is shown in Figure B-3. The knob is inserted into the 25-mm gun barrel. The adapter is fully inserted when the tapered stop contacts the end of the gun barrel. The adapter should be inserted slowly with a slight twisting motion to keep the adapter from locking in the barrel.

(1) A new adapter (part number 12524144) (Figure B-4) is slightly different from that shown in Figure B-3. A plating is added to the tapered stop and knob to minimize wear. The knob has a larger diameter than the gun bore. Slots in the knob allow it to compress when inserted into the gun barrel. The newly designed adapter is usually more accurate than the original design.

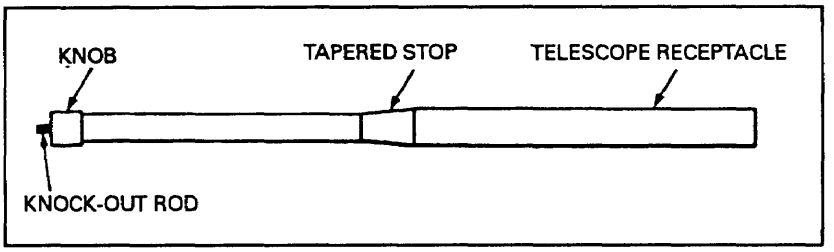


Figure B-3. 25-mm adapter (12524010).

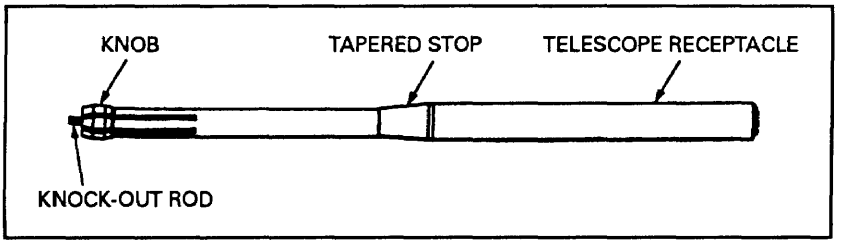


Figure B-4. 25-mm adapter (12524144).

(2) The telescope fits into the telescope receptacle of the adapter. When inserting the telescope, hold the telescope at the base without touching the glass lens. The telescope is firmly inserted by using a slight twisting motion. If the telescope gets stuck in the adapter, the user can gently hit the telescope knockout rod. Hard hits on the rod may damage the shaft of the telescope.

B-2. KIT ACCURACY TEST

The kit rotation test described in this appendix differs from the accuracy test in the turret technical manual. The technical manual describes two 90-degree rotations of the telescope to test its accuracy. The 180-degree kit rotation test described in this appendix tests the entire kit.

a. The 25-mm gun is boresighted with both the boresight telescope and 25-mm adapter. This 25-mm kit should always be tested for accuracy before the gun is boresighted. To prepare for testing, follow the first 18 steps described under the section "Boresight 25-mm Gun" in TM 9-2350-252-10-2. Accuracy of the kit is tested as described below instead of using steps 19 through 22 of the technical manual.

(1) Focus the telescope reticle using the reticle focus ring.
(2) Focus on the target using the target objective focus ring.
(3) Rotate the telescope so that the eyepiece is facing to the right.
(4) Tell the gunner to lay the gun so that the telescope reticle is aimed at a target with a corner (for example, a boresight panel or building). Figure B-5 shows an 8-foot-square boresight panel at 1,200 meters.

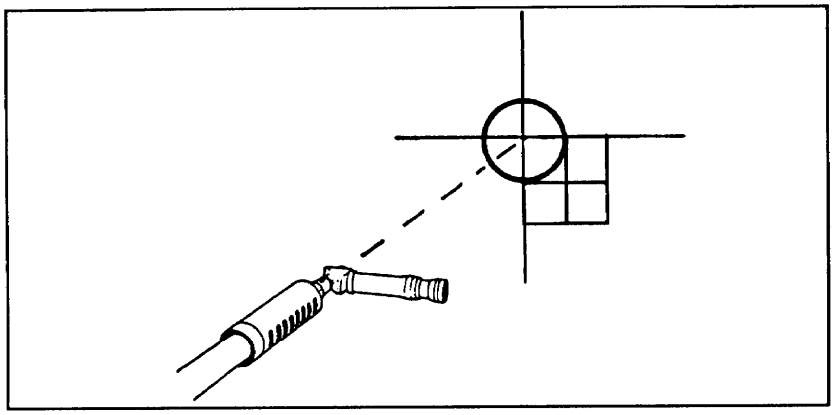


Figure B-5. Telescope reticle aimed at a corner of a boresight panel.

NOTE: If necessary, hold the telescope in the adapter as it is rotated. This keeps the telescope from slipping within the adapter.

(5) Rotate the telescope and adapter together 180 degrees until the telescope is facing to the left (Figure B-6).

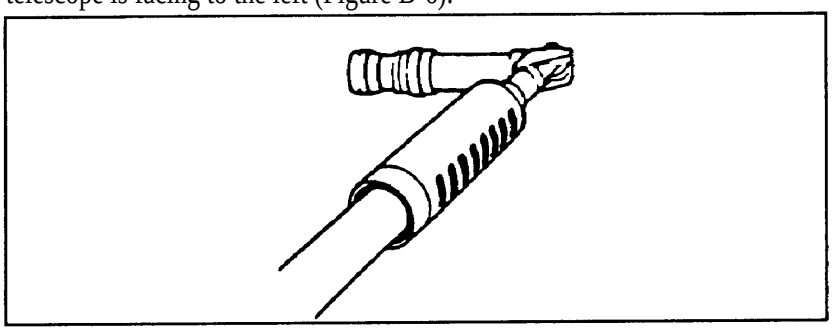


Figure B-6. Telescope facing to the left.

(6) Score the accuracy. Standards are met if the original aiming point stays in or on the 2-mil circle of the telescope reticle (Figure B-7). Standards are not met if the original aiming point moves outside the 2-mil circle.

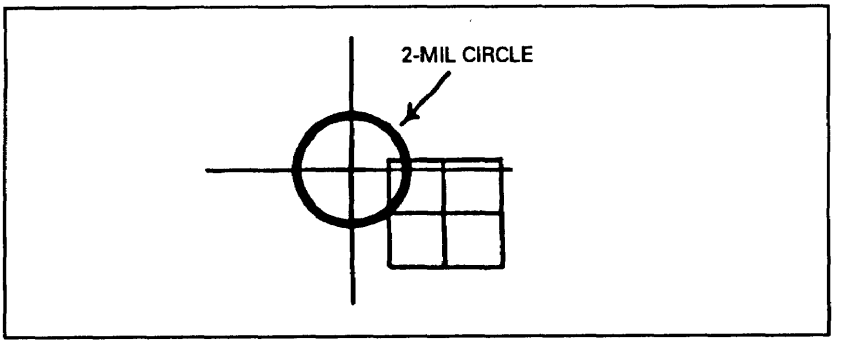


Figure B-7. Aiming point in the 2-mil circle.

b. After an accurate kit has been identified, weapons are foresighted as described in the turret TM 9-2350-252-10-2 beginning with step 23.

B-3. PREPARATION TO SCREEN EQUIPMENT

A 25-mm boresight kit maybe inaccurate because of the telescope or adapter, or both. If a 25-mm kit does not meet standards of the kit accuracy field test, then the telescope and 25-mm adapter must be tested separately. If a large number of kits do not meet standards, then the battalion must screen all of its telescope and 25-mm adapters. Accurate telescopes are then used to form accurate 25-mm kits. The following must be performed before equipment screening begins:

- Designate a test BFV and testing personnel.
- Designate a testing area..
- Prepare and position a boresight test panel.
- Learn how to use the score sheet.
- Aim the 25-mm gun at the center of the boresight test panel.

a. **BFV and Testing Personnel.** One BFV is used to test boresight equipment. The 25-mm gun barrel should have fired no more than 5,000 rounds, because gun erosion can affect testing results.

(1) Testing should be conducted by two master gunners at either the company or battalion level. Testers should know boresighting and have the ability to accurately obtain, record, and score the boresight data. One tester observes aiming points of tested equipment and the other tester records data on a standardized score sheet (discussed later).

(2) Testers should alternate between testing and recording to prevent eye strain from using the telescope. To screen all boresight equipment in a battalion may take from three to five days.

b. Testing Area. Testing should be conducted close to where the boresight equipment is stored or secured to facilitate movement of equipment to and from the test vehicle. A 52-meter line of sight is required from the end of the 25-mm gun barrel to the test panel. Testing materials and equipment can be stowed in the test vehicle overnight. This makes it easier to set up for testing at the beginning of each day.

c. Boresight Test Panel. A special test panel is used to test the equipment. The panel is a scoring grid of 2-inch squares. An example drawing of the panel is shown in Figure B-8. For actual size, this drawing must be made by the local Training Support Center. Each 2-inch square of the scoring grid, as seen through the boresight telescope, is 1 mil high and wide when the panel is placed 52 meters from the end of the 25-mm gun barrel. This grid allows the tester to observe the location of the boresight aiming point. The aiming point is then recorded on the score sheet.

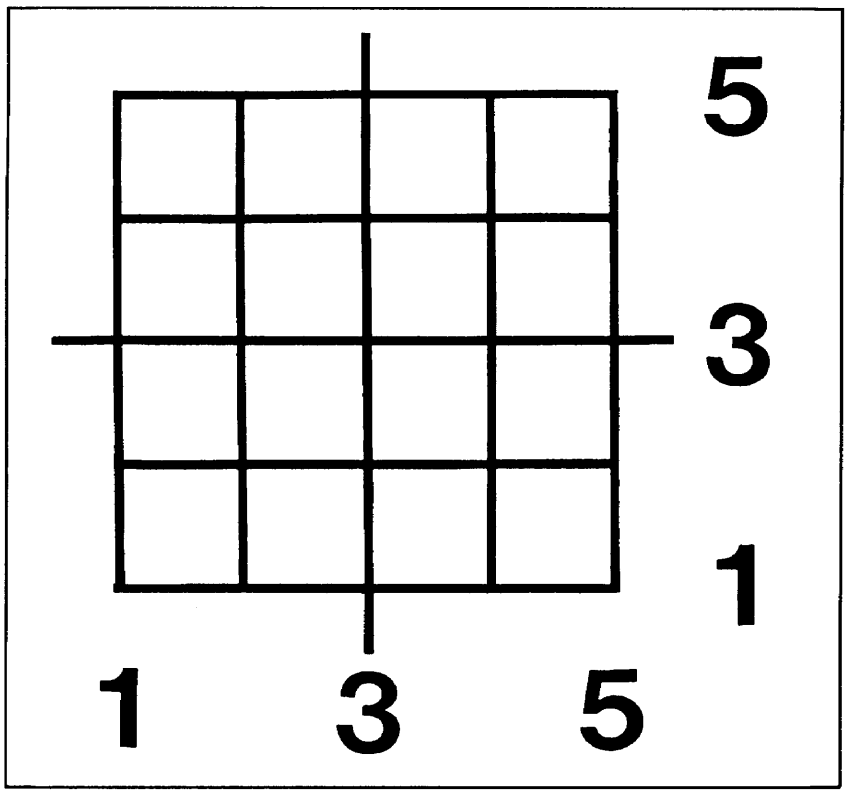


Figure B-8. Example boresight test panel.

(1) The test panel has a white background. Squares on the panel are marked by solid black lines that are l/8-inch wide. The length of each side of a square is 2 inches (5 centimeters). Numbers are from 1.5 to 2 inches tall.

(2) The drawing can be waterproofed like a map and stapled to a piece of plywood for use as a test panel. A fence or any other rigid structure can be used to support the panel. It should be tied to the support structure so that the panel does not get knocked down by wind. The panel is placed 52 meters from the 25-mm gun. The panel can be placed on the ground in the upright position, it does not have to be at gun level.

d. Scorn Sheet. A standardized score sheet is used to record and score boresight data. An example of the score sheet is in Figure B-9, page B-8. The score sheet is used to screen all equipment—adapters, telescopes, and 25-mm boresight kits.

(1) The information section at the top of the score sheet is used to record when testing occurred, who did it, the equipment tested, and the results (pass or fail) of the test. Test data are recorded in the two blocks labeled TEST 1 and TEST 2, There are two test blocks because equipment is tested twice. A GO score must be received on both tests for the equipment to PASS the screening test.

(2) Before testing begins, know how to record and plot boresight aiming points on the score sheet as described below.

(3) The telescope reticle must be aligned with the scoring grid of the test panel before an aiming point is recorded. If the retic!e is out of alignment, rotate the telescope until the correct sight picture is obtained (see Figure B-10, page B-9).

(4) The aiming point of the telescope can be determined using one of two techniques.

(a) For one technique, the tester draws an X on the scoring grid of the score sheet where the telescope reticle is aiming at the panel (Figure B-11, page B-9). Use of this technique maybe difficult for some testers because of the clutter between the reticle and grid lines.

EXAMPLE BORESIGHT EQUIPMENT SCORE SHEET

DATE: _____ TIME: _____

TESTER: _____

UNIT: _____

TEST TYPE: TELESCOPE / ADAPTER / KIT

TELESCOPE NO. _____ ADAPTER NO. _____

PASS / FAIL (Pass requires a GO on Tests 1 and 2)

TEST 1

Right aim-point coordinates:

AZ _____ EL _____

Left aim-point coordinates:

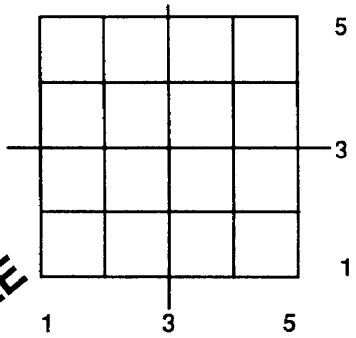
AZ _____ EL _____

Distance in inches between aim points: _____

Distance in mils between aim points: _____

SCORE: GO / NO-GO (GO is 1 mil or less)

SCORING GRID 1



EXAMPLE

TEST 2

Right aim-point coordinates:

AZ _____ EL _____

Left aim-point coordinates:

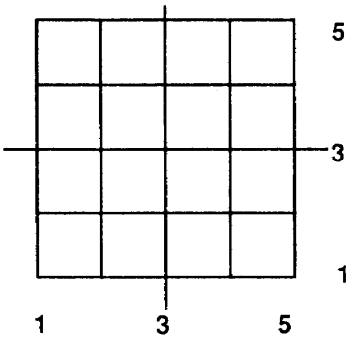
AZ _____ EL _____

Distance in inches between aim points: _____

Distance in mils between aim points: _____

SCORE: GO / NO-GO (GO is 1 mil or less)

SCORING GRID 2



INCH TO MIL CONVERSION

INCH	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1
MILS	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2

Figure B-9. Example score sheet.

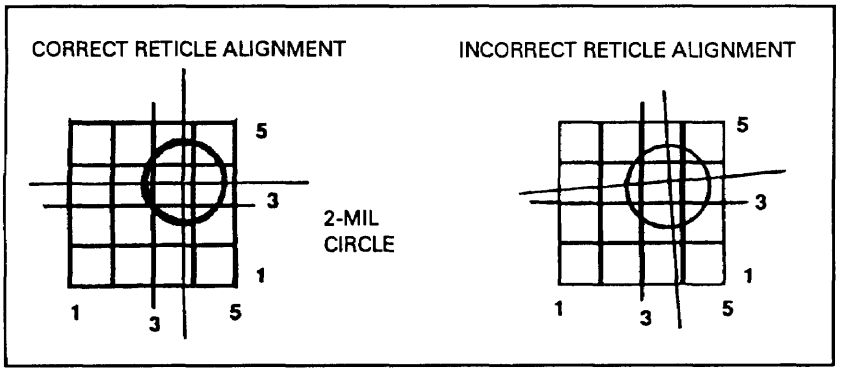


Figure B-10. Reticle alignment.

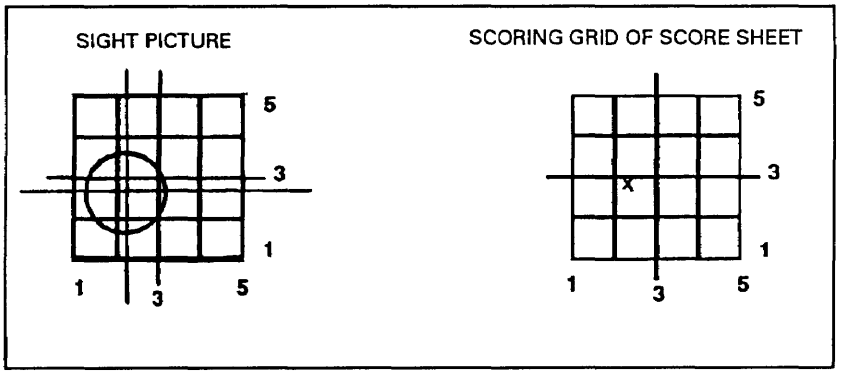


Figure B-11. Sight picture and scoring grid.

(b) A second technique for observing and plotting aiming points is similar to using grid coordinates on a map. Numbers along the bottom and right side of the test panel are used to read grid coordinates for each aiming point. Coordinates are read to the right and up starting from the lower left-hand corner of the grid. There are two readings for each aiming point of the telescope—an azimuth (AZ) coordinate and an elevation (EL) coordinate.

- The right AZ coordinate is read where the AZ cross hair crosses the scale at the bottom of the grid. The AZ coordinate for the example is 3 3/4 mils. This is recorded as the right aim-point coordinates in data section 1 of the score sheet (Figure B-12, page B-10).
- The right EL coordinate is read where the EL cross hair crosses the right side of the grid. The EL coordinate is 3 1/2 roils in the example and is recorded as the right aim-point coordinates in data section 1 of the score sheet (Figure B-13, page B-10).

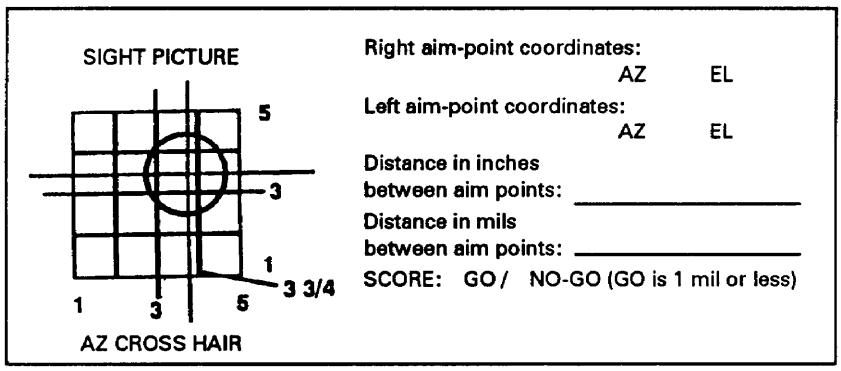


Figure B-12. Azimuth for right aim-point coordinates.

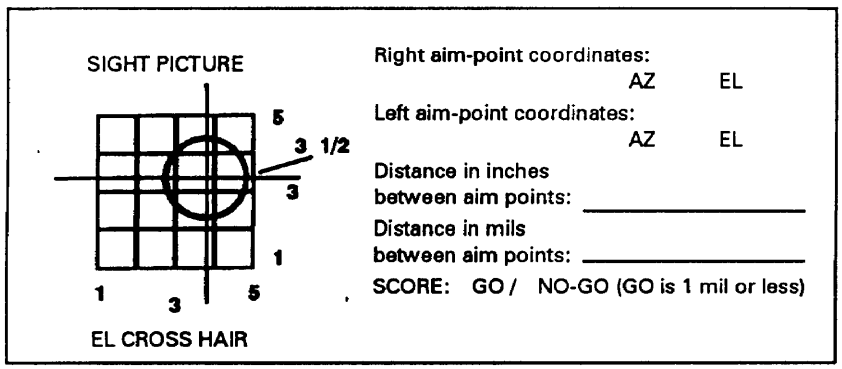


Figure B-13. Elevation for right aim-point coordinates.

(5) Plot the aiming point on the scoring grid of the score sheet. In this case, go right 3 3/4 mils and up 3 1/2 mils (Figure B-14).

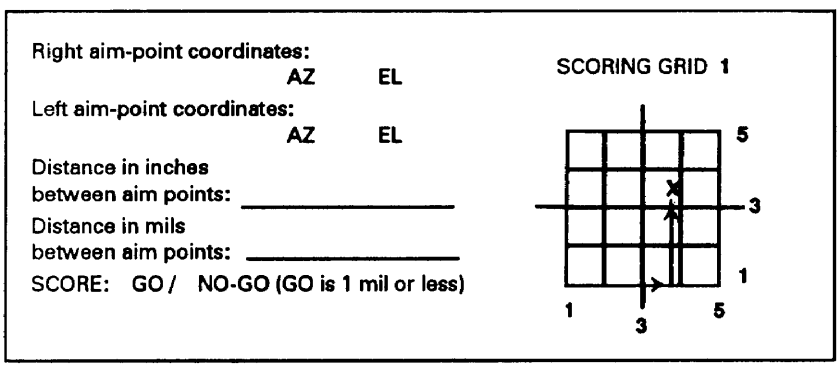


Figure B-14. Aiming point plotted.

(6) Two testers can practice recording boresight aiming points with this technique by laying the 25-mm gun on different parts of the test panel. Testers should practice observing and recording the AZ and EL coordinates for the same aiming point. Testers should be able to obtain AZ and EL readings to at least the nearest 1/4 of a mil. However, optimal testing results are obtained with aiming point accuracy readings taken to the nearest 1/8 mil.

e. Gun Lay. The gun should be aimed near the center of the test panel before testing begins. This makes it more likely that aiming points will be on the grid during testing. Aiming points not on the grid are difficult to record and score. Gun lay is performed with foresight equipment using the following procedures. The gun-lay procedure is performed in manual mode of turret operation. A boresight equipment score sheet and pencil are required. Accurate gun lay can be performed with a Wild-Heerbrugg boresight kit, if one is available.

(1) Insert the adapter into the gun barrel.

(2) Insert the telescope into the adapter with the eyepiece facing up.

(3) Tell the gunner to lay the gun so that the telescope reticle aims at the center of the panel.

(4) Focus the telescope (Figure B-15).

- Focus the reticle using the reticle focus ring.
- Focus on the target using the target objective focus ring.

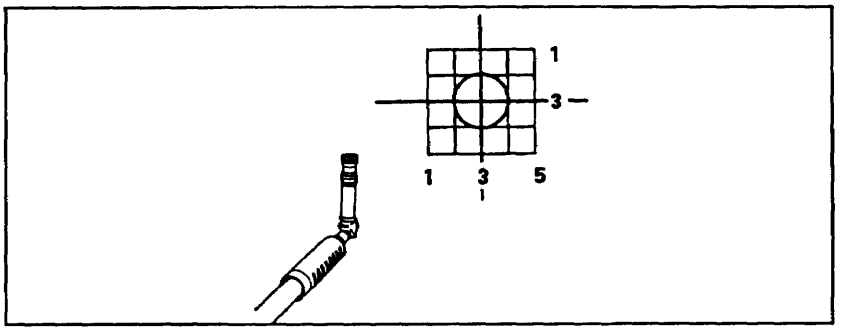


Figure B-15. Reticle aim at the center of the panel.

The telescope is now aiming at the center of the target; but the gun will not be aiming at the center of the target if the boresight equipment is inaccurate. For this reason, the following procedure is performed.

(5) Rotate the kit (telescope plus adapter) until the eyepiece is facing to the right.

(6) Mark the aiming point on scoring grid 1 of the score sheet (Figure B-16, page B-12).

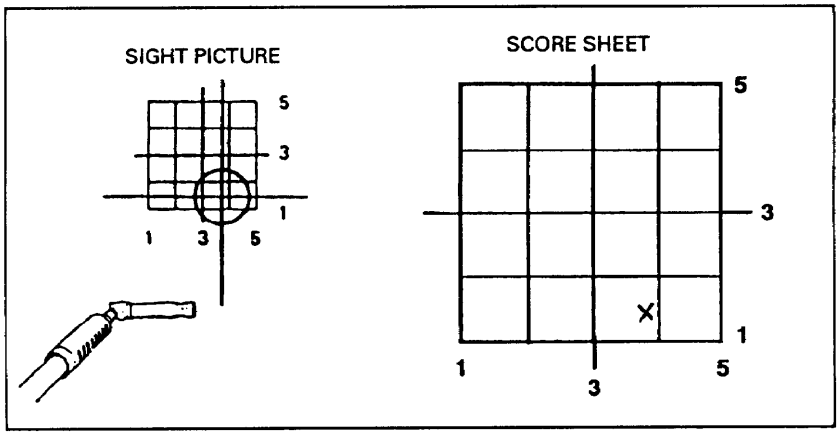


Figure B-16. Kit right aiming point.

(7) Rotate the kit until the telescope eyepiece is facing left.

(8) Mark the left aiming point on scoring grid 1 (Figure B-17). Taking right and left aiming points is like using a shot group to zero a weapon. The next step determines the middle of the two aiming points to estimate where the gun is aiming. Next, the gun is laid on the estimated center of the panel.

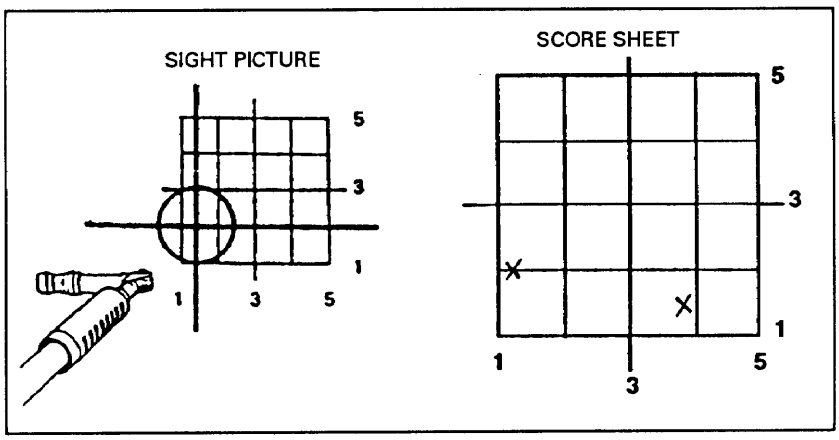


Figure B-17. Kit left aiming point.

(9) Determine aiming point of gun:

- Draw a line between the two aiming points marked on the score sheet.
- Mark the middle of the line. This is where the gun is aiming (Figure B-18).

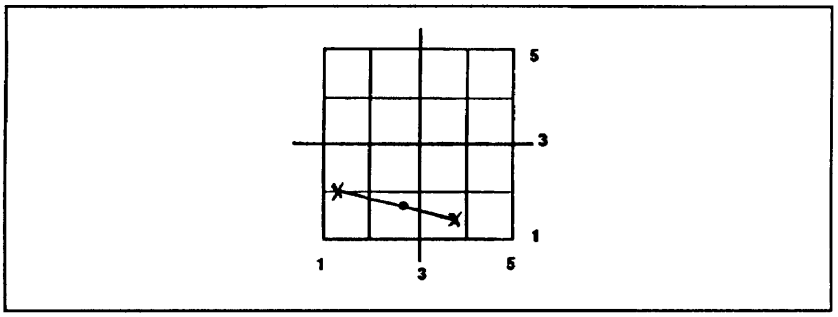


Figure B-18. Aiming point.

(10) Lay the gun on the estimated center of the panel:

- Draw an arrow from the middle of the line to the center of the panel. The arrow shows the distance and direction of the gun to target center (Figure B-19).
- Helper tells the gunner to lay the gun the distance and direction shown by the arrow from the last lay of the telescope (Figure B-20).

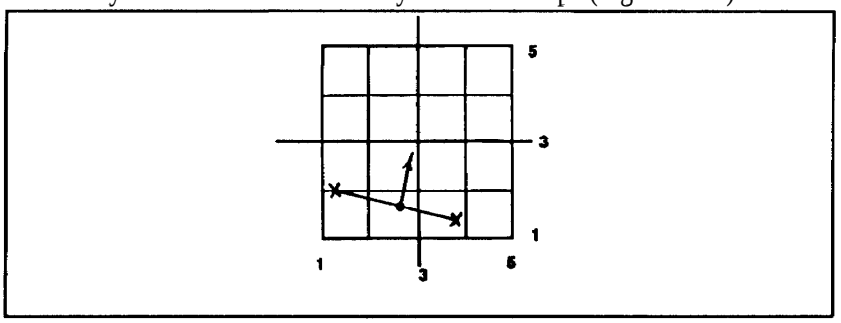


Figure B-19. Distance and direction from center.

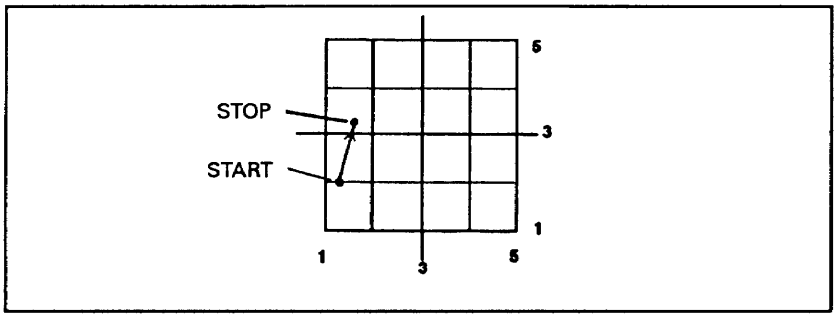


Figure B-20. Adjusted aim point.

NOTE: The example shows the start and stop points of a gun lay with the telescope starting in the left position. In this case, the gun was moved about 1 1/4 mils in the 1 o'clock direction. The gun lay can be performed with the telescope in any position (left or right), but the gun is moved the same distance and direction as shown by the arrow.

B-4. ADAPTER SCREENING TEST

Adapters are tested first using an accurate telescope. New telescopes usually meet accuracy requirements, so obtain a new telescope if possible. A new telescope can be obtained from a new vehicle or from direct exchange for a deflective telescope. A new telescope will be easy to identify if it is still wrapped in shipping material. However, a new telescope may have been unwrapped but still unused. These can be identified since there may still be tape over the eyepiece. A telescope can be inspected for scratches, dirt, and fingerprints on the lens to estimate prior use.

a. Mark Adapters. Adapters must be marked before screening. Apiece of l-inch-wide masking tape is wrapped around the telescope end of the adapter. Position marks are made on the tape: (a) to align the adapter in the barrel and (b) to align the telescope with the adapter. An adapter marking template can be used to help make the position marks (Figure B-21). The template can be taped to the clipboard used to hold score sheets during testing. The telescope end of the adapter is placed on the template and the position marks. Adapters have no permanent identification marks, so an ID number must be added to each adapter. An identification number for each adapter is then marked on the tape. The example adapter in Figure B-22 is numbered with a 4.

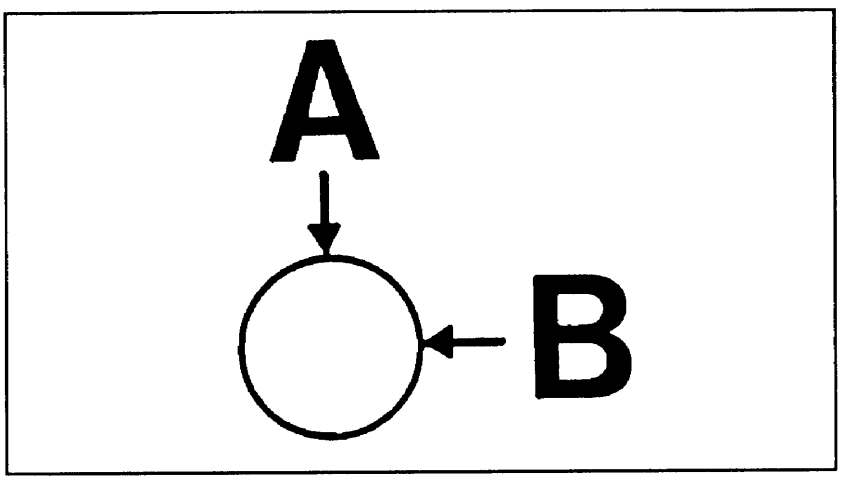


Figure B-21. Adapter marking template.

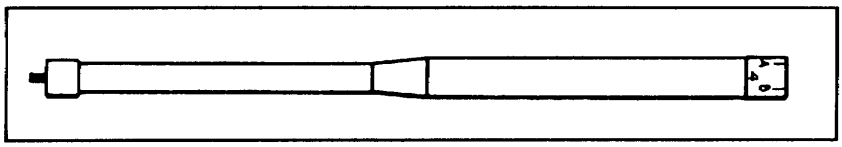


Figure B-22. Marked adapter.

b. Test. Testing begins when the vehicle is in place, the panel is in position, the gun is aiming at the panel, the adapters are marked, an accurate telescope is available, and the data recorder has a set of score sheets and a clip board.

(1) Before testing each piece of equipment, one tester must record the date, time, tester, unit, test type, telescope serial mumber, and adapter number on the score sheet. The test type shows whether an adapter, telescope, or kit is being tested.

(2) Adapters are tested using the kit rotation procedure used for the Kit Accuracy Field Test. Testing begins with the telescope facing right. The aiming point of the reticle is observed and recorded on the score sheet. The adapter and telescope are then rotated together one-half turn (180 degrees) until the eyepiece is facing left. This aiming point is then recorded on the score sheet. Scoring of equipment accuracy is described in subparagraph c.

(3) Each adapter is given two iterations of the test to provide a more reliable estimate of accuracy. Data for the frost test are recorded in the TEST 1 section of the score sheet, and the second test is recorded in the TEST 2 section. The only difference between tests 1 and 2 is the position of the adapter in the gun barrel. The following describes a sample test.

(a) Insert the 25-mm adapter into the gun barrel with position mark A facing right.

(b) Insert the telescope into the adapter with the eyepiece facing right.

(c) Estimate AZ coordinate and EL coordinate for the aiming point. The A&Z coordinate for the example is 3 3/4, and the EL coordinate is 2 3/4 (Figure B-23).

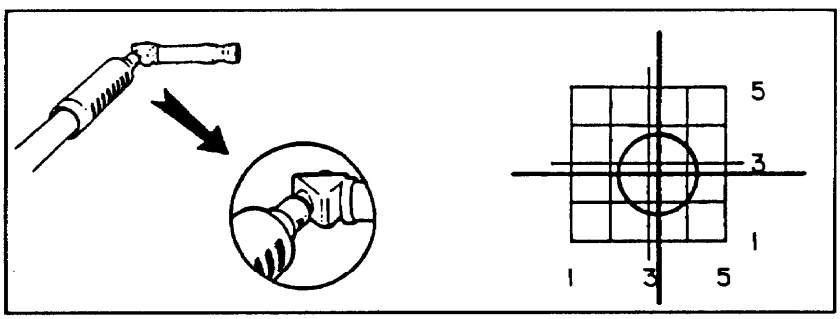


Figure B-23. Azimuth and elevation with adapter to the right, at mark A.

(d) Record the AZ coordinate and the EL coordinate in the right aim-point coordinate item of scoring grid 1 of the score sheet.

(e) Plot the right aiming point for test 1 on scoring grid 1 (Figure B-24).

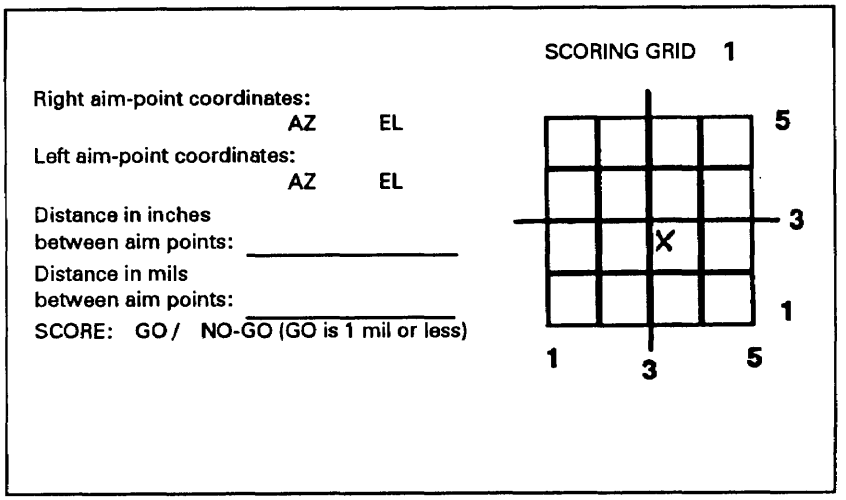


Figure B-24. Right aiming point as recored on score sheet.

(4) It is best to plot an aiming point after its AZ and EL coordinates are recorded in the data section of the score sheet. The following technique is recommended for recording aiming points when two testers are collecting data. The tester observing the aiming point reads the AZ and EL coordinates to the other tester, who records them on the score sheet. The observer takes the score sheet and plots the aiming point on the scoring grid using the AZ and EL data. The observer compares the score sheet and sight picture to make sure that the aiming points were accurately recorded.

(5) Now that the right reading of test 1 is completed, the left reading must be taken.

NOTE: It is important to maintain the position of the telescope in the adapter during kit rotation If the telescope slips in the adapter when the kit is rotated, make sure that position mark A of the adapter is facing left before the aiming point is recorded.

(a) Rotate both the telescope and the adapter until the eyepiece is facing left (Figure B-25).

(b) Record the AZ coordinate and EL coordinate of the aiming point in the left aim-point coordinate in data section 1 of the score sheet. For example the AZ coordinate is 2 1/2, and the EL coordinate is 2 1/2.

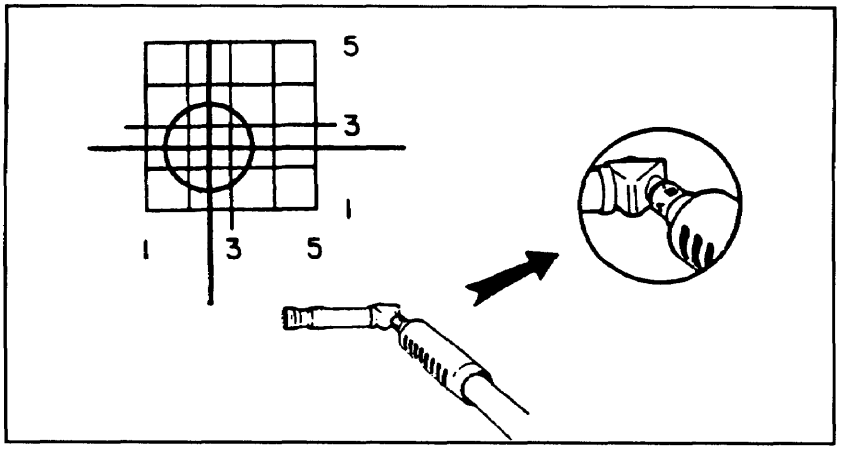


Figure B-25. Azimuth and elevation with adapter to the left, at mark A.

(c) Plot the left aiming point for test 1 on scoring grid 1 (Figure B-26).

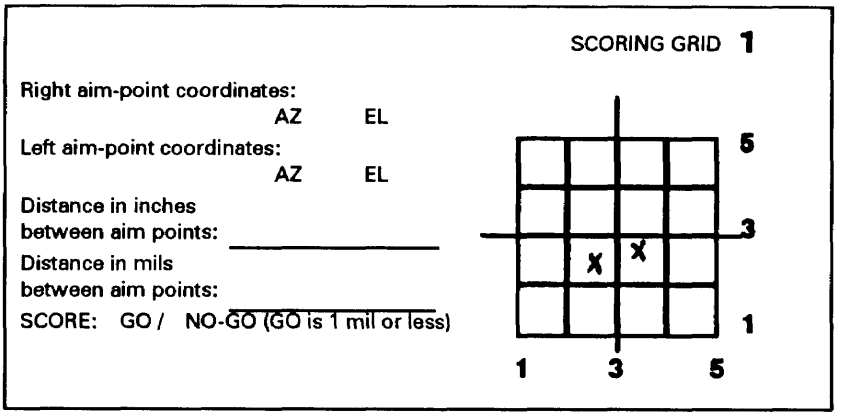


Figure B-26. Left aiming point as recorded on score sheet.

(6) Test 1 of the adapter is now complete. Test 2 is just like test 1 except that the telescope is aligned with position mark B on the adapter before testing.

(a) Rotate the adapter until position mark B is facing right.

(b) Rotate the telescope to the right. The AZ coordinate is 3 1/2, and the EL coordinate is 2 1/4 in this example (Figure B-27, page B-18).

(c) Estimate and record the AZ and EL coordinates in the right aim-point coordinate item of data section 2 of the score sheet.

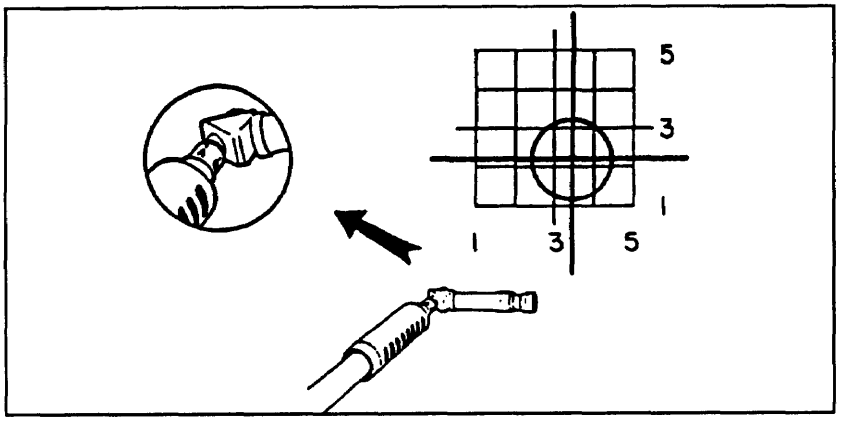


Figure B-27. Azimuth and elevation with adapter to the right, at mark B.

(d) Plot the right aim-point on scoring grid 2 (Figure B-28).

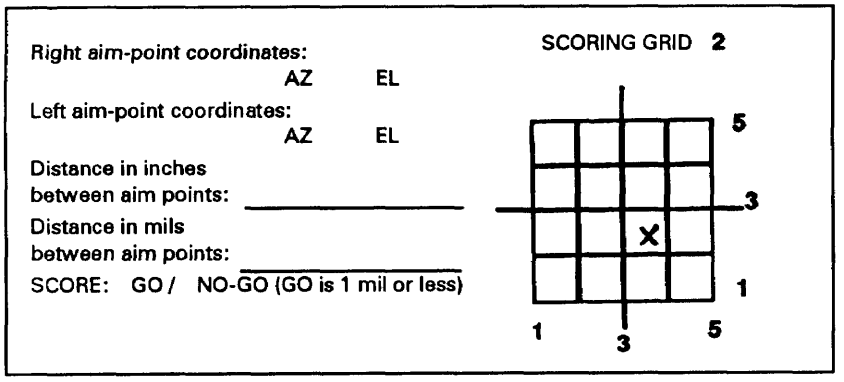


Figure B-28. Right aiming point as recored on score sheet for test 2.

(e) Rotate both the adapter and telescope to the left. Position mark B of the adapter should be facing left. AZ and EL coordinate readings are 2 1/4 and 2 1/4, respectively (Figure B-29).

(f) Estimate and record the AZ and EL coordinates in the left aim-point coordinate in data section 2 of the score sheet.

(g) Plot the left aim-point on scoring grid 2 (Figure B-30).

(7) Data collection for one adapter is now complete. Testing continues until all adapters from one company are tested. Testing one adapter takes about 2 to 4 minutes per piece, so 13 adapters in a company can be tested in

about 1 hour. Adapters are tested one company at a time until all equipment in the battalion is tested. Adapters are then scored.

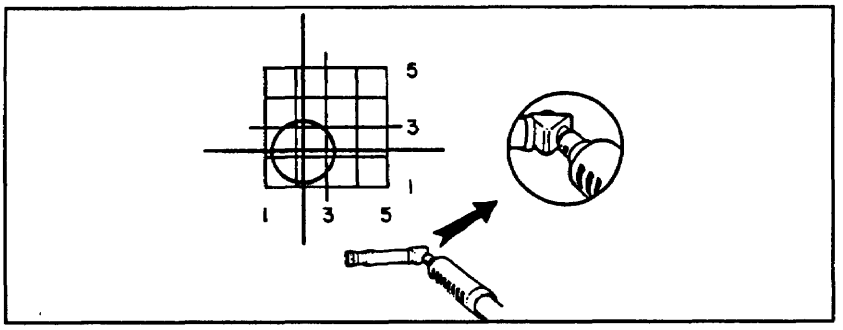


Figure B-29. Azimuth and elevation with adapter to the left, at mark B.

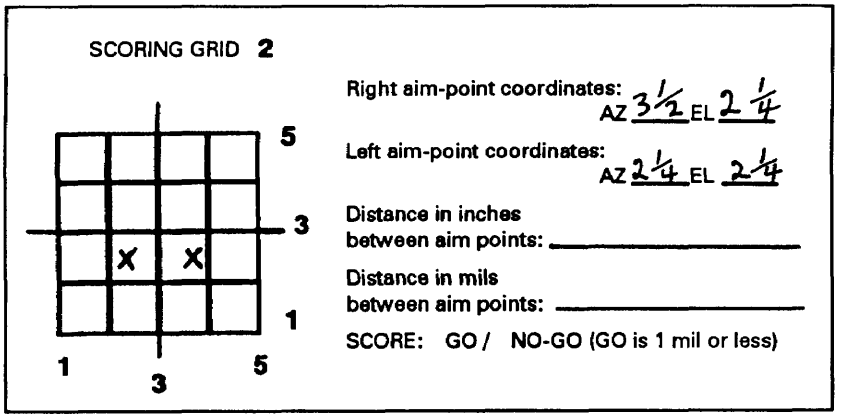


Figure B-30. Left aiming point as recorded on score sheet for test 2.

c. Score the Adapter Data. The distance between the two aiming points during an iteration of a test is used as a measure of accuracy. To receive a GO score, there must be 1 mil or less between the two aiming points. The scoring grid on the score sheet is scaled so that 1 mil is 1/2 inch long. A standard ruler is used to measure the distance between points. The distance must be 1/2 inch or less for a GO score. GOs must be scored on both test 1 and test 2 for an adapter to pass the screening test. A step-by-step description of scoring is given below. The previous sample data will be scored.

(1) Use a ruler that has markings every 1/16 of an inch. A 1/16 scale allows measurement to the nearest 1/8 mil of the score sheet.

(2) Measure the distance between the two aiming points marked scoring grid 1. he distance in this example is 7/16 inch.

(3) Record the measured distance in the distance between aim-points item of data section 1.

(4) Score test 1.

- Circle GO in data section 1 if distance is 1/2 inch or less.
- Circle NO-GO in data section 1 if distance is more than 1/2 inch.

(5) Record distance in mils between aim points (Figure B-31). See the conversion chart at the bottom of the score sheet (Figure B-32).

SCORING GRID 1

Right aim-point coordinates: AZ 3 1/4 EL 2 3/4

Left aim-point coordinates: AZ 2 1/2 EL 2 1/2

Distance in inches between aim points: 7/16

Distance in mils between aim points: _____

SCORE: (GO) / NO-GO (GO is 1 mil or less)

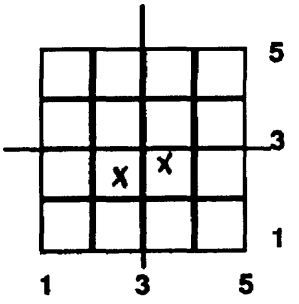


Figure B-31. Distance between aim points, test 1. sheet for test 2.

INCH TO MIL CONVERSION								
INCH	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1
MILS	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2

Figure B-32. Conversion chart.

(6) Measure the distance between aiming points marked on scoring grid 2. The distance in this example is 5/8 inch.

(7) Record the distance between aim-points item of data section l.

(8) Score test 2 (Figure B-33).

- Circle GO in data section 1 if distance is 1/2 inch or less.
- Circle NO-GO in data section 1 if distance is more than 1/2 inch.

(9) Score the screening test.

- Circle PASS at top of score sheet if test 1 and test 2 are GOs.
- Circle FAIL at top of score sheet if:
  — Test 1 is a NO-GO.
  — Test 2 is a NO-GO.
  — Test 1 and 2 are NO-GOs.

A sample completed score sheet for the same data is in Figure B-34, page B-22. The adapter received a GO score for test 1 and a NO-GO for test 2. Therefore, the sample adapter failed the screening test.

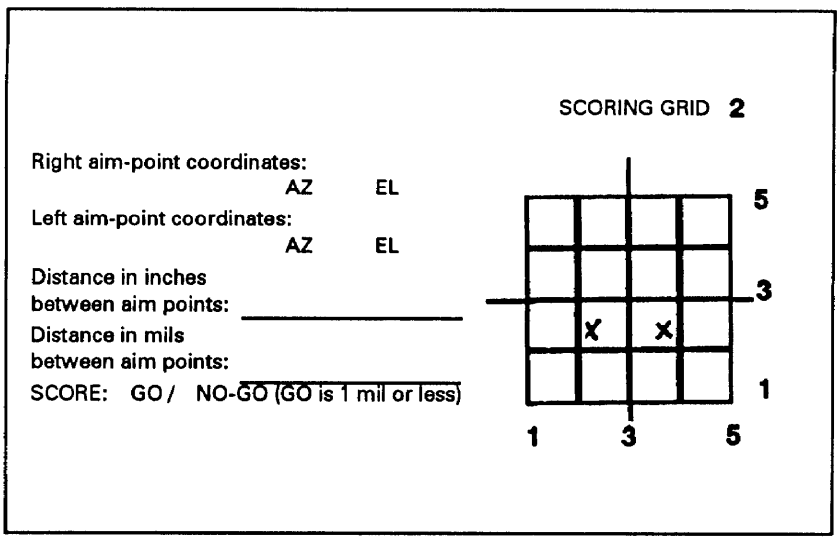


Figure B-33. Distance between aim points, test 2.

EXAMPLE BORESIGHT EQUIPMENT SCORE SHEET

DATE: 10-6-95 TIME: 0832

TESTER: SFC Duncan

UNIT: 1/29

TEST TYPE: TELESCOPE (ADAPTER) KIT

TELESCOPE NO. 3022 ADAPTER NO. 4

PASS / (FAIL) (Pass requires a GO on Tests 1 and 2)

TEST 1

Right aim-point coordinates:

AZ 3 1/4 EL 2 3/4

Left aim-point coordinates:

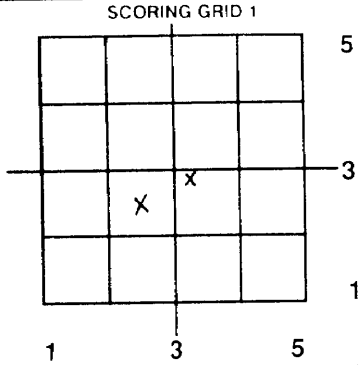
AZ 2 1/2 EL 2 1/2

Distance in inches between aim points: 7/16

Distance in mils between aim points: _____

SCORE: (GO) / NO-GO (GO is 1 mil or less)

SCORING GRID 1



TEST 2

Right aim-point coordinates:

AZ 3 1/2 EL 2 1/4

Left aim-point coordinates:

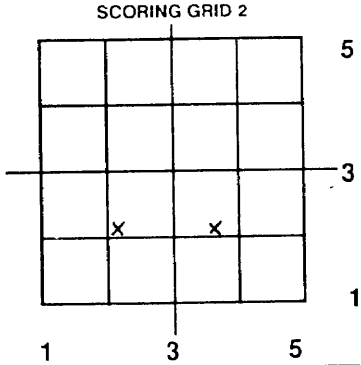
AZ 2 1/4 EL 2 1/4

Distance in inches between aim points: 5/8

Distance in mils between aim points: _____

SCORE: GO / (NO-GO) (GO is 1 mil or less)

SCORING GRID 2



INCH TO MIL CONVERSION

INCH	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1
MILS	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2

Figure B-34. Sample completed score sheet.

B-5. TELESCOPE SCREENING TEST

Telescopes are tested for accuracy when paired with a highly accurate adapter identified after screening of adapters. The most accurate adapter has the shortest distance between right and left aiming points during testing.

a. Mark Telescope. Each telescope has a serial number stamped on the base plate near the shaft. The serial number can be marked on tape placed on the 7.62-mm boresight kit container. Marking the case makes it easier to sort accurate and inaccurate telescopes after testing.

b. Test. Telescopes are tested using the telescope rotation procedures. After the adapter is inserted into the gun barrel, the telescope is inserted with the eyepiece facing to the right. The aiming point is observed and recorded on the score sheet. Only the telescope is rotated until the eyepiece is facing to the left. The telescope passes standards if the aiming point changes 1 mil or less after telescope rotation. Each telescope must meet the standard on two iterations of the test procedures to pass the screening test. The following describes the screening procedure for telescopes. Sample data are not provided, since data recording, plotting, and scoring are the same as for adapters.

(1) Record date, time, tester, unit, telescope serial number, adapter assigned number, and test type in information section of score sheet.

(2) Insert an accurate 25-mm adapter into the gun barrel with position mark A facing up.

(3) Insert telescope into adapter with the eyepiece facing right (Figure B-35).

(4) Record AZ and EL coordinates in the right aim-point coordinate item of data section 1.

(5) Plot the right aim point on the scoring grid.

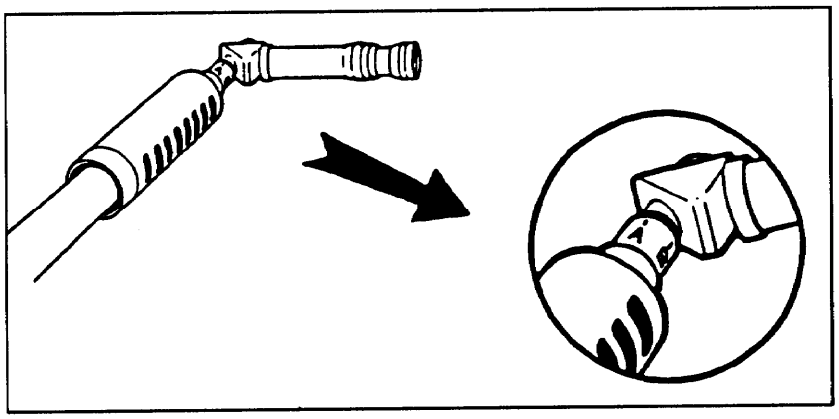


Figure B-35. Mark A facing up, telescope to the right.

(6) Rotate only the telescope 180 degrees so that the eyepiece is facing left. Position mark A of the adapter is facing up (Figure B-36).

(7) Record the AZ and EL coordinates in the left aim-point coordinate item of data section 1.

(8) Plot the left aim point on scoring grid 1. Test 1 is now complete. Test 2 is like test 1 except that position mark B faces up.

(9) Rotate the adapter until position mark B is facing up.

(10) Rotate the telescope to the right. Position mark B of the adapter still is facing up.

(11) Record right aim point in data section 2.

(12) Plot right aim point on scoring grid 2.

(13) Rotate telescope to the left. Position mark B of the adapter is facing up.

(14) Record aim point in the left aim-point coordinate item of data section 2.

(15) Plot left aim point on scoring grid 2. Testing for one telescope is now complete. Testing should continue until all telescopes within the battalion are tested.

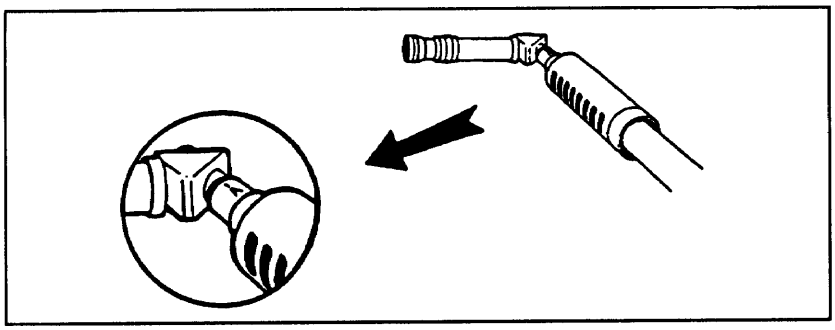


Figure B-36. Mark A facing up, telescope to the left.

c. Score the Telescope Data. Scoring is done after accuracy data are collected for all telescopes. Scoring procedures are the same as for adapters. A GO score is given on an iteration of the test procedure when the distance between right and left aiming points is 1/2 inch or less on the scoring grid of the score sheet A pass on the screening test requires a GO score on both iterations of the test procedure. The telescope fails the screening test if a NO-GO score is received on one or both rotation tests. PASS or FAIL is circled in the information section of the score sheet.

B-6. FORM THE 25-MlM BORESIGHT KITS

The final objective is to form accurate 25-mm boresight kits from telescopes and 25-mm adapters that are accurate. Kits are screened using the same procedure and standard used for adapters—the kit rotation procedure with a 1-mil standard. To screen kits, adapters and telescopes meeting their standards are paired and tested. Accurate kits are reissued to the squad.

a. Before kits are screened, testing of adapters and telescopes may identify, more adapters than telescopes that meet standards. In this case, the number of accurate kits that can be formed is limited by the number of accurate telescopes.

b. If more telescopes than adapters meet standards, then testing of kits begins using telescopes that are the most accurate. These telescopes will be noticeably more accurate than their standard requires. The most accurate telescopes are those with the lowest distance between right and left readings during an iteration of a test.

c. After an accurate kit is formed, it is important to keep the adapter and telescope together. The serial number of the telescope can be etched on the adapter using an electrical etching tool.

B-7. QUALITY DEFICIENCY REPORTS

Telescopes and 25-mm adapters not passing the screening tests must be reported using Standard Form 368, Quality Deficiency Report. Separate QDRs can be completed for each defective piece of equipment; however, it is easier to fill out a single QDR for all defective or inaccurate telescopes and a second QDR for inaccurate adapters. In Figure B-37, page B-27, is a sample QDR for reporting defective and inaccurate telescopes. The information for this sample QDR is typed, but the SF 368 can be hand written.

a. Instructions for filling out the form for a defective or inaccurate telescope are as follows:

(1) *Block 1a.* The QDR should be filled out by the battalion master gunner. Enter the unit designation and address to include the zip code and the Department of Defense Ammunition Code (DODAC).

(2) *Block 1b.* This block is for the name of the person falling out the QDR, duty phone number, and signature.

(3) *Block 2a.* The sample QDR shows the name and address of the manager who will receive the QDR.

(4) *Block 2b.* Leave this block blank.

(5) *Block 3.* The report control number has 12 places in it. The first six places are the DODAC. The next two places indicate the calendar year

(the last two numbers of the year), while the last four places of the report control number indicate the number of QDRs submitted by the unit.

(6) *Block 4.* Enter the dates that equipment was examined and tested.

(7) *Blocks 5 and 6.* The form should have the same NSN and nomenclature for the boresight telescope.

(8) *Blocks 7 and 8.* The manufacture (block 7) and part munber (block 8) for the telescope are shown. The part number is on the base plate of the telescope.

(9) *Block 9.* Serial numbers of defective or inaccurate equipment will be reported in block 22.

(10) *Block 10.* Enter UNKNOWN.

(11) *Blocks 11 and 12.* If telescopes are new or have been repaired, then check block 11. Block 12 is used to enter manufacturing and repair dates if they are known.

(12) *Block 13.* Enter NA.

(13) *Block 14.* Check the NO square.

(14) *Block 15.* Use block 15b to enter the number of items that were examined and tested. The number of defective and inaccurate telescopes that were detected is included in block 15c. Blocks 15a and 15d are filled out if appropriate.

(15) *Block 16.* Enter the NSN of the BFV (M2) in block 16a(l). Enter NA in all other portions of block 16.

(16) *Blocks 17, 18, and 19.* Enter or check UNKNOWN.

(17) *Block 20.* Enter the letter O since defective items were detected and reported at the organizational level.

(18) *Block 21.* Check and write in 45 in the blank for HOLDING EXHIBIT FOR _____ DAYS, so that defective items will be held 45 days pending disposition instructions.

(19) *Block 22.* This is the most important block because it contains the details of the problem. This block presents information suggesting that a problem exists (for example, excessive ammunition expenditure during zeroing), how the equipment was examined or tested to detect the problem (for example, telescope rotation test), and the results of testing. If there is not enough space on the form, then another sheet with the Report Control Number can be included (Figure B-37).

PRODUCT QUALITY DEFICIENCY REPORT ☐ CATEGORY I ☒ CATEGORY II

1a. FROM (Originator)
Commander, 1/29th IN
ATTN: Bn Master Gunner, SFC John C. Smith
Fort Benning, GA 31905 W33RQH

2a. TO (Screening point)
Commander, US AMCCOM
ATTN: AMSMC-QAD
Rock Island, IL 61299

1b. NAME, TELEPHONE NO. AND SIGNATURE: SFC John C. Smith AV 835-4101
1c. DATE:
2b. NAME, TELEPHONE NO. AND SIGNATURE:
2c. DATE:

3. REPORT CONTROL NO.: W33RQH005
4. DATE DEFICIENCY DISCOVERED: May-Jun 86
5. NATIONAL STOCK NO. (NSN): 1005-01-120-0449
6. NOMENCLATURE: 25-mm Boresight Adapter Assembly

7a. MANUFACTURER/CITY/STATE: Unknown
7b. MFRS. CODE: Unknown
7c. SHIPPER/CITY/STATE: Unknown
8. MFRS. PART NO.: 12524010

9. SERIAL/LOT/BATCH NO.: See Block 22
10a. CONTRACT NO.: Unknown
10b. PURCHASE ORDER NO.:
10c. REQUISITION NO.:
10d. GBL NO.:

11. ITEM ☐ NEW ☐ REPAIRED/OVERHAULED
12. DATE RECD. MFRD. REPAIRED, OR OVERHAULED:
13. OPERATING TIME AT FAILURE:
14. GOVERNMENT FURNISHED MATERIAL ☐ YES ☒ NO

15. QUANTITY: a. RECEIVED: b. INSPECTED: 60 c. DEFICIENT: 42 d. IN STOCK:

16. DEFICIENT ITEM WORKS ON/WITH
a. END ITEM (Aircraft, mower, etc.): (1) TYPE/MODEL/SERIES: Fighting Vehicle, Infantry, M2 NSN 2350-01-048-5920 (2) SERIAL NO.: N/A
b. NEXT HIGHER ASSEMBLY: (1) NATIONAL STOCK NO. (NSN): N/A (2) NOMENCLATURE: N/A (3) PART NO.: N/A (4) SERIAL NO.: N/A

17. UNIT COST: $ Unknown
18. ESTIMATED REPAIR COST: $ Unknown
19a. ITEM UNDER WARRANTY ☐ YES ☐ NO ☒ UNKNOWN
19b. EXPIRATION DATE:

20. WORK UNIT CODE/EIC (Navy and Air Force Only.)
0

21. ACTION/DISPOSITION
☒ HOLDING EXHIBIT FOR 45 DAYS ☐ RELEASED FOR INVESTIGATION ☐ RETURNED TO STOCK ☐ DISPOSED OF ☐ REPAIRED ☐ OTHER (Explain in Item 22)

22. DETAILS (Describe, to best ability, what is wrong, how and why, circumstances prior to difficulty, description of difficulty, cause, action taken, including disposition, recommendations. Attach copies of supporting documents. Continue on separate sheet if necessary.)

1. First indication of trouble was excessive ammunition expenditure during numerous zeroings of the 25-mm gun.
2. Deficiencies were detected during inspection and testing of boresight equipment.
3. Adapter accuracy was tested using the kit rotation procedure. The tested adapter and an accurate telescope were rotated 180 degrees in the gun. The standard required a change in aiming point of no more than 1 mil.
4. A total of 42 adapters did not meet the accuracy standard.
5. Adapters not meeting standards were marked with identification numbers. They will be held for 45 days pending disposition instructions.

23. LOCATION OF DEFICIENT MATERIAL

24a. TO (Action Point):
24b. NAME, TELEPHONE NO. AND SIGNATURE:
24c. DATE:
25a. TO (Support Point) (Use Items 26 and 27 if more than one):
25b. NAME, TELEPHONE NO. AND SIGNATURE:
25c. DATE:
26a. TO (Support Point):
26b. NAME, TELEPHONE NO. AND SIGNATURE:
26c. DATE:
27a. TO (Support Point):
27b. NAME, TELEPHONE NO. AND SIGNATURE:
27c. DATE:

348-102
NSN 7540-00-133-8541

STANDARD FORM 368 (REV. 10-85)
GENERAL SERVICES ADMINISTRATION
(FPMR 101-26.4)

Figure B-37. Sample telescope quality deficiency report.

b. Instructions for falling out a QDR for a defective or inaccurate adapter are as follows:
A sample QDR for adapter is in Figure B-38. Blocks 1 and 2 are the same as for telescopes. The report Control Number is different from the telescopes because each QDR has a separate number. The NSN and nomenclature for the 25-mm adapter is shown below. The part number (Block 8) depends on the design of the adapter. Blocks 9 through 21 are filled out in a manner similar to that used for telescopes. Block 22, the most important part of the QDR, is filled out as shown with the exception of the number of reported defective adapters (Item 4). This is the number of defective adapters detected during testing.

c. Repair of the boresight kits is the responsibility of depot maintenance or the manufacturer depending on the deficiency.

PRODUCT QUALITY DEFICIENCY REPORT — [ ] CATEGORY I [x] CATEGORY II

1a. FROM (Originator)
Commander, 1/29th IN
ATTN: Sn Master Gunner, SFC John C. Smith
Fort Benning, GA 31905 W33RQH

2a. TO (Screening point)
Commander, US AMCCOM
ATTN: AMSMC-QAD
Rock Island, IL 61299

1b. NAME, TELEPHONE NO. AND SIGNATURE: SFC John C. Smith AV 835-4101
1c. DATE:
2b. NAME, TELEPHONE NO. AND SIGNATURE:
2c. DATE:

3. REPORT CONTROL NO.: W33RQH004
4. DATE DEFICIENCY DISCOVERED: May-Jun 88
5. NATIONAL STOCK NO. (NSN): 4900-00-867-6607
6. NOMENCLATURE: 5X Boresight Telescope

7a. MANUFACTURER/CITY/STATE: Lenzar Optics Corp.
7b. MFRS. CODE:
7c. SHIPPER/CITY/STATE:
8. MFRS. PART NO.: Lenzar P/N 85-0111-9520-4

9. SERIAL/LOT/BATCH NO.: See Block 22
10a. CONTRACT NO.:
10b. PURCHASE ORDER NO.:
10c. REQUISITION NO.:
10d. GBL NO.:

11. ITEM: [ ] NEW [ ] REPAIRED/OVERHAULED
12. DATE RECD., MFRD., REPAIRED, OR OVERHAULED: N/A
13. OPERATING TIME AT FAILURE: N/A
14. GOVERNMENT FURNISHED MATERIAL: [ ] YES [x] NO

15. QUANTITY: a. RECEIVED: ; b. INSPECTED: 60 ; c. DEFICIENT: 17 ; d. IN STOCK: 60

16. DEFICIENT ITEM WORKS ON/WITH
a. END ITEM (Aircraft, mower, etc.): (1) TYPE/MODEL/SERIES: Fighting Vehicle, Infantry, M2 NSN 2350-01-048-5920 ; (2) SERIAL NO.: N/A
b. NEXT HIGHER ASSEMBLY: (1) NATIONAL STOCK NO. (NSN): N/A ; (2) NOMENCLATURE: N/A ; (3) PART NO.: N/A ; (4) SERIAL NO.: N/A

17. UNIT COST: $ Unknown
18. ESTIMATED REPAIR COST: $ Unknown
19a. ITEM UNDER WARRANTY: [ ] YES [ ] NO [x] UNKNOWN
19b. EXPIRATION DATE:

20. WORK UNIT CODE/EIC (Navy and Air Force Only.): 0

21. ACTION/DISPOSITION: [x] HOLDING EXHIBIT FOR 45 DAYS [ ] RELEASED FOR INVESTIGATION [ ] RETURNED TO STOCK [ ] DISPOSED OF [ ] REPAIRED [ ] OTHER (Explain in Item 22)

22. DETAILS (Describe, to best ability, what is wrong, how and why, circumstances prior to difficulty, description of difficulty, cause, action taken, including disposition, recommendations. Attach copies of supporting documents. Continue on separate sheet if necessary.)

1. First indication of trouble was excessive ammunition expenditure during numerous zeroings of the 25-mm gun.
2. Deficiencies were detected during inspection and testing of boresight equipment.
3. Eleven telescopes were unserviceable or had operational problems as follows:
   A. Water/condensation in the telescopes: S/Ns 1043, 1484, 2134, & 2088A.
   B. Eyepiece disassembled or assembled incorrectly: S/Ns 1050, 1176, 1807, & 2234.
   C. Telescope dirty inside: S/N 2022, 3464,& 1240.
4. Accuracy was tested by rotating the telescope 180-degrees in a 25-mm adapter.
5. Six telescopes not meeting the standard had S/Ns of 1190, 1775, 2086, 2110, 2173, & 2254.

23. LOCATION OF DEFICIENT MATERIAL:

24a. TO (Action Point):
24b. NAME, TELEPHONE NO. AND SIGNATURE:
24c. DATE:
25a. TO (Support Point) (Use Items 26 and 27 if more than one):
25b. NAME, TELEPHONE NO. AND SIGNATURE:
25c. DATE:
26a. TO (Support Point):
26b. NAME, TELEPHONE NO. AND SIGNATURE:
26c. DATE:
27a. TO (Support Point):
27b. NAME, TELEPHONE NO. AND SIGNATURE:
27c. DATE:

368-102
NSN 7540-00-133-5541

STANDARD FORM 368 (REV. 10-85)
GENERAL SERVICES ADMINISTRATION
(FPMR 101-26.8)

Figure B-38. Sample adapter quality deficiency report.

APPENDIX C

BORESIGHTING AND WEAPON CHECKS WITH THE CLOSE-IN PANEL

The close-in boresight panel is used to boresight the BFV turret weapons in a restricted or confined area like the motor pool (Figure C-1). Reference crosses are labeled TOW, ISU, AUX, 25MM, and COAX. A sixth reference is T-shapd and made of metal to allow boresighting of the thermal sight. The background color of the panel is white, the ISU cross and T are black, while the TOW, 25MM, COAX, and AUX crosses are orange. Paragraph C-2 describes how to boresight turret weapons and sights with the close-in boresight panel. Paragraph C-7 describes the dimensions and features of the panel in addition to procedures for making the panel.

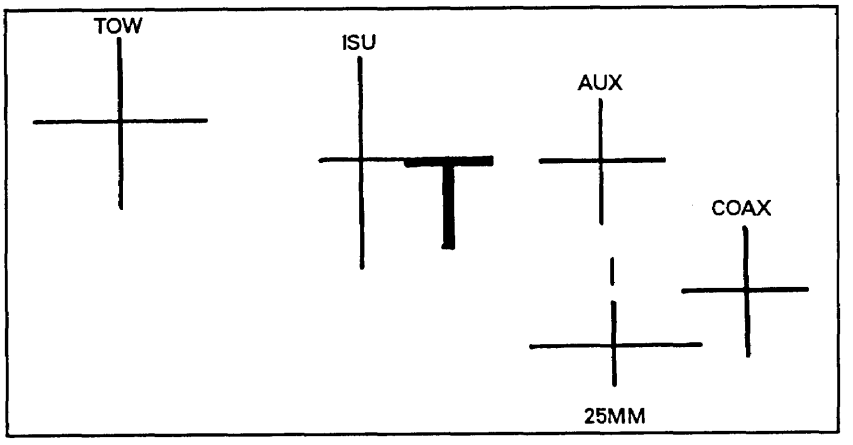


Figure C-1. Close-in panel.

C-1. WEAPON CHECKS

The close-in boresight panel is also used to test backlash, equilibrator, drift, and boresight retention. These tests allow the BFV crew to identify weapon system errors that decrease firing accuracy, and to become more familiar with their weapons. Tests for backlash, the equilibrator, and drift should be conducted in the motor pool in preparation for live fire.

C-2. BORESIGHITING

Depending on the positioning of vehicles and the panel in the motor pool, it may be possible to boresight vehicles of an entire battalion with one panel. Figure C-2 shows an overhead view of panel placement and location of vehicles.

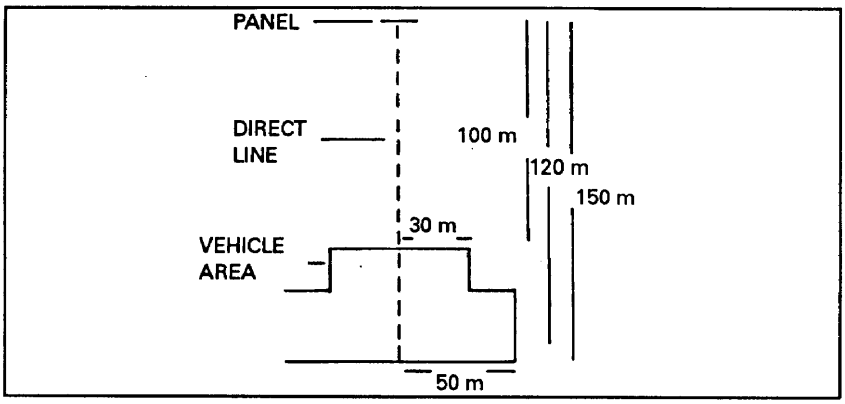


Figure C-2. Panel placement.

a. Panel Placement. The panel can be placed from 0 to 25 meters above ground level. This allows panel placement on top of a building or on the side of a tower.

(1) Vehicles can be up to 30 meters right or left for direct line distances of 100 to 120 meters. For direct line distances of 120 to 150 meters, vehicles can be 50 meters to the right or left.

(2) Direct line distance is determined when the panel is first placed in the motor pool. A boresight kit is inserted into the 25-mm gun of a vehicle positioned on a direct line with the panel. The boresight reticle is aligned with the 25MM cross on the panel. Ranging gaps (Figure C-3) in the 25MM cross are used to determine the panel's distance. Vehicles are at a correct distance if the 2-mil circle of the boresight reticle is on the edge of, or in the gaps of, the 25MM cross. The following are examples of vehicles at correct distances for boresighting (Figure C-3).

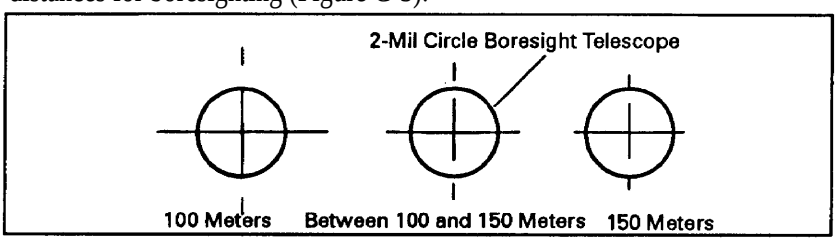


Figure C-3. Correct distance alignment for boresighting.

b. Preparation. Crews should be familiar with boresight procedures described in TM 9-2350-252-10-2. All turret weapons must be mounted and operational. A boresight kit and turret tool kit are required. The following checklist is used to prepare for boresighting with the close-in boresight panel.

- Master power on.
- Turret power on.
- Night vision switch turned on.
- Turret, gun, and TOW select levers in power (to raise TOW launcher).
- TOW launcher raised.
- Turret azimuth select lever in manual.
- Gun elevation select lever in manual.
- TOW elevation drive select lever in power.
- Day and thermal ballistic sight cover doors open.
- Sensor select switch set on neutral.
- Range control knob set at O.
- Reticle brightness turned all the way to the right.
- Magnification set on high.
- AP or HE selected on weapons control panel.
- Status indicator displays ammunition and range index.
- Gun reticle is displayed.
- Turret travel lock disengaged.

c. Weapons and Sight Alignment. Weapons and sight are aligned as follows.

(1) Boresight kit accuracy test should be done before sight and weapon alignment (see Appendix B).

(2) Lay the 25-mm gun. The gun lay pattern should end in elevation to control backlash.

(a) Helper rotates the telescope until the eyepiece is facing up.

(b) Helper aligns the boresight reticle with the 25MM cross on the panel:

- Tells gunner to align the top of the 10-mil circle of the boresight reticle with the 25MM cross on the panel (Figure C-4, page C-4).

- Tells gunner to align the boresight reticle with the 25MM cross on the panel (Figure C-5).

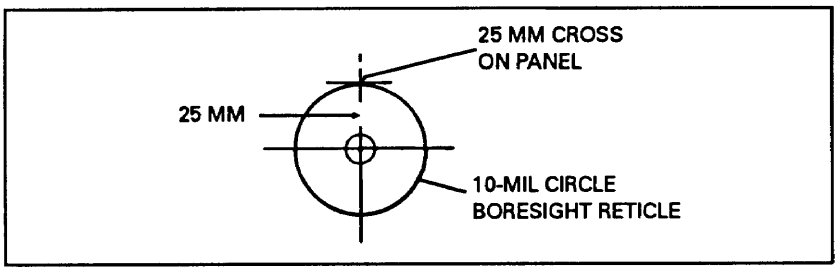


Figure C-4. 10-mil circle aligned with the 25MM cross.

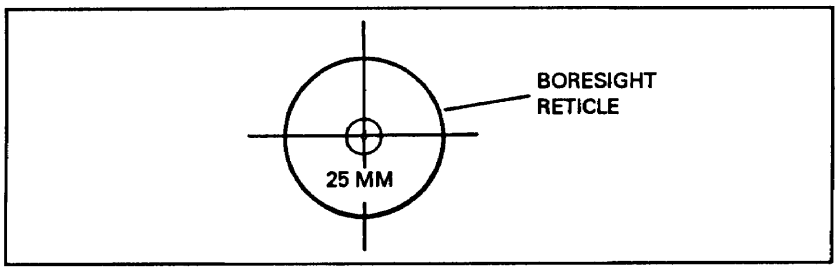


Figure C-5. Boresight reticle aligned with the 25MM cross.

NOTE: Do not traverse the turret or elevate or depress the gun until alignment of the TOW weapon system.

(3) Align the ISU day reticle. The neutral sensor select setting is better on bright sunny days.

(a) Move the sensor select switch (clear or neutral) to produce the best view of the ISU reticle and panel.

(b) Align the ISU reticle with the ISU cross on the panel using the AZ and EL boresight adjustment knobs.

(c) Adjust the browpad (Figure C-6).

NOTE: When the panel is from 100 to 150 meters away, head movement on the browpad changes the aim of the reticle. For example, moving the head to the left shifts the aim to the left. Correct adjustment of the browpad is important.

- Move head to the left until the sight begins to black out and note the aiming point of the reticle; this aiming point is called the left limit.
- Move head to the right and note the right limit of the reticle.

- Move head up and note the upper limit of the reticle.
- Move head down and note the lower limit of the reticle.
- Adjust the browpad so that the reticle appears centered between the left, right, up, and lower limits.

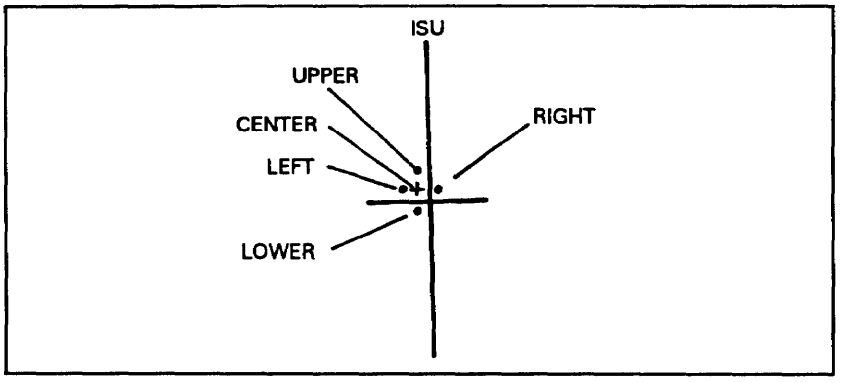


Figure C-6. Reticle centered between left, right, and lower limits.

NOTE: If the ISU reticle is not aligned with the ISU cross after adjustment, the reticle will require realignment.

(d) If necessary, realign the ISU reticle with the ISU cross using the AZ and EL boresight knobs.

(4) Align the auxiliary sight.

(a) Focus sight with the eyepiece diopter.

(b) If necessary, align the cross of the auxiliary sight with the AUX cross on the panel:

- Loosen locknut.
- Adjust thumbscrews (Figure C-7, page C-6) to align the level (horizontal) line of the reticle cross hair with the level line of the AUX cross on the panel.
- Tighten the locknut.
- Loosen horizontal adjustment lock screw by about one-half turn to the left.
- Turn horizontal adjustment screw to align the vertical line of the reticle cross hair with the vertical line of the AUX cross on the panel.
- Tighten the horizontal adjustment lock screw (Figure C-8, page C-6).

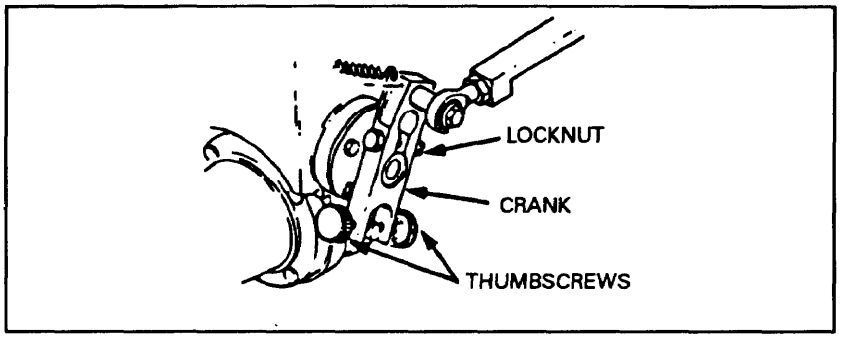


Figure C-7. Locknut, crank, and thumbscrews.

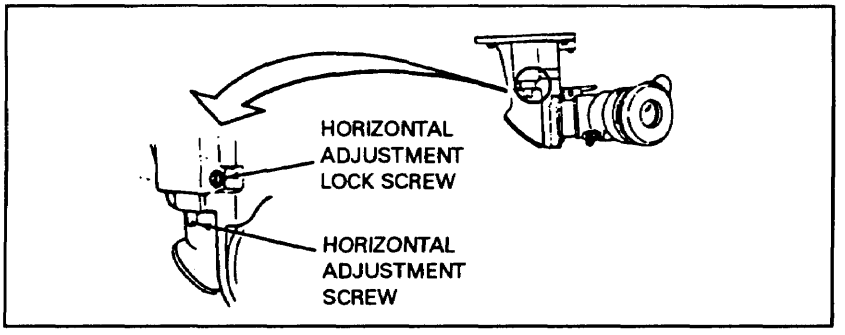


Figure C-8. Horizontal adjustment lock screw and horizontal adjustment screw.

(5) Align the 7.62-mm coax machine gun.

(a) Select ammunition:

- Press the 7.62 button on the weapon control box.
- Check that 7.62 appears on status indicator.

- Helper inserts the 7.62-mm adapter and boresight telescope into the coaxial machine gun.

(c) Helper tells gunner to align the boresight reticle with the COAX cross on the panel:

- Tells gunner to use the AZ knob on the gun to align the boresight AZ cross hair (vertical) with the vertical line on the COAX cross.
- Tells gunner to use the EL knob on the gun to align the boresight EL cross hair (horizontal) with the level line on the COAX cross.

(6) Align the ISU night reticle.

(a) Move sensor select switch to NIGHT.

NOTE: Use of black hot makes it easier to see the ISU reticle on the T of the panel.

(b) Set the polarity switch (PLRT) on black hot (BH).

(c) Adjust the thermal sight until the T is clearly visible:

- Turn the CON knob all the way to the right.
- Turn the BRT knob all the way to the left.
- Turn the BRT knob to the right until the "T" on the panel is seen.
- Focus on the T using the focus ring.
- Turn the CON knob left about one-quarter turn.
- Turn BRT knob to the right until the T becomes clearer.
- Repeat focus ring, CON knob, and BRT knob adjustments, if necessary.

(d) Align the ISU reticle with the T on the panel using the night boresight EL and AZ knobs (Figure C-9).

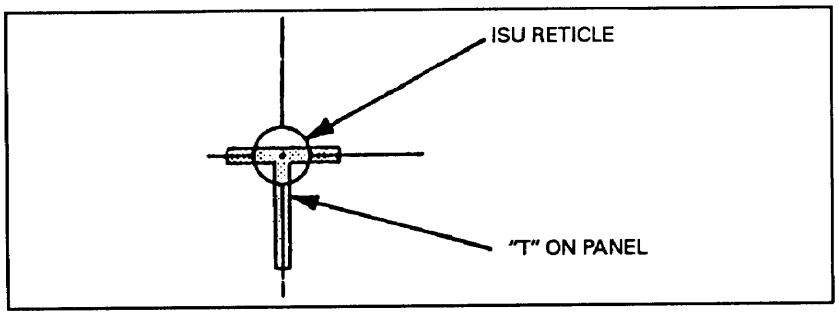


Figure C-9. ISU reticle aligned with T.

(7) Align the TOW weapon system.

(a) Move the sensor select switch to clear or neutral.

(b) Place the 25-mm gun elevation select lever in the power mode.

(c) Place the TOW elevation lever in the manual mode.

(d) Helper inserts the boresight telescope into the alignment hole between the TOW launcher tubes.

(e) Press the TOW button.

(f) Check that the TOW indicator light goes out when the self-test is completed.

(g) Check that TOW appears on status indicator.

(h) Helper aligns the boresight reticle with the TOW cross on the panel:

- Tells gunner to traverse to align the boresight AZ cross hair (vertical) with the vertical line of the TOW cross.
- Tells gunner to gunner or depress to align the boresight EL cross hair (horizontal) with the level line of the TOW cross.

(i) Align the TOW reticle EL cross hair (horizontal) with the level line on the ISU cross of the panel using the TOW boresight screw.

(j) Traverse to align the TOW reticle with the ISU cross on the panel (Figure C-10).

- Determine launcher alignment error:
- Observe the aiming point of the boresight reticle on the TOW cross of the panel.
- Estimate distance (mils) between the boresight reticle and TOW cross using the 2-mil circle of the boresight reticle.

(1) Adjust the launcher if the error is more than 1 mil.

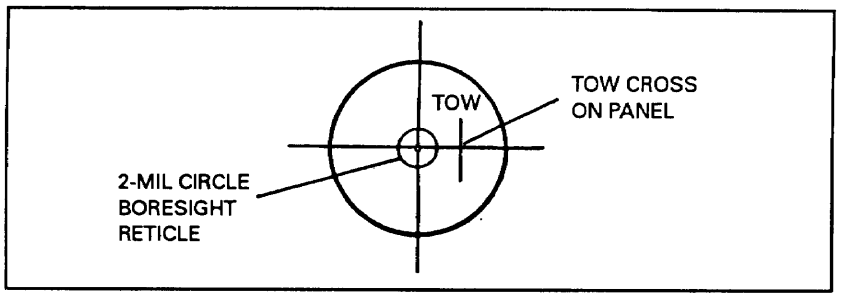


Figure C-10. 2-mil circle and TOW cross alignment.

C-3. BACKLASH TEST

When the direction of gun elevation is reversed (for example, the gun is depressed after being elevated), the sight may not immediately move with the gun. This slack between the sight and gun is called backlash. Backlash is controlled during boresighting by using a gun lay ending in elevation. To prevent gunnery errors caused by backlash, targets should also be engaged using a gun lay ending in elevation. Separate backlash testing procedures are described for the ISU and auxiliary sight.

a. Boresight. The 25-mm gun, ISU day reticle, and auxiliary sight must be foresighted as described in paragraph C-2 before backlash is tested. Weapon, sight, and turret controls are set the same as at the start of boresighting.

b. Measure ISU Backlash. ISU backlash is measured as follows:

(1) If necessary, select AP-SS on the weapon control box. Do not move or remove the 25-mm boresight kit until backlash testing is completed.

(2) Insert 25-mm adapter and boresight telescope into the 25-mm gun If necessary, focus the telescope.

(3) Align the ISU reticle with the ISU cross on the panel using gun and turret handwheels.

(4) Depress the gun. Use the gun handwheel to depress the gun, until the top of the ISU reticle touches the bottom of the ISU cross on the panel (Figure C-11).

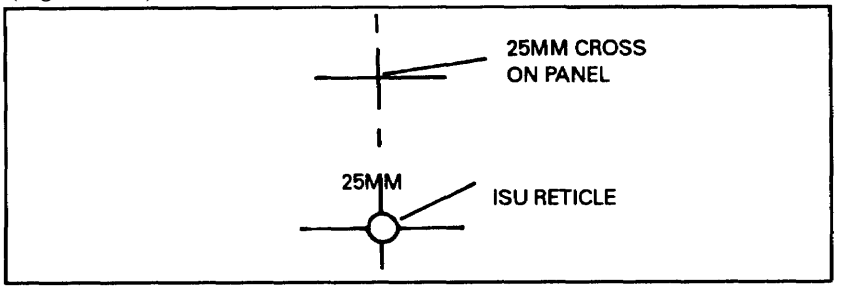


Figure C-11. ISU reticle position below the 25MM cross.

(5) Elevate the gun to align the ISU reticle with the ISU cross on the panel.

(6) Helper notes the aiming point of the boresight reticle.

(7) Elevate the gun. Use the gun handwheel to elevate the gun, until the bottom of the ISU reticle touches the top of the ISU cross on the panel.

(8) Depress the gun to align the ISU reticle with the ISU cross on the panel.

(9) Helper notes the aiming point of the boresight reticle.

(10) Measure backlash.

(a) Helper notes the location of the boresight reticle and the 25MM cross.

(b) Helper uses the 2-mil circle of the boresight reticle to estimate the distance (mils) between aiming points observed in elevation and depression (Figure C-12).

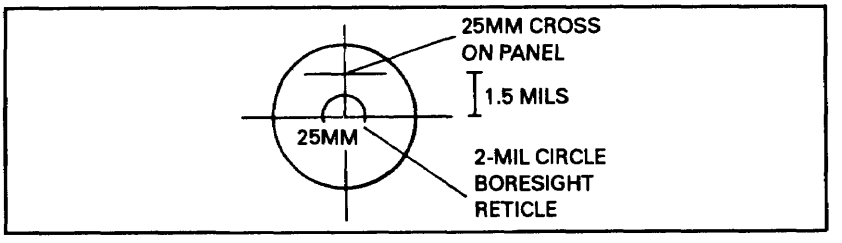


Figure C-12. Distance between aiming points.

(c) Notify unit maintenance if backlash is more than 2 mils.

NOTE: The backlash for the example is 1.5 mils.

c. Measure Auxiliary Sight Backlash. Auxiliary sight backlash is measured as follows.

(1) Insert the 25-mm adapter and boresight telescope into the 25-mm gun.

(2) Align the auxiliary sight reticle with the AUX cross on the panel using the turret and gun handwheels.

(3) Use the gun handwheel to depress the gun, until the top of the auxiliary sight reticle touches the bottom of the AUX cross on the panel (Figure C-13).

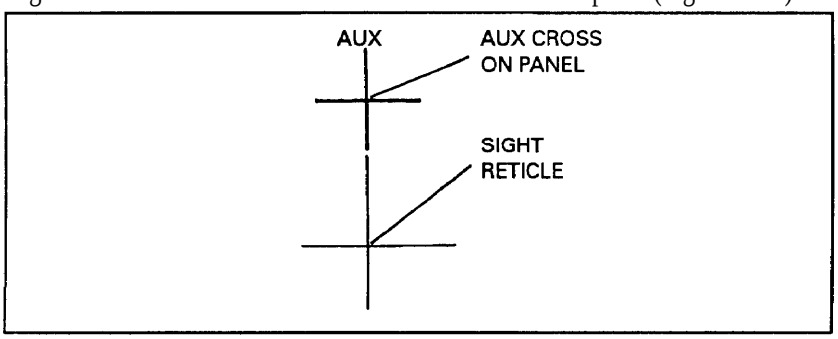


Figure C-13. Auxiliary sight reticle positioned below the AUX cross.

(4) Elevate the gun to align the auxiliary sight reticle with the AUX cross on the panel.

(5) Helper notes the aiming point of the boresight reticle.

(6) Use the gun handwheel to elevate the gun; the bottom of the auxiliary sight reticle touches the top of the AUX cross on the panel (Figure C-14).

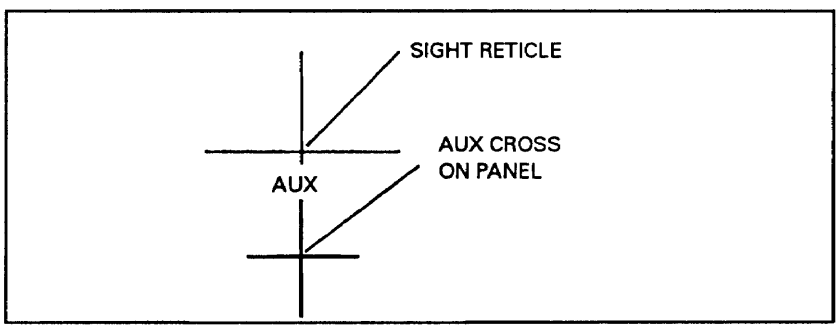


Figure C-14. Auxiliary sight reticle positioned above the AUX cross.

(7) Depress the gun to align the auxiliary sight reticle with the AUX cross of the panel.

(8) Helper notes the aiming point of the boresight reticle.

(9) Measure backlash as described for the ISU.

C-4. EQUILIBRATOR TEST

When the ISU reticle is laid on target in power mode, the aiming point should not change when the palm switches are released. The equilibrator may be faulty if the sight and the gun drop after the palm switches are released. The following is a check of the equilibrator. The equilibrator test is conducted after boresighting and the backlash test. Turret and gun select levers should be on power.

a. Using the gunner's handstation align the ISU reticle with the ISU cross on the panel.

b. Release the palm switches.

c. Notify unit maintenance if the ISU circle and ISU cross are not aligned when the palm switches are released. Failure to pass the test may be because of a faulty equilibrator or a faulty gun elevation brake.

C-5. DRIFT TEST

Drift is tested after the equilibrator test. Switch settings and vehicle conditions are the same as existing at the end of the equilibrator test. When stabilization is turned on, the palm switches are depressed, and the BFV is stationary, the 25-mm and coax reticle is allowed to drift from the aiming point no more than 0.1 mil per second. A 5-second test of drift is described.

a. Turn stabilization on.

b. Check that the stabilization indicator light comes on.

c. Press the drift button. Testing should be conducted within one minute after pressing the drift button.

d. Align the ISU reticle with the ISU cross on the panel, using the gunner's handstation.

e. Start five-second test.

(1) Helper uses watch to signal start of test.

(2) Gunner presses the palm switches while keeping the handstation in the neutral position.

f. Stop the test.

(1) Helper signals end of five-second test.

(2) Gunner releases palm switches on helper's signal.

g. Drift is scored.

(1) The standard is met if the ISU cross of the panel is either on or within the 1-mil circle of the ISU reticle. (See Figure C-15, page C-12.)

(2) Notify unit maintenance if the ISU cross of the panel is outside the l-mil circle of the ISU reticle.

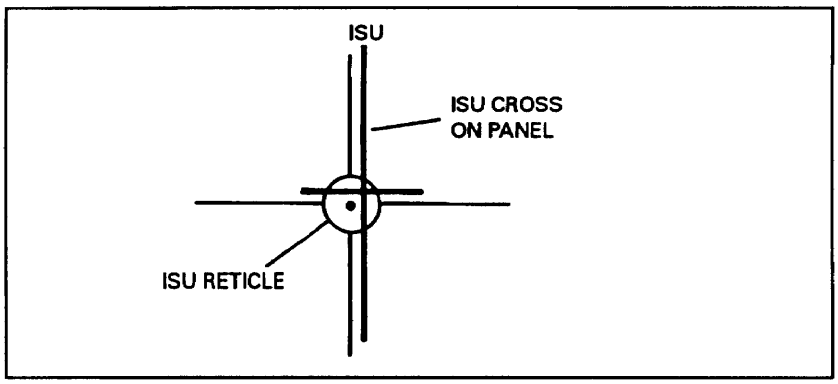


Figure C-15. Drift within 1-mil circle.

C-6. BORESIGHT RETENTION TEST

After the 25-mm gun and ISU are boresighted, sight alignment should change no more than 0.25 mil for vehicle operation up to 50 miles, provided that the ambient temperature does not change more than 54 degrees (plus or minus) from that existing when boresighting was conducted. If boresight retention requirements are met, the weapon can be boresighted in the motor pool and the vehicle can move to a fighting position without the need to re-boresight before zeroing.

a. Vehicles should be tested to ensure that boresight retention requirements are met. The most accurate boresight equipment should be used to test boresight retention. Because of boresight equipment errors, the boresight retention standard for field testing is 1 mil.

b. Boresight retention can be measured during a tactical road march or any other movement exercise that does not require adjustment of the boresight knobs. Boresight retention can be measured following movement of any distance; movement does not have to be 50 miles. Testing allows crews to learn the conditions that lead to loss of boresight retention for their vehicle. This is critical for deciding when to re-boresight the weapons.

(1) Identify a 25-mm boresight kit that passes the kit accuracy test.

(2) Conduct preparation, lay the 25-mm gun, and align the ISU day reticle as described in paragraph C-2.

(3) Tape the cover of the boresight knobs to prevent accidental movement or adjustment.

(4) Record distance traveled and temperature variations during the vehicle operations (Weather conditions such as hot or cold temperature, rain.)

(5) Test boresight retention.

(a) Return vehicle to same positioning which boresighting was conducted.

(b) Conduct preparation as described in paragraph C-2.

(c) Insert the boresight kit into the 25-mm gun.

(d) Align the ISU reticle with the ISU cross on the panel using a gun lay pattern ending in elevation.

(e) Determine boresight retention:

- The l-mil field standard is met if the 25MM cross on the panel is on or within the 2-mil circle of the boresight telescope (Figure C-16).
- The standard is not met if the 25MM cross of the panel is outside the 2-mil circle of the boresight telescope.

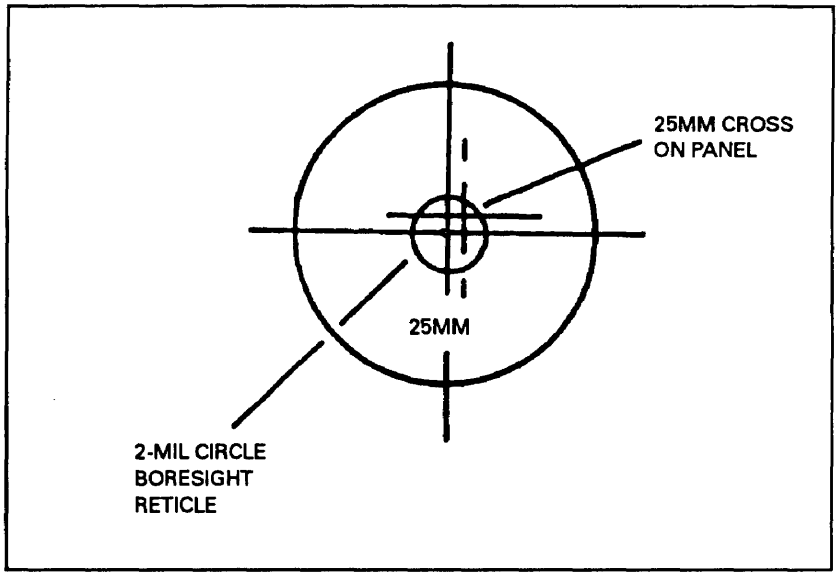


Figure C-16. Boresight retention met.

C-7. PANEL CONSTRUCTION

The panel can be constructed locally.

a. Panel Dimensions and Features. The close-in boresight panel is 4 feet by 8 feet. The location of the center of each cross is measured from the lower left corner of the panel (Table C-1, page C-14).

DIRECTION	REFERENCE CROSS					
	TOW	ISU	T	AUX	25 MM	COAX
RIGHT	19	41	49	63	64	74
UP	35	31	31	31	14	19

Table C-1. Distance (inches) of crosses from lower left corner of close-in boresight panel.

(1) The lines of all crosses, except the T, are 1/2 inch. The l-inch lines of the T are made of steel, screwed on the panel to allow a good image for thermal boresighting. Lines are either black or orange. Crosses viewed with a black reticle (boresight telescope and auxiliary sight) are orange. The two references (ISU and T) viewed using the 25-mm reticle are black. (See Table C-2.)

FEATURE	REFERENCE CROSS					
	TOW	ISU	T	AUX	25 MM	COAX
COLOR	ORANGE	BLACK	BLACK	ORANGE	ORANGE	ORANGE
WIDTH (inches)	1/2	1/2	1	1/2	1/2	1/2

Table C-2. Color crosses and with of lines.

(2) The length of each arm on the crosses is in Table C-3. The 8-inch upper and lower lines of the 25MM cross have ranging gaps from 4 to 6 inches from the center of the cross.

ARM	REFERENCE CROSS					
	TOW	ISU	T	AUX	25 MM	COAX
UPPER	8	10	0	6	8	6
LOWER	8	10	8	6	8	6
RIGHT	8	4	4	6	6	6
LEFT	8	8	4	6	6	6

Table C-3. Length of lines on crosses.

b. **Supplies.** The following supplies are needed:

- 3/4-inch x 4-foot x 8-foot exterior plywood, A/C grade or B/C grade.
- A 15 l/2-inch-long strip of l-inch-wide steel.
- Four number 6, 3/4-inch-long flat-head wood crews.

- One quart of white primer, exterior (oil or alkyd base).
- One quart of white paint, exterior (latex or oil base).
- One pint of black paint, exterior (latex or oil base).
- One pint of bright orange paint, exterior (latex or oil base).
- Paint thinner or brush cleaner.
- Medium grit sandpaper.
- If the names of crosses are not painted on, then 3-inch vinyl stick-on letters are used to spell TOW, ISU, AUX, 25MM, and COAX.

c. Equipment. The following equipment is needed:

- 8-foot straight-edge.
- Two C-clamps.
- Framing square.
- 8-feet (or longer) tape measure.
- 6-inch or 8-inch paint pad or a paint brush.
- 3/8-inch paint brush.
- A router and a l/2-inch straight router bit.
- Power drill and a l/4-inch bit.
- Jigsaw.
- Pencil.

d. Procedures. The following procedure allows construction of the panel by any person who can measure, paint, use a jigsaw and a router. Painting the l/2-inch-wide lines for the crosses is simplified by using a router to cut grooves that form the crosses. The grooves are then painted.

(1) Sand the front, back, and edge of plywood to remove dirt and grease.

(2) Mark the words "LOW, LEFT" on the lower left-hand corner of the panel.

(3) To mark the TOW cross, use a pencil and the 8-foot straight-edge to (Figure C-17, page C-16)–

(a) Make a mark 19 inches to the right (A) of the lower left edge of the panel. (Table C-1 shows that the TOW cross is 19 inches from the left edge of the panel.)

(b)Make a mark 19 inches to the right (B) of the upper left edge of the panel.

(c) Draw a line connecting the two marks made at (A) and (B).

(d) Make a mark at 35 inches up from the bottom edge of panel (along 8-foot side) (C).

(e) Make a mark at 35 inches up from the lower right edge of the panel (D).

(f) Draw a line connecting the two marks made at (C) and (D).

(g) Make marks 8 inches from the center of the cross formed by lines drawn (E, F, G, H). (The length of each arm is shown in Table C-3.)

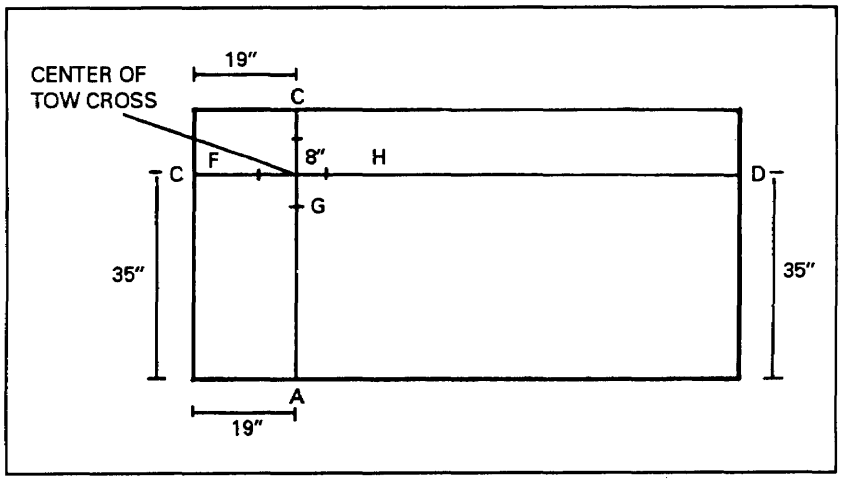


Figure C-17. Positioning the TOW cross.

(4) To mark the ISU, AUX, 25MM, and COAX crosses, use the following procedure.

(a) Using the data from the RIGHT direction row of Table C-1, mark the vertical lines of the crosses as described above for the TOW cross.

(b) Using the data from the UP direction row of Table C-1, mark the horizontal lines of the crosses as described above for the TOW cross.

(c) Mark the length of each arm of each cross using the data from Table C-3.

(5) Rout the crosses by performing the following for each cross.

(a) Set router depth shallow (1/32 or 3/64 inch) so that it will not cut through the first layer of the plywood.

(b) Clamp the straight-edge to the wood to serve as a guide for the router.

(c) Use the router to cut grooves between the tick marks for the lines of the cross.

(6) Apply a coat of primer to the front, back, and edge of the panel. Make sure that paint does not build up in the grooves.

(7) Apply a coat of white paint to the entire panel.

(8) Paint the crosses using a 3/8-inch paint brush and colors described in Table C-3.

(9) Make the T.

(a) Cut the steel strip into one 8-inch section and another 7 l/2-inch section using a jigsaw.

(b) Drill two l/4-inch holes in each of the two sections: each hole is placed 1 1/2 inches from the end.

(c) Apply a coat of primer.

(d) Apply a coat of black paint.

(10) Mount the T.

(a) Lay a straight edge along the right arm of the ISU cross.

(b) Draw a 9-inch line along the straight-edge starting at the edge of the right arm.

(c) Align the 8-inch strip of steel on the line; the left edge of the strip touches the right edge of the right arm of the ISU cross.

(d) Mount the strip using two wood screws.

(e) Center the 7 l/2-inch strip underneath the 8-inch strip to form the letter T.

(f) Mount the 7 l/2-inch strip using two wood screws.

(11) Label the crosses using vinyl letters and numbers. Apply labels as shown in Figure C-1.

APPENDIX D

DISMOUNTED INFANTRY TRAINING

This appendix provides information for developing dismounted training programs. ARTEP 7-7J-DRILL and ARTEP 7-8-MTP provide the task, conditions, and standards. Chapter 6 describes the METL development process and lists methods for commanders to assess dismounted infantry proficiency. Training must be battle-focused, challenging, and must emphasize dismounted skills. Dismounted training must start with the individual soldier and progress through fire team, squad, and platoon.

D-1. REQUIREMENTS FOR TRAINING EXECUTION

Training to tough and demanding standards develops dismounted infandtrymen who can fight and win on the battlefield. Leaders and trainers should review their training responsibilities for plannning and execution in Chapters 3 and 4 of FM 25-101. This review will enhance their ability to provide tough and challenging training. Leaders must apply several important considerations when conducting dismounted infantry training. These key considerations are—

- Concentrate on the basic fundamentals—shoot, move, communicate, sustain, and secure.
- Keep it simple. Ensure basic task proficiency before progressing to more complex tasks.
- Use drills as prerequisites. Certify crew drills and battle drills before executing collective live-fire tasks.
- Make training realistic. Expose leaders and soldiers to unexpected and challenging situations—favorabIe and unfavorable.
- Replicate battlefield conditions for live-fire training.
- Conduct a risk assessment before training.
- Conduct AARs as part of training.

D-2. WEAPONS AND EQUIPMENT TRAINING

All squad members must be proficient with their assigned weapons and equipment. Proficiency with these individual tasks must be established before collective task training. Weapon and equipment training consist of preliminary weapon training and qualification.

a. Preliminary Weapons Training. During preliminary weapons training, squad members learn and demonstrate their proficiency in disassembly, assembly, PMCS, and operation of their weapons along with all other squad equipment. The following weapons and equipment are included in preliminary weapons training:

- M16A2 rifles.
- M203 grenade launchers.
- M249 light machine guns.
- M47 Dragon/Javelins.
- Night vision devices.
- Mines and demolitions.
- Squad communication equipment.

b. Weapons Qualification. Squad members are evaluated on their individual proficiency with their assigned weapons during weapon qualfications every six months. (For detailed training strategies, see the applicable weapon field manuals and DA Pam 350-38.)

D-3. MOVEMENT TRAINING

During movement training dismounted members train and rehearse individual, buddy team, fire team, squad, and platoon movement formations and techniques. Movement training begins with individual and buddy-team movement techniques. Once individual and buddy-team movement proficient has been demonstrated, fire team and squad formations should be established. Squad movement techniques are trained after all squad members are confident in their individual abilities to move within fire team and squad formations. All squad members must know arm-and-hand signals. Platoon movement training is conducted after squad proficient is achieved.

a. Individual and Buddy Team Movement. Squad and team leaders control and lead by example. They direct dismounted members to move by the best method for the situation. In an assault, this movement may be by crawling or by short rushes from cover to cover. A high or low crawl is slow but may be necessary when cover and concealment are limited. Soldiers use short three- to five-second rushes when cover and concealment are available and the volume of enemy fire is low enough to allow brief exposure. Soldiers

must look for the next covered position before moving away from their firing positions and move using the best covered routes available.

(1) Individual movement training should include high and low crawl techniques, the difference between cover and concealment, and short rush techniques. (Figure D-1.) FM 21-75 explains the proper movement techniques. Squad leaders can designate a lane through various types of terrain and have soldiers move from one end to the other. Squad leaders should critique the soldier's performance based on the use of cover and concealment, length of exposure to enemy free, and speed of movement. As soldiers master these basic skills, leaders can add challenges with natural or man-made obstacles, or add the use of MILES with a single enemy soldier at the far end of the lane. The squad member must negotiate the lane without being hit by enemy fire.

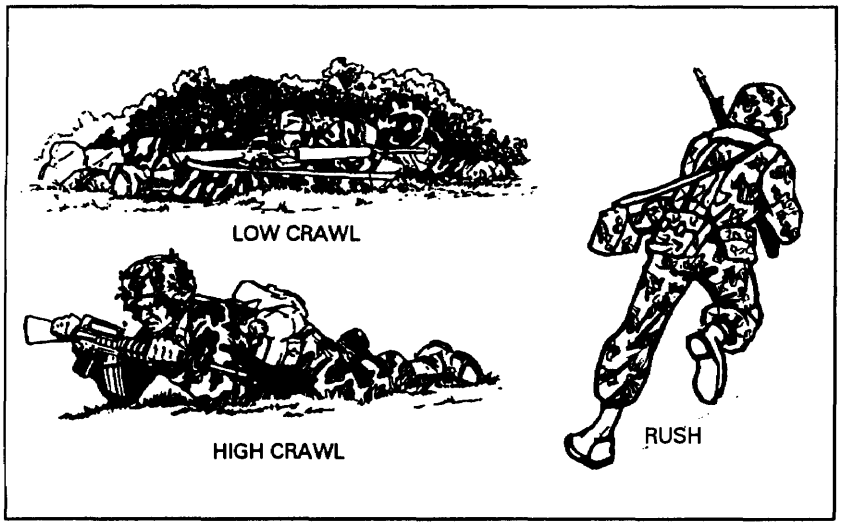
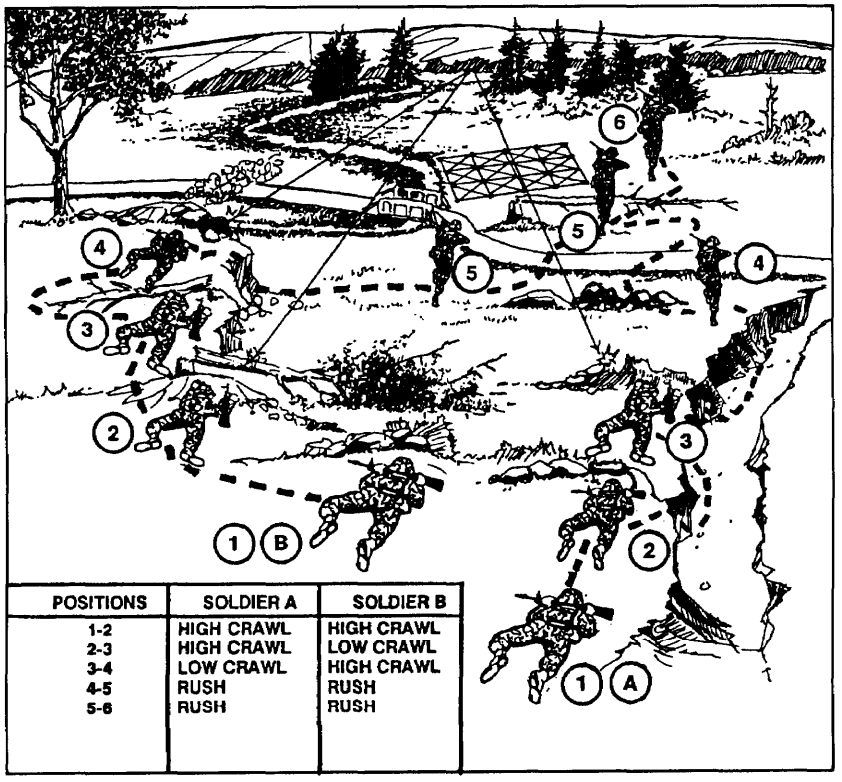


Figure D-1. High and low crawl and rush.

(2) Buddy team movement training builds on individual movement skills by having two-man teams negotiate the lane together. One soldier provides covering fire while his buddy moves to the next covered position. The team must maintain visual or audible communication with each other at all times during the movement. This exercise forms the foundation for trust and confidence between fire team and squad members. It should be conducted before executing battle drill training. Figure D-2, page D-4, shows an example individual/buddy team movement exercise lane. The following is an example individual/buddy team movement exercise.



POSITIONS	SOLDIER A	SOLDIER B
1-2	HIGH CRAWL	HIGH CRAWL
2-3	HIGH CRAWL	LOW CRAWL
3-4	LOW CRAWL	HIGH CRAWL
4-5	RUSH	RUSH
5-6	RUSH	RUSH

Figure D-2. Example individual/buddy team movement lane.

(a) Squad leaders should select a course area with various types of cover and concealment to allow the soldier to choose the best positions and routes. The soldier's or team's movement and coordination are evaluated by the performance measures in STP 21-1-SMCT, task 071-326-0502.

(b) The squad leader or team leader conducts precombat checks to ensure that each soldier has the correct equipment and ammunition before starting the course. The soldier or team occupies prone positions at the start of the course, and the team leader tells them to move.

(c) Soldiers search the terrain to the front for enemy activity, select their next position, and choose a route that has the most cover and concealment.

(d) The soldier quickly moves along the route with the least exposure to enemy fire and does not cross in front of his buddy and mask his free. The soldier uses the appropriate individual movement technique.

- Uses the rush when—
  — Crossing open areas.
  — Low volume of enemy fire allows brief exposure.
  — Time is critical.
- Uses high crawl when—
  — The route provides good cover and concealment.
  — Poor visibility reduces enemy observation.
  — Enemy fire prohibits rushing but speed is required.
- Uses low crawl when—
  — The route provides cover and concealment less than one-foot high.
  — The enemy has good observation and can effectively fire at the position.
  — Speed is not required.

(e) This process continues until the soldier closes with and kills the enemy soldier. If the enemy kills the soldier, the process should start again. Commanders can add situations to this course to make the soldier execute other individual tasks.

- The soldier can move over, through, or around a wire or log obstacle (STP 21-1-SMCT, task 071-326-0503) while negotiating the course.
- Squad or team leaders can throw artillery simulators during daylight exercises or flares during night operations and evaluate the soldier's ability to react to indirect fire (STP 21-1-SMCT, task 071-326-0510) or flares (STP 21-1-SMCT, task 071-326-0511).
- Once the soldier closes with the enemy, he can use hand grenades (STP 21-1-SMCT, task 071-325-4407) to knock out the enemy position. Once the enemy is killed or withdraws, the soldier should prepare and report enemy information (STP 21-1-SMCT, task 301-348-1050) in the SALUTE report format.
- At the end of the mission, the soldier moves back to the start point (which can simulate friendly lines) and is challenged by the next soldier. Both soldiers are graded on using a challenge and password (STP 21-1-SMCT, task 071-3314801).

b. **Fire Team, Squad, and Platoon Movement.** Fire team, squad, and platoon movement training consist of movement formations and techniques. Formations are the arrangement of squad members in relation to each other. Movement techniques are the ways in which squads and platoons traverse terrain

(1) *Movement formations.* Formations provide control, flexibility, and security. Leaders choose formations based on METT-T. Leaders position

themselves in the best position to control movement. Team leaders' positions are in front of their teams. All members must maintain positions that allow them to see their leaders and to receive signals. Formations are modified as necessary depending on terrain and visibility. Each member is assigned different sectors of responsibility to guard while moving. This provides the formation with all-round security.

(a) Fire team formations.

- The wedge is the basic formation for fire teams (Figure D-3). The interval between soldiers in a wedge expands or contracts depending on terrain or visibility.

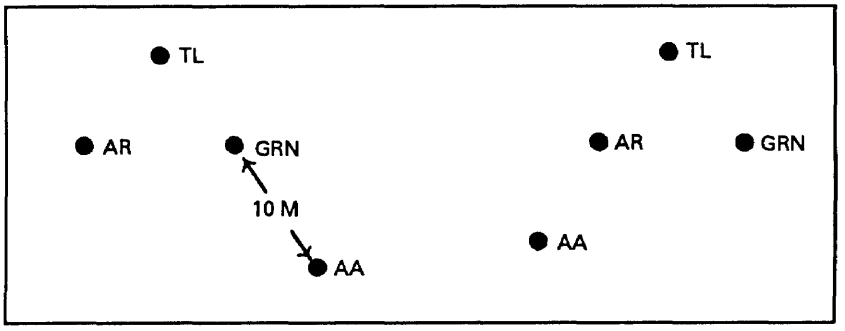


Figure D-3. Fire team wedge formation.

- The file formation is used by the fire team when terrain precludes use of the wedge (Figure D-4).

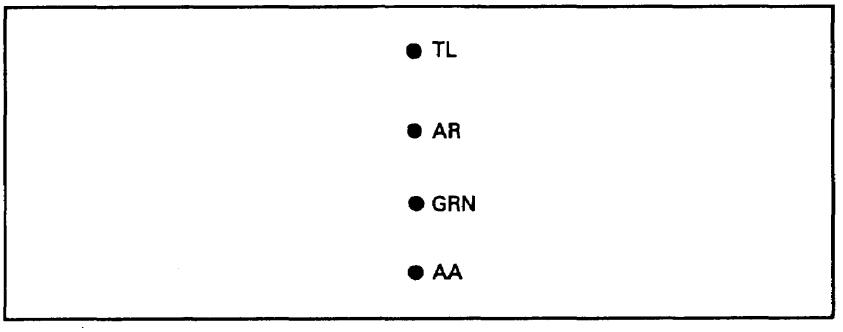


Figure D-4. Fire team file formation.

(b) Squad formations.

- The squad's basic formation is the column (Figure D-5). It provides good dispersion laterally and in depth without sacrificing control, and it facilitates maneuver.

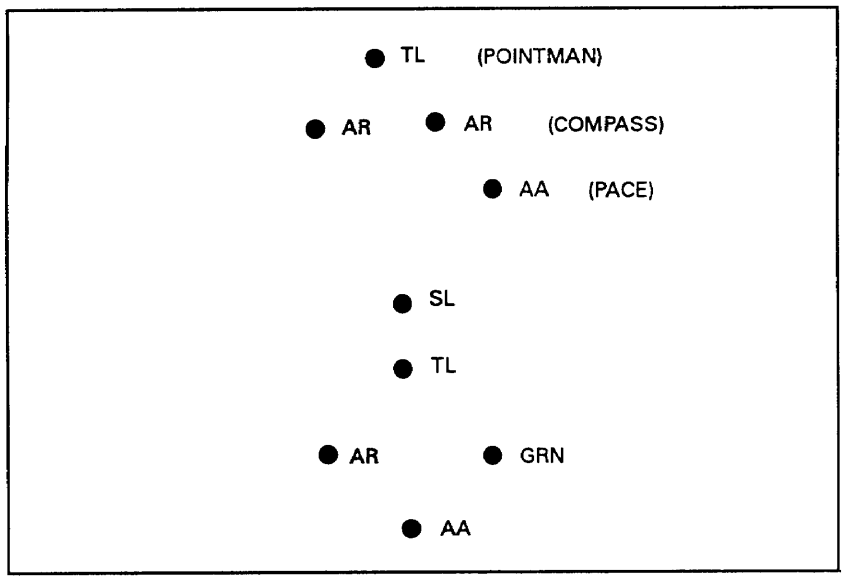


Figure D-5. Squad column formation.

- The squad line provides maximum firepower to the front (Figure D-6).

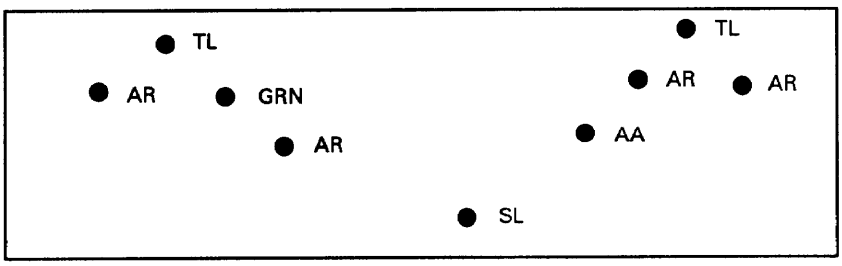


Figure D-6. Squad line formation.

- The squad file is used when terrain is restrictive (Figure D-7, page D-8). The squad leader can place himself in the first or second position if he wants more control of the formation and can be in position to make key decisions quickly. Additional control of the rear of the formation can be provided by moving a team leader to the rear.

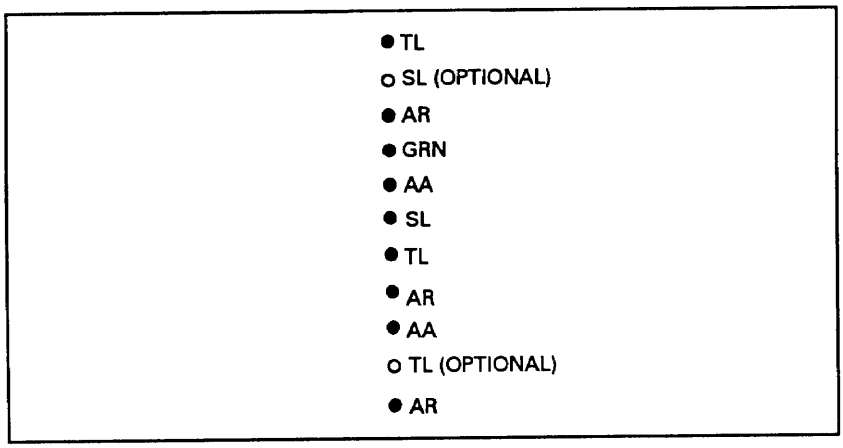


Figure D-7. Squad file formation.

(c) Platoon formations.

- The platoon uses the column as its primary formation (Figure D-8). This formation can deliver a limited volume of fire to the front and a high volume to the flanks.

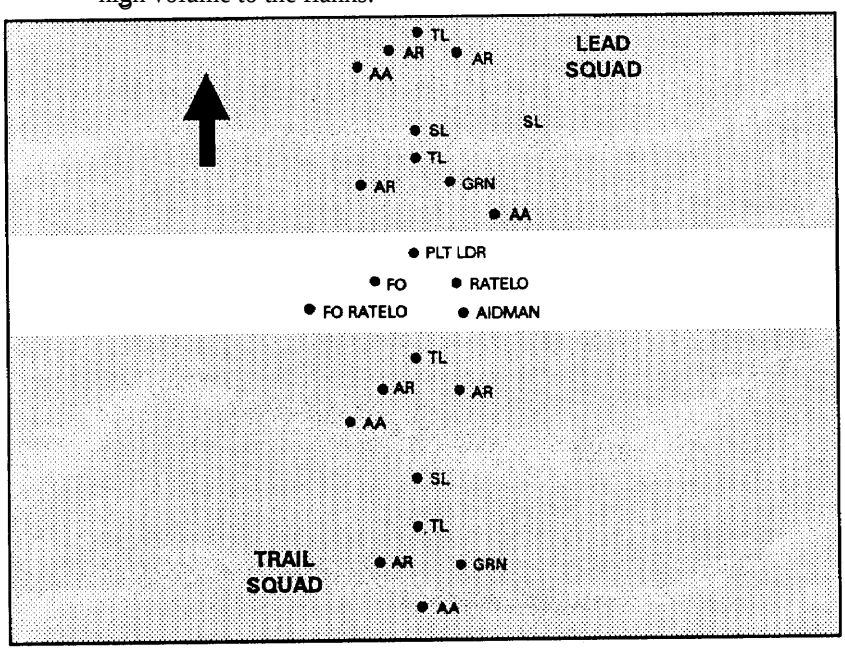


Figure D-8. Platoon column formation.

• The line formation allows the platoon to deliver the greatest amount of fire to its front (Figure D-9).

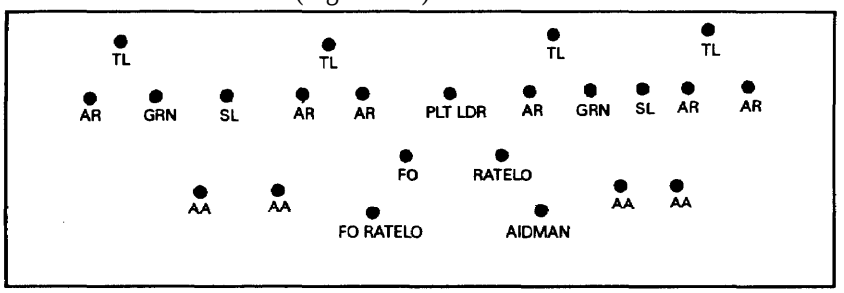


Figure D-9. Platoon line formation.

(2) *Movement techniques.* Squads and platoons use three basic movement techniques: traveling traveling overwatch, and bounding overwatch. The selection of a movement technique is based on the likelihood of enemy contact and the need for speed. Factors to consider for each technique are control, dispersion, speed, and security.

(a) Traveling is used when contact with the enemy is not likely and speed is needed (Figure D-10).

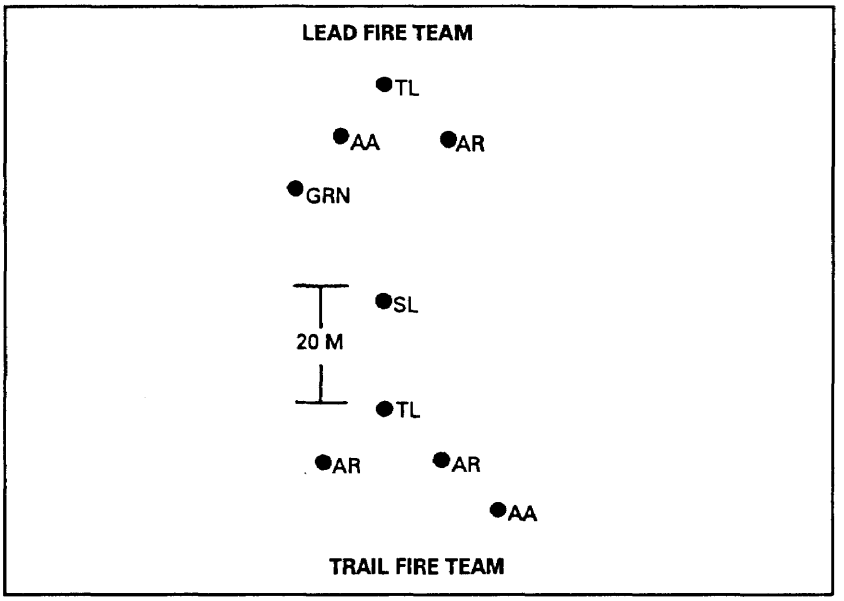


Figure D-10. Traveling movement technique.

(b) Traveling overwatch is used when contact with the enemy is possible (Figure D-11). Traveling overwatch is similar to the traveling technique except the distance between the lead fire team or squad and the remainder of the element is increased.

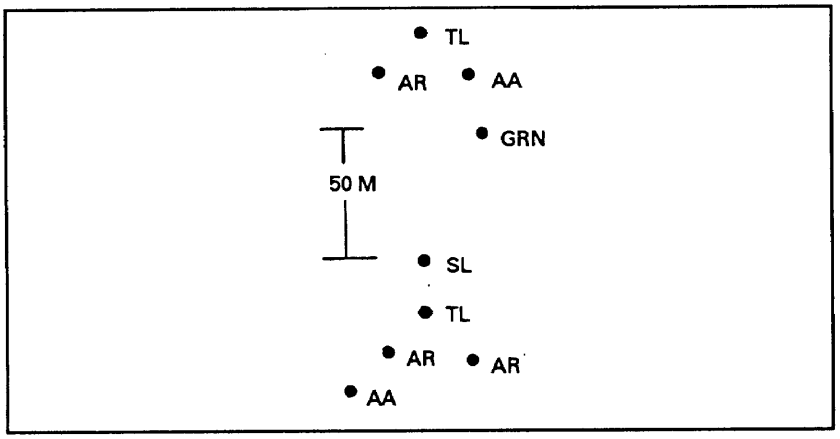


Figure D-11. Traveling overwatch movement technique.

(c) Bounding overwatch is used when contact with the enemy is expected (Figure D-12). This is the slowest movement technique but provides the most security.

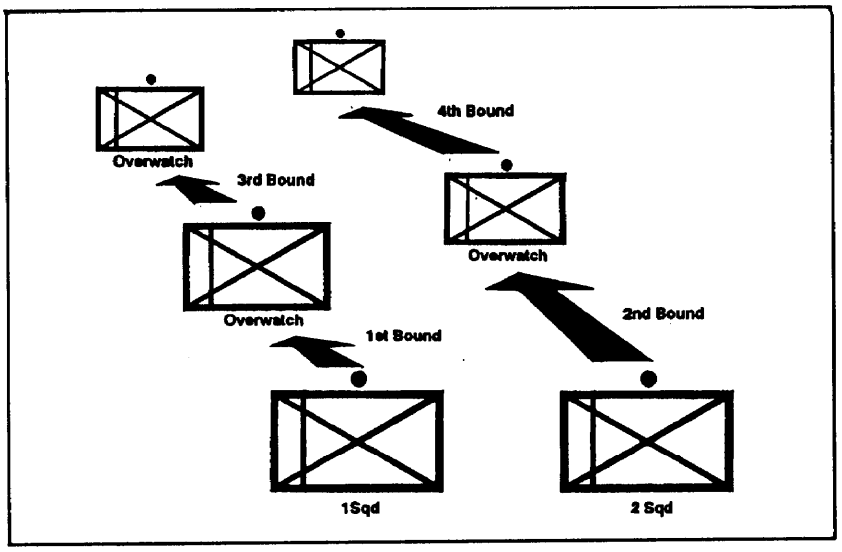


Figure D-12. Bounding overwatch movement technique.

D-4. SQUAD/PLATOON SITUATIONAL TRAINING EXERCISE

STXs are short, scenario-driven tactical exercises that train a single collective task or a group of related battle drills and collective tasks. Chapter 4, ARTEP 7-8-MTP explains how to develop, resource, train, and evaluate an STX.

a. Commanders must develop a graphical scenario of task performance to fit the exercise. In the scenario, the commander must place all dismounted infantry critical collective tasks, which support his METL and need improvement, in a logical sequence. Figure D-13 is an example task performance scenario.

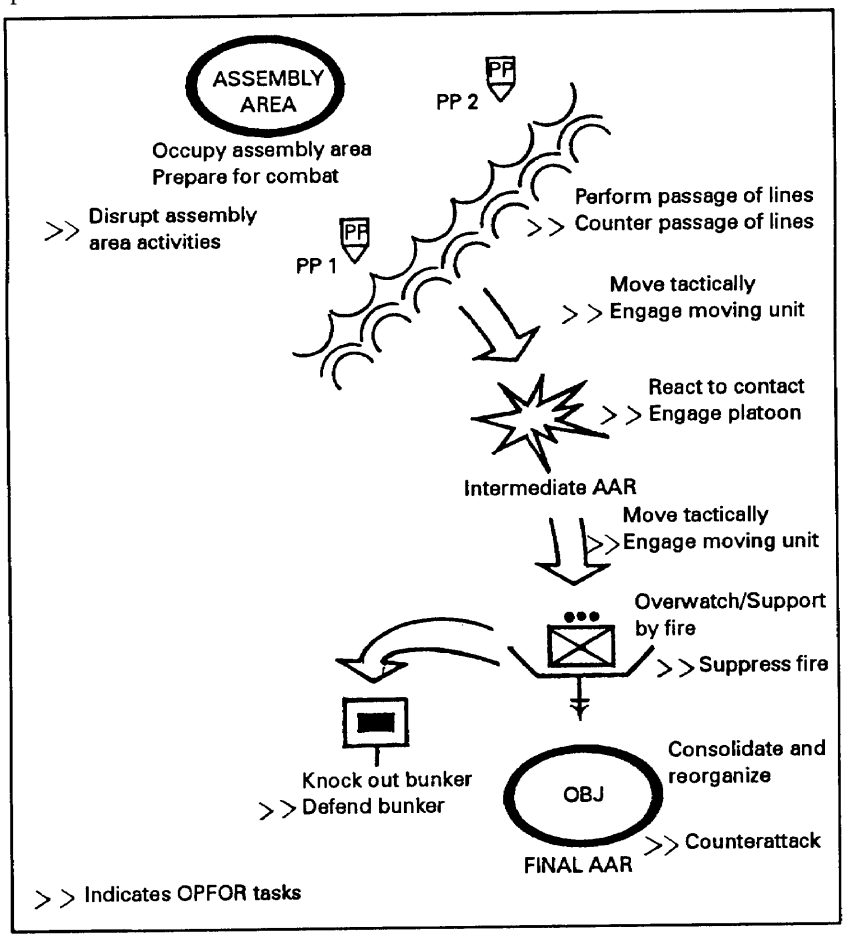


Figure D-13. Graphic scenario of task performance.

b. After the graphical scenario has been drawn, leaders must list each event in sequence and indicate the time required for each event. The leader adds all event times to determine the overall time required to complete the STX. Trainers should use this overall time as a guide for planning purposes only. Trainers do not use this time as a training standard. Table D-1 provides a sample for sequence of events and times for the STX.

EVENT	ACTION	ESTIMATED TIME
1	Occupy Assembly Area	1.0 HR
2	Prepare for Combat	2.0 HRs
3	Perform Passage of Lines	30 MIN
4	Move Tactically	1.0 HR
5	React to Contact	5 MIN
6	Intermediate AAR	20 MIN
7	Move Tactically	1.0 HR
8	Overwatch/Support by Fire	2.0 HRs
9	Knock Out Bunker	2.0 HRs
10	Consolidate and Reorganize	1.0 HR
11	Final AAR	45 MIN
*	Maintain Operation Security	
		**Total Time 11 hours

*These tasks are integrated and evaluated throughout the exercise.

**Additional time is required if great portions of the exercise are conducted at night or during other limited visibility.

Table D-1. Sequence of events and time for STX.

c. Trainers match this event list with the corresponding T&EOs in ARTEP 7-8-MTP to identify support requirements, prepare evaluation packets, and develop an OPORD or scenario that leads the squad or platoon through each of these collective tasks.

(1) Trainers review each T&EO to determine the support requirements for each event within the STX. These requirements include personnel, vehicles, ammunition, training aids, and training devices for friendly and OPFOR units. Trainers determine the consolidated support requirements for the STX by totaling these requirements for each event. Training managers must coordinate for and request these items early to ensure that they are available.

(2) Leaders prepare evaluation packets by making copies of the T&EOs and organizing them in the sequence that they will be preformed. The T&EOs provide a framework for collective task evaluation. Commaders expand each T&EO by adding additional performance measures and details related to his unit and specific mission. This will assist the evaluator in recording the key training points during STX execution. The packet shouldd also contain the exercise scenario, OPORD, administrative instructions, and critical safety information.

(3) Commanders prepare orders that match the scenario. This procedure requires some imagination to present a realistic situation to the squad or platoon conducting the STX. A basic OPORD should provide the necessary information to start the exercise. Commanders can assess the squad or platoon's flexibility by FRAGOs during the exercise.

(4) Trainers must conduct an after-action review to provide performance-oriented training feedback to the unit. The evaluator or controller uses the AAR to tell a story about what was planned and lets the soldiers and leaders discover for themselves what actually happened, why it happened, and what could have been done differently to improve performance. Informal AARs are usually done at the crew, squd, and platoon level.

D-5. SQUAD/PLATOON LIVE-FIRE EXERCISES

Live fire must replicate battlefield conditions. Squad and platoon LFXs develop confidence and esprit while reinforcing soldier, leader, and unit discipline. Dismounted squad and platoon LFXs are the culmination of separate dismounted STX training. Live-fire exercises are critical for preparing soldiers and units for the danger, confusion, and speed of combat operations. External evaluators should critique the LFX and give the commander a critical assessment of the squad or platoon's performance of the critical combat tasks that support the company METL.

a. Exercise Development. The principal focus of LFXs is weapons integration in a tactical operation. Squads and platoons must learn the procedures to command, control, and distribute well-aimed, effective fires. This fire includes small arms; indirect fire support assets; and other weapons, demolitions, and pyrotechnics. LFXs should follow the same exercise development procedures as outlined in Chapter 13 for Platoon Qualification.

(1) The commander and S3 determine which ARTEP 7-8-MTP dismounted infantry operations will be evaluated based on METL and command guidance. The operations are movement to contact, attack, raid, ambush, reconnaissance and security, defend, and retrograde. The S3 selects subtasks within these operations, which the platoon or squad will execute.

(2) The S3 and S2 select enemy target arrays that the dismounted squad or platoon can expect to see in combat. These dismounted target arrays are developed based on threat analysis and command emphasis. Enemy scenarios must include M16A2, M249, M203, AT4, and Dragon/Javelin targets.

(3) The S3 develops an exercise scenario in which the squad or platoon conducts tactical tasks in a maneuver area and live-fire tasks mixed with tactical tasks on the range. An operation order, which provides all the tactical information and supports the execution of the exercise, is prepared and given to the unit by the next higher headquarters.

(4) Commanders must include night and NBC conditions into scenarios. Soldiers should wear the man-worn MILES, laser detector harnesses equipment (not weapons transmitters), which allows the controller to cause a near miss or to kill personnel for tactical errors or to induce stress. Combat service support (casualty evacuation and resupply) can be added to the scenario.

b. Prerequisites. The following prerequisites must be accomplished before the LFX.

(1) Each soldier must have qualified with his individual weapon (M16A2, M203, M249) within the previous 6 months.

(2) Dragon gunners must have certified with the Dragon within the past 3 months.

(3) Squads must have completed a squad LFX within the past 6 months before a platoon LFX.

c. Standards. Each MTP operation and subtask has established maneuver and live-fire standards. These standards are in ARTEP 7-8-MTP. Trainers use the T&EOs and the dismounted infantry penalty matrix from Chapter 9 to evaluate the squad or platoon. Units are given a rating of trained, needs practice, or untrained. Squads and platoons must achieve a trained or needs practice rating to receive a GO on the LFX.

d. Example Squad LFX Scenario. See Table D-2, page D-16.

(1) The squad occupies a tactical assembly area (ARTEP 7-8-MTP, task 7-3/4-1022) and prepares for combat operations (ARTEP 7-8-MTP, task 7-3/4-1046). The platoon leader gives an operation order in which the squad moves as part of the platoon (simulated) along a specified route in a dismounted movement to contact.

(2) The squad moves tactically (ARTEP 7-8-MTP, task 7-3/4-1025), performs a passage of lines (ARTEP 7-8-MTP, task 7-3/4-1040), and receives fire from a three-man enemy ATGM position. The squad executes the react to contact battle drill and assaults (ARTEP 7-8-MTP, task 7-3/4-1001) to destroy the enemy (Table D-2, engagement 1).

(3) The squad provides the platoon leader a SITREP and continues to move. The squad makes contact with an enemy combat reconnaissance outpost consisting of several troops and reconnaissance BTR. The squad leader reports contact and the platoon leader orders the squad to engage (Table D-2. engagement 2).

(4) The platoon leader orders the squad to continue to move. The squad receives fire from a bunker. The lead fire team provides suppressive fire while the trail fire team maneuvers to assault the enemy position from the flank. The squad knocks out the bunker (AKTEP 7-8-MTP, task 7-3/4-1012) and engages the enemy vehicle and troop targets in the enemy main defensive belt (Table D-2, engagement 3).

(5) The squad leader continues to clear the objective and the enemy withdraws. The squad consolidates and reorganizes on the position (ARTEP 7-8-MTP, task 7-3/4-1047). Squad prepares a hasty defensive position (ARTEP 7-8-MTP, task 7-3/4-1021) to prepare for a counterattack.

(6) The squad defends against an enemy platoon's counterattack. The squad can call for and adjust indirect fire (Table D-2, engagement 4).

(7) The squad repels the counterattack and is ordered to disengage (ARTEP 7-8-MTP, task 7-3/4-1008). Mission complete.

ARRAY	TARGET	AMMUNITION	STANDARDS
1. Engage target with small-arms weapons.	Enemy ATGM team (3 IRETS), 200 to 400 meters.	30 rds 5.56-mm per M16A2, 5 rds 40-mm per M203, 50 rds per M249.	Hit 1 target within 20 seconds. Score IAW Chapter 9
2. Engage target with small-arms weapons.	Engage target with AT4.Enemy squad (-) dug in as combat outpost (5 IRETS), 300 to 500 meters.	30 rds 5.56-mm per M16A2, 3 rds 40-mm per M203, 100 rds per M249.	Hit 2 targets within 20 seconds. Score IAW Chapter 9.
Engage target with AT4.	One BTR-60 at 600 meters.	2 rds (9-mm or MILES).	Kill target IAW applicable threat-based timing matrix. Score IAW Chapter 9.
3. Engage target with small-arms weapons.	Enemy platoon (21 IRETS) in prepared positions (100 to 150 meters).	60 rds 5.56-mm per M16A2, 3 rds 40-mm per M203, 100 rds per M249.	Hit bunker with effective weapon system.
Engage targets with AT4.	Two BMPs at 400 meters.	2 rds (9-mm or MILES).	Kill targets IAW applicable threat-based timing matrix. Score IAW Chapter 9.
4. Engage targets with small-arms weapons.	21 IRETS, 600 to 800 meters; 11 to 14 IRETS, 300 to 400 meters; 7 to 9 IRETS, 100 meters.	90 rds per M16A2, 50 rds per M249, 5 rds per M203.	Hit 4 targets within 20 seconds at each range band. Score IAW Chapter 9.
Engage targets with AT4.	Two BMPs. One at 500 meters and one at 400 meters.	4 rds (9-mm or MILES).	Kill targets IAW applicable threat-based timing matrix. Score IAW Chapter 9.
Engage target with Dragon/ Javelin.	One flank BMP at 800 to 1,000 meters.	1 Dragon/Javelin (MILES).	Kill target IAW applicable threat-based timing matrix. Score IAW Chapter 9.

Table D-2. Example squad LFX (day).

D-6. SAMPLE DISMOUNTED INFANTRY TRAINING PROGRAM

Units must develop training programs that train and evaluate dismounted squads and platoons. Successful training programs incorporate a building block strategy that begins with individual tasks that support identified collective tasks. Collective tasks buiId upon each other beginning with fire team, then squad, and finishing with platoon collective tasks. The training program must parallel the mounted element's training. This ensures both mounted and dismounted elements are prepared for integrated training at the prescribed times. These building blocks also provide an organized method to plan, resource, and manage the program. Task, conditions, and standards are in STP 21-1-SMCT, STP 7-11BCHM14-SM-TG, STP 7-11M14-SM-TG; ARTEP 7-8-MTP, and ARTEP 7-7J-DRILL.

a. Preliminary Training. Preliminary training consists of weapon and equipment training and qualification and movement training. Weapon and equipment training and qualification is the dismounted element's equivalent to the mounted element's BGST. Movement training consists of Dismounted Tables I through IV.

(1) *Dismounted Table I, Individual/Buddy Team Movement Exercise.* DT I trains and evaluates individual and buddy team movement techniques. Tasks evaluated are—

(a) Individual.

- Move under direct fire (071-326-0502).
  - High crawl.
  - Low crawl.
  - Rush.
- Select temporary fighting positions (071-326-0513).

(b) Buddy team.

- Move over, through, or around obstacles (071-326-0503).
- React to indirect fire while dismounted [071-326-0510).

(2) *Dismounted Table II, Fire Team Movement Exercise.* DT II trains and evaluates a fire team's ability to move tactically. Tasks evaluated are—

(a) Move as a member of a fire team (071-326-5921).

(b) Control movement of a fire team (071-326-5605).

(c) Conduct maneuver of a fire team (017-420-0007).

(3) *Dismounted Table III, Squad Movement Exercise.* DT III trains and evaluates a squad's ability to use movement techniques. Tasks evaluated are—

(a) Conduct maneuver of a squad (071-326-5611).

(b) Select overwatch positions (071-326-5606).

(4) *Dismounted Table IV, Platoon Movement Exercise.* DT IV trains and evaluates platoon's ability to use movement techniques. Tasks evaluated are—

(a) Conduct movement techniques by an M2 BFV dismount element (071-326-5910).

(b) Conduct maneuver of a platoon (071-420-0005).

b. Device Training. Device training consists of dismounted squad and platoon STXs that incorporate dismounted battle drills and collective tasks. STXs must be conducted using MILES equipment in a force-on-force mode or with MILES LTID targetry. These are dismounted exercises; however, units are encouraged to provide the squad or platoon Bradleys in assembly areas. This provides realistic training during assembly area procedures. Device training consists of Dismounted Tables VI through VIII.

(1) *Dismounted Table VI, Squad Practice.* DT VI allows squads to practice troop-leading procedures, reactions to contact, and conducting an antiarmor ambush. This exercise is a day exercise, but may be conducted again at night. (Figure D-14.)

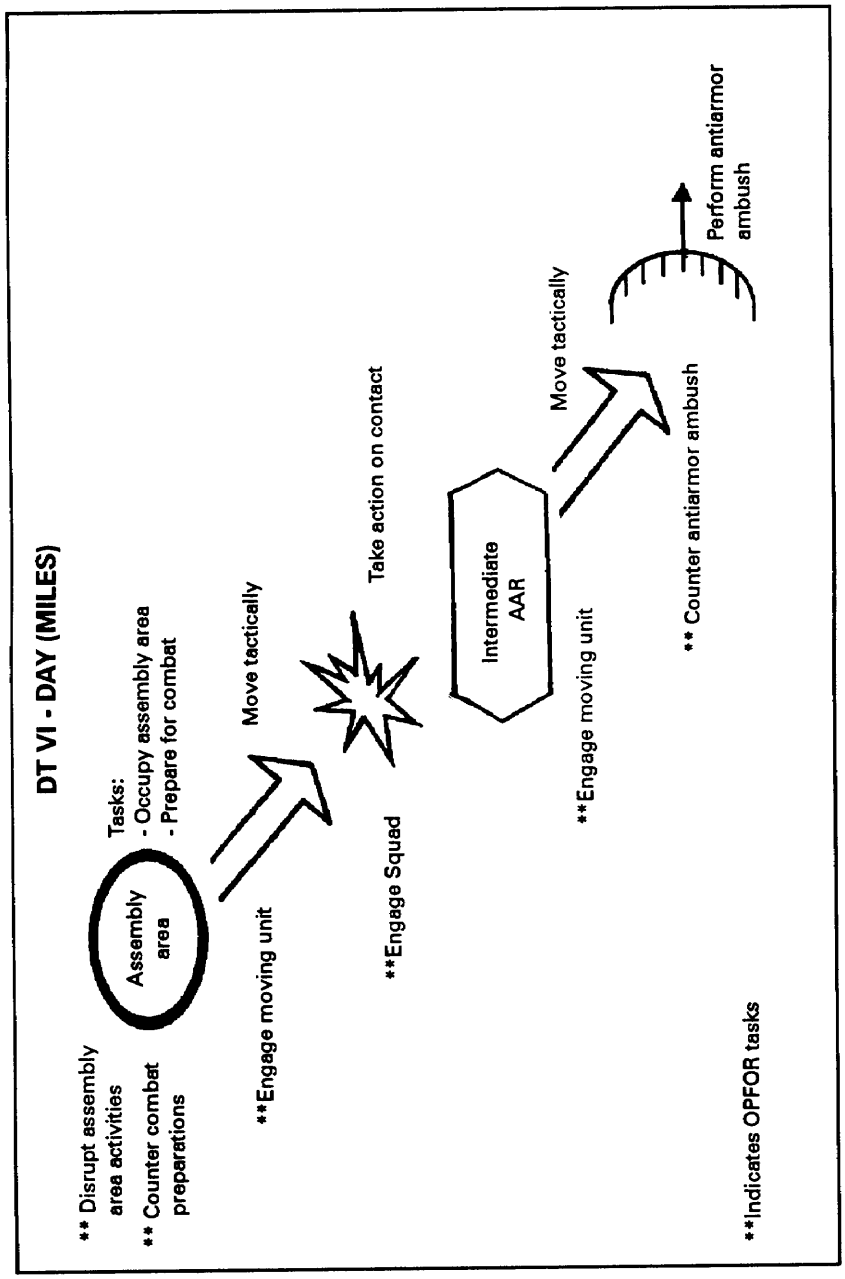


Figure D-14. Dismounted Table VI, Squad Practice.

(2) *Dismounted Table VII, Squad Certification.* DT VII evaluates dismounted squads while conducting tactical tasks day and night (Figure D-15.)

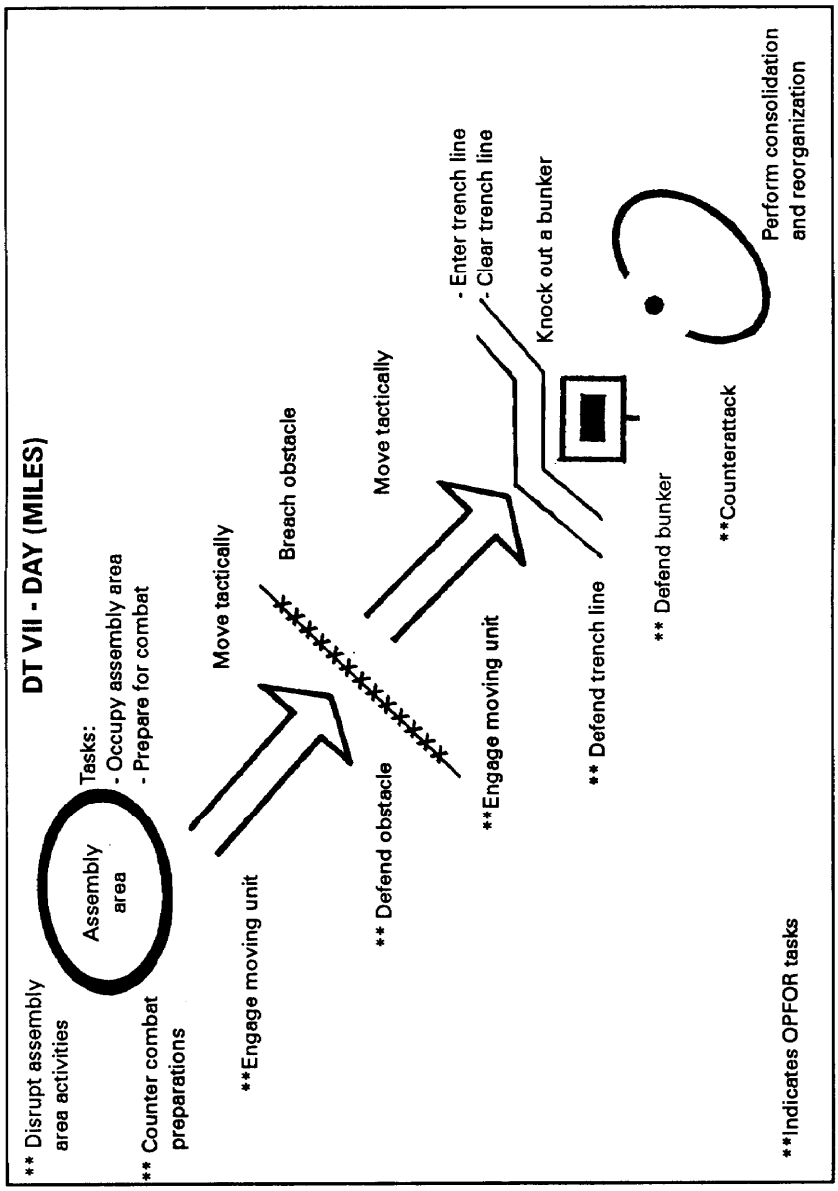


Figure D-15. Dismounted Table VII, Squad Certification.

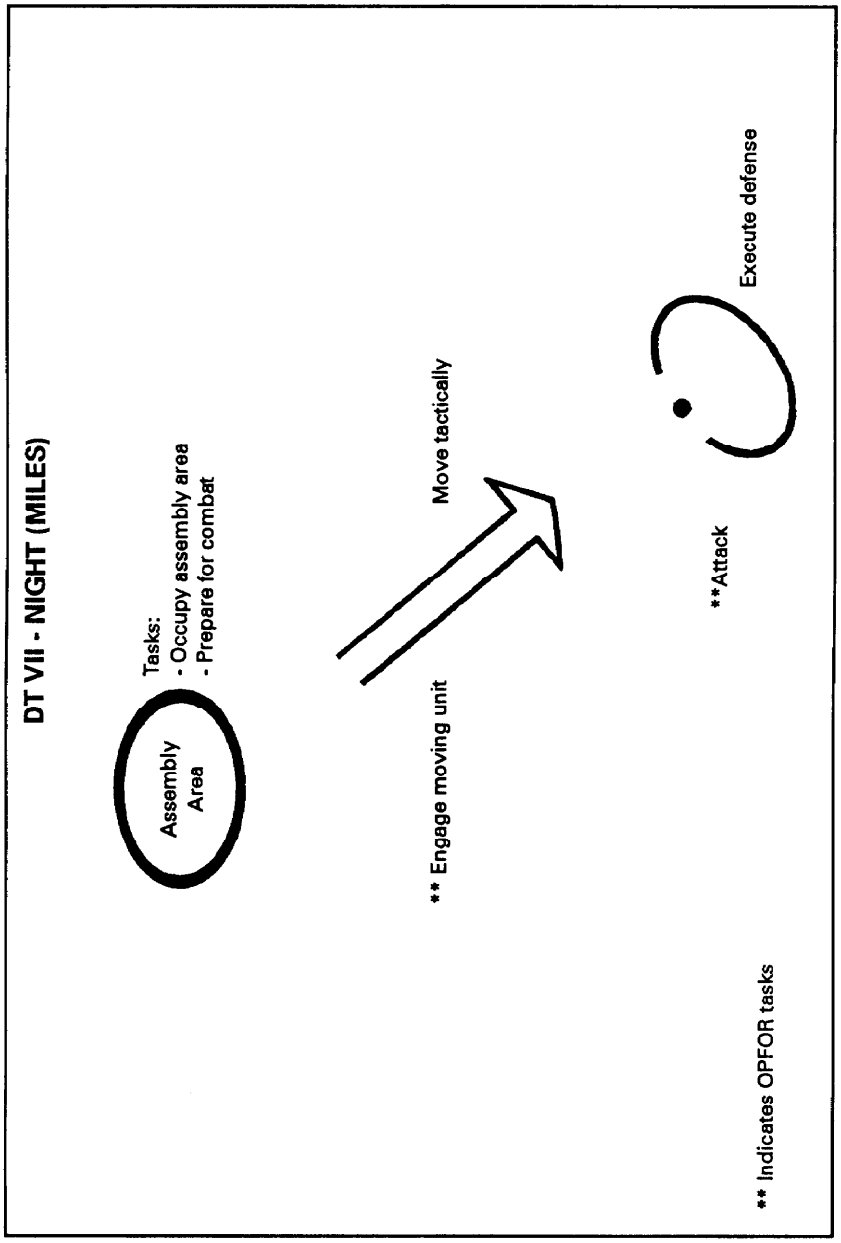


Figure D-15. Dismounted Table VII, Squad Certification (continued).

(3) *Dismounted Table VIII, Platoon Certification.* DT VIII evaluates dismounted platoon's ability to conduct tactical tasks day and night. (Figure D-16.)

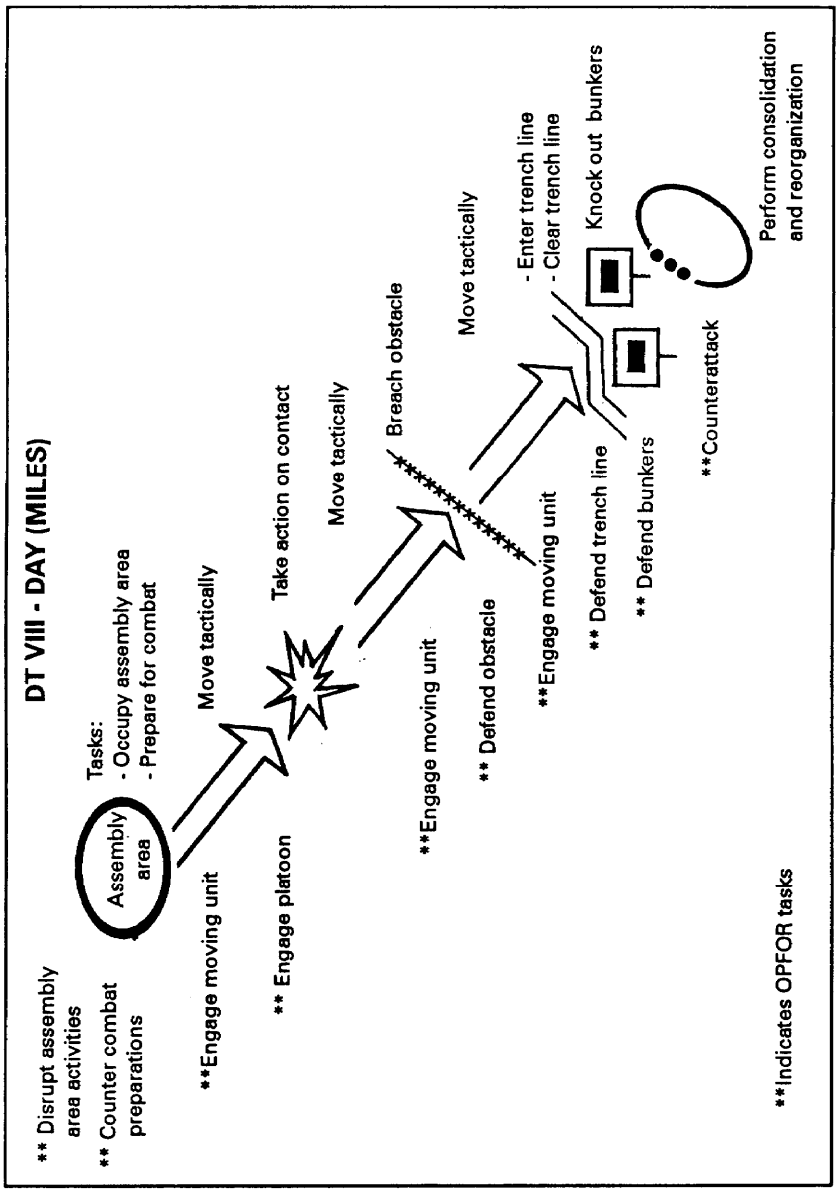


Figure D-16. Dismounted Table VIII,Platoon Certification.

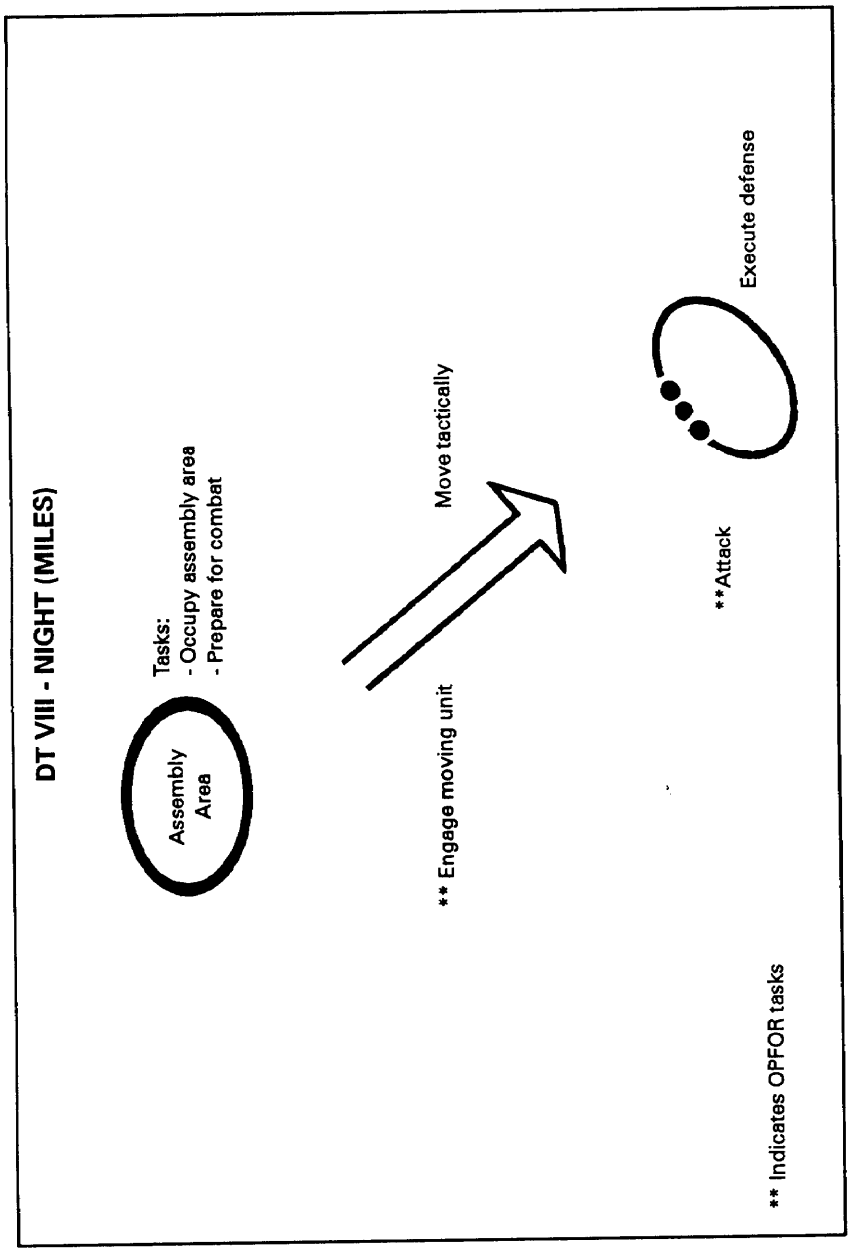


Figure D-16. Dismounted Table VIII, Platoon Certification (continued).

c. Live-Fire Training. Live-fire training consists of dismounted squad and platoon LFXs. The LFXs combine battle drills and collective tasks conducted on live fire ranges. Live-fire training consists of Dismounted Tables XI and XII.

(1) *Dismounted Table XI, Squad Qualification.* DT XI evaluates dismounted squad ability to conduct live fire, tactical tasks during day and night. (Figure D-17.)

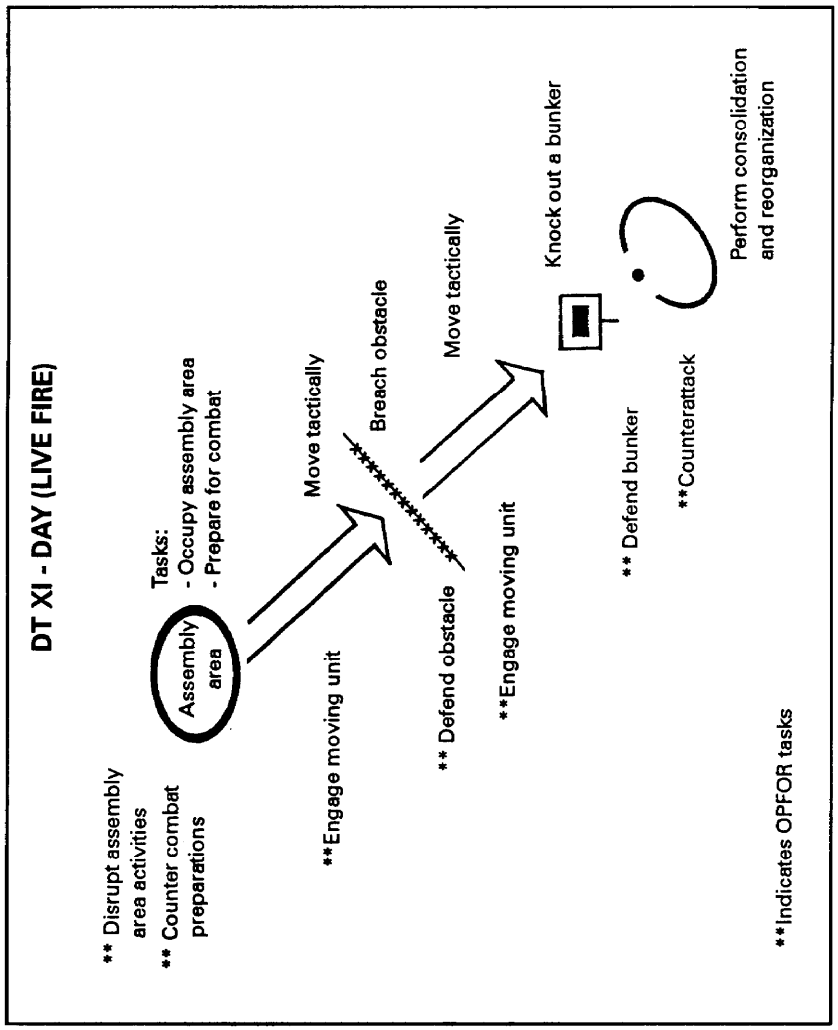


Figure D-17. Dismounted Table XI, Squad Qualification.

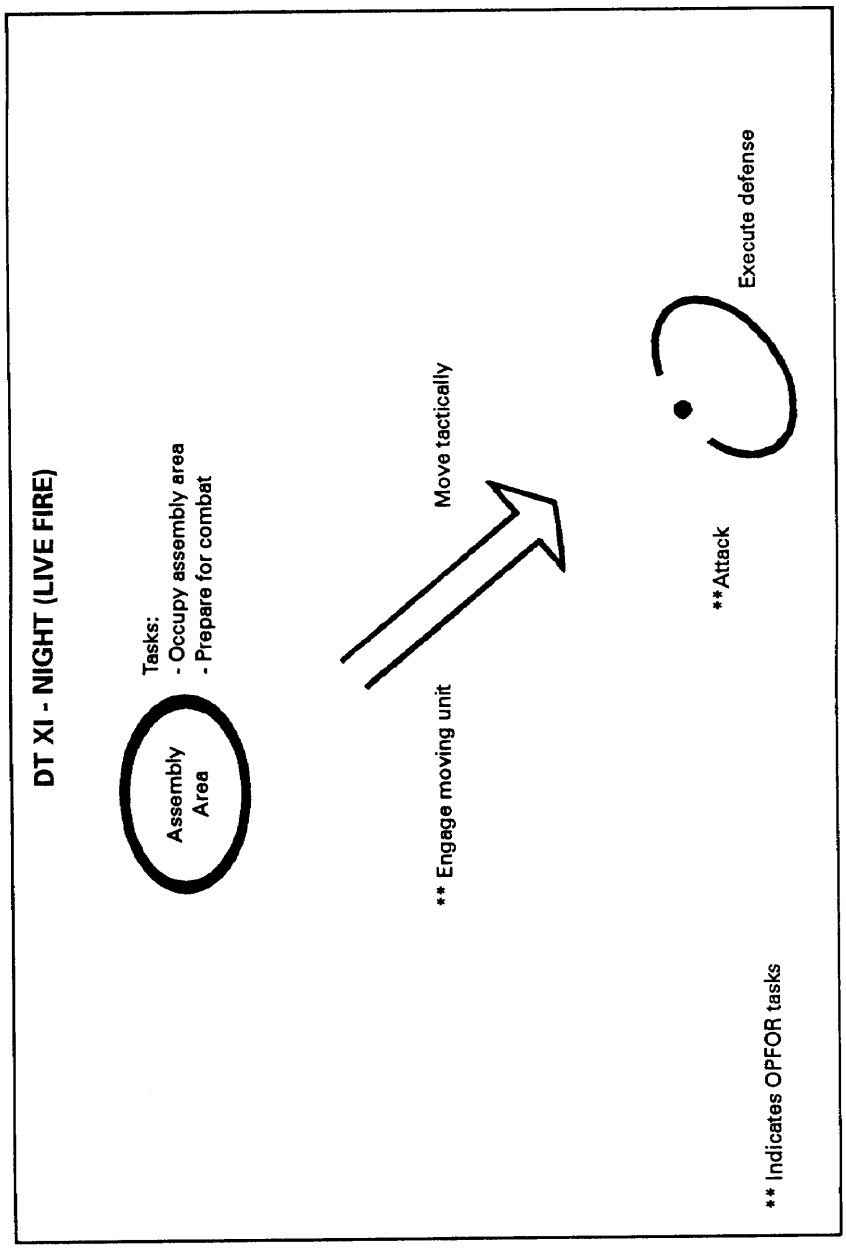


Figure D-17. Dismounted Table XI, Squad Qualification (continued).

(2) *Dismounted Table XII, Platoon Qualification.* DT XII evaluates dismounted platoon's ability to conduct live fire, tactical tasks during day and night. (Figure D-18.)

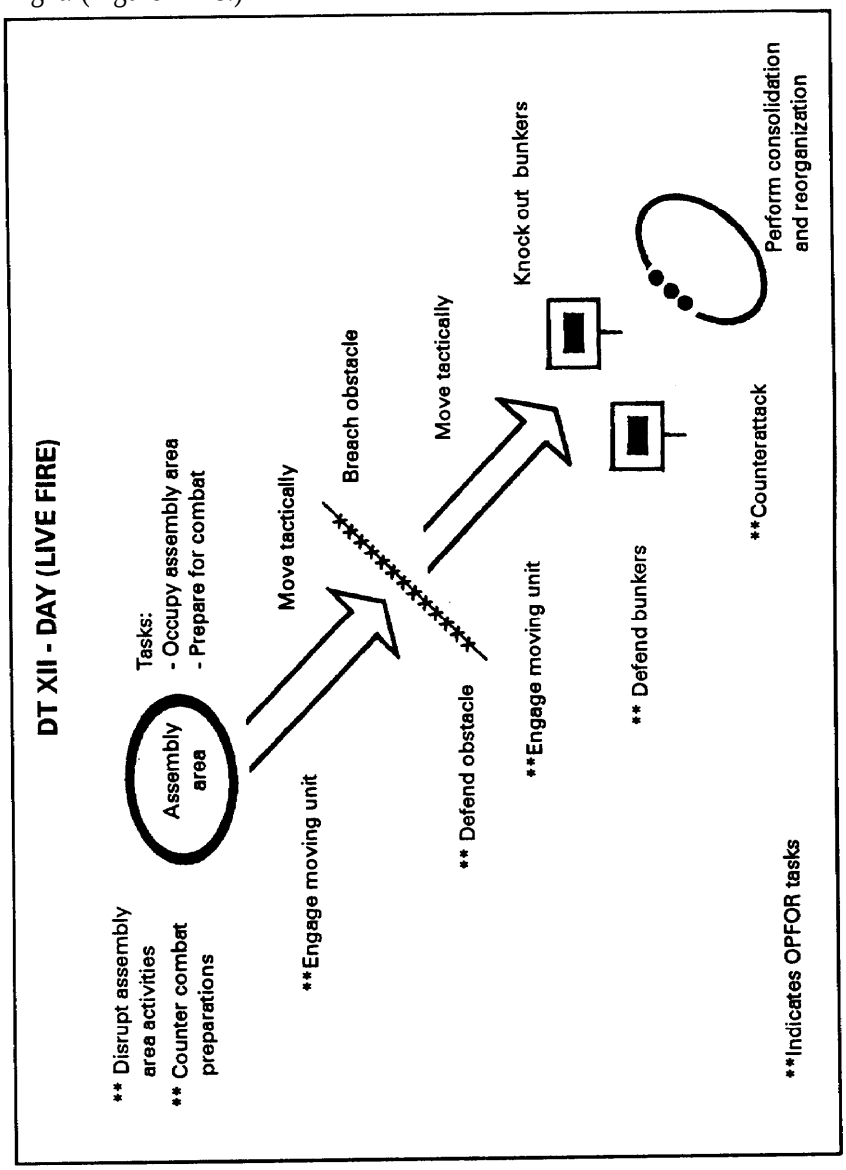


Figure D-18. Dismounted Table XII, Platoon Qualification.

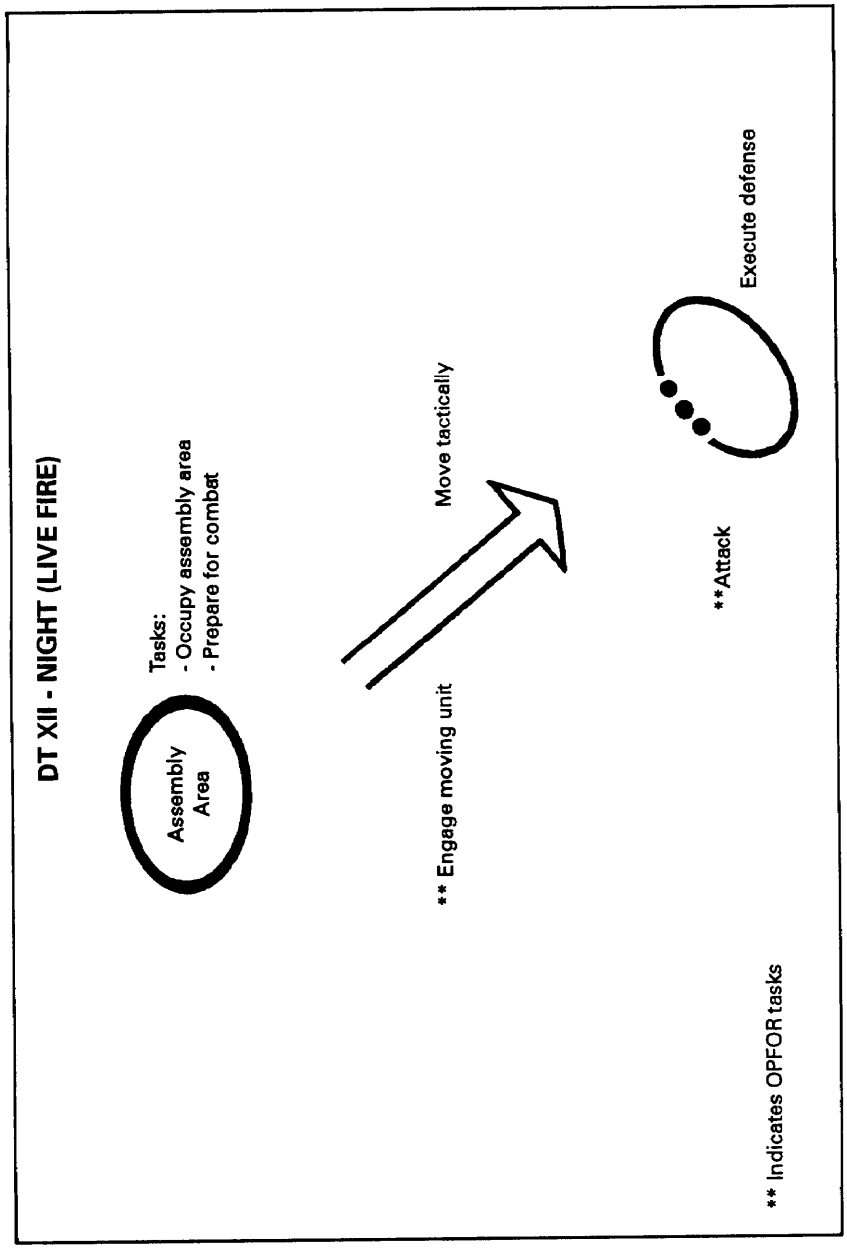


Figure D-18. Dismounted Table XII, Platoon Qualification (continued).

APPENDIX E

BRADLEY RANGE CARD

A range card is a sketch or diagram of the terrain that a direct-fire weapon is assigned to cover by fire. It shows possible target areas and terrain features plotted in relation to a firing position. The information on a range card is used for planning and controlling fire, for rapidly detecting and engaging targets, and for orienting replacement personnel or units; therefore, DA Form 5517-R, Standard Range Card, should be used to record the information.

E-1. DESCRIPTION

Each Bradley gunner normally prepares range cards for his vehicle. He prepares one for each primary, alternate, and supplemental position designated in the defense and for any static position when enemy contact is possible; for example, a position in an assembly area. A range card aids in planning and controlling fires, and aids the crew in acquiring targets during limited visibility. It is also an aid for replacement personnel or platoons or squads to move into the position and to orient on their sector. During good visibility, the gunner should have no problems maintaining orientation within his sector. During poor visibility, he may not be able to detect lateral limits. If the gunner becomes disoriented and cannot find or locate reference points or sector limit markers, he can use the range card data to locate the limits. The gunner should make the range card so that he becomes more familiar with the terrain in his sector. He should continually assess the sector and if necessary update his range card. To prepare the range card, the gunner must know the sectors of fire, target reference points, dead space, maximum engagement lines, and weapon reference point. (A reproducible Standard Range Card is in FM 7-8.)

a. Sectors of Fire. A sector of fire is a piece of the battlefield for which a gunner is responsible. He maybe assigned a primary and a secondary sector. Leaders use sectors of fire to ensure that fires are distributed across the platoon's area of responsibility.

(1) A sector of fire is assigned to cover possible enemy avenues of approach. Leaders should overlap sectors to provide the best use of overlapping fire and to cover areas that cannot be engaged by a single weapon system.

(2) The leader assigns left and right limits of a sector using prominent terrain features or easily recognizable objects, for example, rocks, telephone poles, fences, or emplaced stakes. The gunner should index the TOW into the ISU. This reticle position does not induce superelevation into the fire control system to find the left and right limits. Superelevation causes changes in the field of view between APDS-T, HEI-T, and coax when ammunition and range changes are selected. Using the TOW reticle also allows the gunner to scan his sector without making ammunition and range changes during scanning procedures. The turret position indicator (Figure E-1) and the azimuth indicator (Figure E-2) are also used to assist in determining sectors of fire. Ammunition is designated for each TRP and reference point as prescribed by the platoon SOP or METT-T.

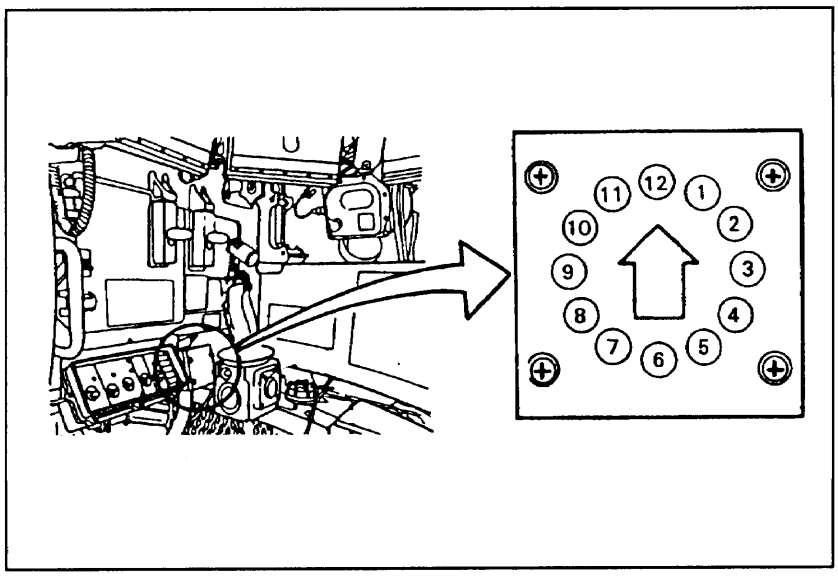


Figure E-1. Turret position indicator.

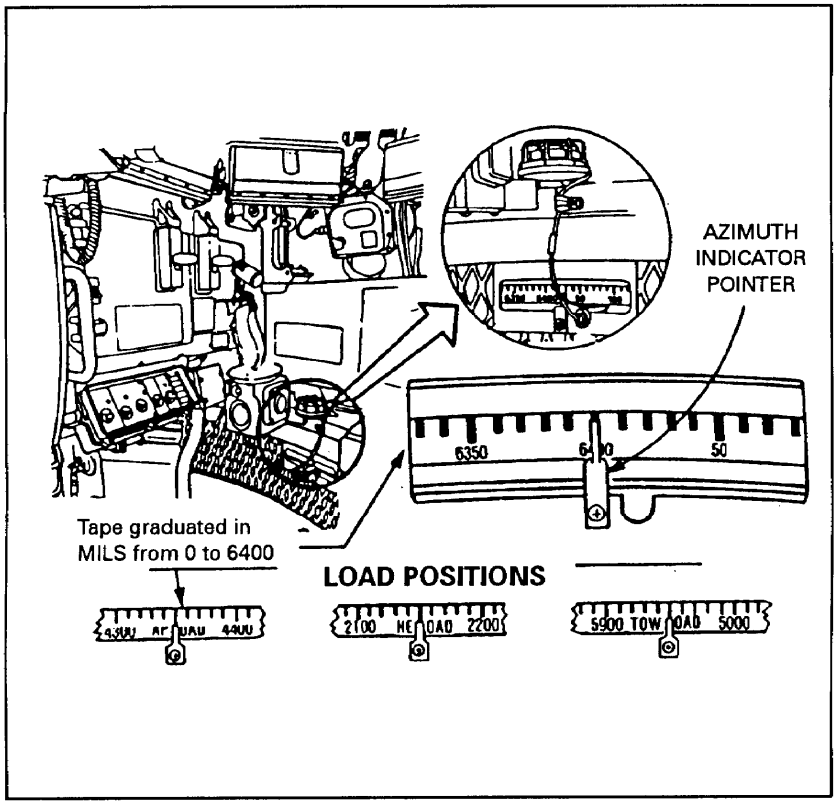


Figure E-2. Azimuth indicator.

b. Target Reference Points/Reference Points. Leaders designate natural or man-made terrain features as reference points. The gunner uses these reference points in target acquisition and range determination process during limited visibility. There will also be predesignated TRPs, which must be seen to be useful as TRPs or indirect fire targets. At least one TRP should always be in view using low magnification.

(1) The commander or platoon leader designates indirect fire targets used as TRPs so that target numbers can be assigned. If TRPs are within the sector of fire, the BC points them out and tells the gunner their designated reference numbers. TRPs should be heated so that the crew can acquire them with thermal sights.

(2) Normally, a gunner has at least one TRP but should not have more than four. The range card should show only pertinent data for reference points and TRPs.

c. Dead Space. Dead space is any area that cannot be observed or covered by direct fire systems within the sector of fire. All dead space within the sector of fire must be identified to allow the BC and platoon leader to plan the use of fires (for example, mortars, artillery) to cover that area. The crew, working with their wingman vehicle crew, must walk the engagement area so that the gunners can detect dead spaces through the ISUs.

d. Maximum Engagement Line. The depth of the sector is normally limited to the maximum effective engagement range of the vehicle's weapon systems; however, it can be less if there are objects that prevent the gunner from engaging targets at maximum effective engagement range. To assist in determining the distance to each MEL, the gunner or BC should use a map to make sure the MELs are shown correctly on the range card. MEL identification assists in decreasing the ammunition used on an engagement.

e. Weapon Reference Point. The WRP is an easily recognizable terrain feature on the map. The WRP is used to assist leaders in plotting the vehicle's position, and to assist replacement personnel in finding the vehicle's position.

E-2. PREPARATION PROCEDURES

The gunner prepares two copies of the range card. If alternate and supplementary firing positions are assigned, two copies are required for these as well. A copy is kept with the vehicle, and the other is given to the section leader for his sketch

a. Draw the weapon symbol in the center of the small circle. Draw two lines from the position of the BFV extending left and right to show the limits of the sector (Figure E-3, page E-6).

b. Determine the value of each circle by finding a terrain feature farthest from the position that is within the weapon system's capability. Determine the distance to the terrain feature. Round off the distance to the next even hundredth, if necessary. Determine the maximum number of circles that will divide evenly into the distance. The result is the value of each circle. Draw the terrain feature on the appropriate circle on the range card. Clearly mark the increment for each circle across the area where DATA SECTION is written. For example, in Figure E-4, page E-7, a hilltop at 3,145 meters is used. The distance is rounded to 3,200 meters, divided by 8, and equals 400. Thus, each circle has a value of 400 meters.

(1) Figure E-5, page E-8, shows a farmhouse at 2,000 meters on the left limit. The right limit is noted by the wood line at 2,600 meters. Determine the distance to these features by using a map or BELRF (ODS vehicles only). Note how the circle markings can assist in positioning the features on the range card.

(2) Draw all TRPs and reference points in the sector. Mark each of these with a circled number beginning with 1. Figure E-6, page E-9, shows the hilltop as RP 1 and a road junction as RP 2 and road junction RP 3. There are times when a TRP and a reference point are the same point (for example, RP 2 and RP 3 above). The TRP is marked with the first designated number in the upper right quadrant, and the reference point marked in the lower left quadrant of the cross. This occurs when a TRP is used for target acquisition and range determination. Road junctions are drawn by first determining the range to the junction, by drawing the junction, then finished by drawing the connecting roads from the road junction.

(3) Dead space is shown as an irregular circle with diagonal lines drawn inside (Figure E-7, page E-10). Any object that prohibits observation or coverage with direct fire will have the circle and diagonal lines extend out to the farthest maximum engagement line. If the area beyond the dead space is engageable, then the circle is closed. For example, an area of lower elevation will have a closed circle, because the area beyond it is engageable.

(4) Maximum engagement lines are shown as in Figure E-8, page E-11. MELs are drawn at the maximum effective engagement range per weapon if there is no dead space to limit their range capabilities. Note how the MEL for HE extends beyond the dead space in Figure E-7. This indicates a higher elevation where HE area suppression is possible. MELs are not drawn through dead space. The maximum effective ranges for Bradley weapon systems are—

COAX	900 meters (tracer burnout)
APDS-T	2,000 meters (tracer burnout)
HEI-T	3,000 meters (self-destruct)
BASIC TOW	3,000 meters (impact)
TOW 2	3,750 meters (impact)

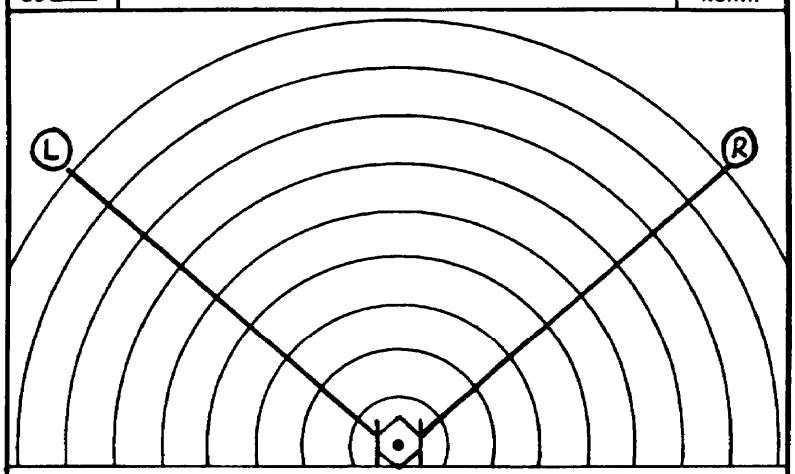
(5) The WRP shown in Figure E-9, page E-12, is represented as a line with a series of arrows extending from a known terrain feature and pointing in the direction of the Bradley symbol. This feature is numbered last. The WRP location is given a six-digit grid. When there is no terrain feature to be designated as the WRP, the vehicle's location is shown as an eight-digit grid coordinate in the remarks block of the range card. (In Figure E-8, the WRP is number 4.)

Note: When the WRP cannot be drawn prercisely on the sketch, due to the vechicle location, it is drawn to the left or right nearest the actual direction.

STANDARD RANGE CARD

For use of this form see FM 7-8. The proponent agency is TRADOC.

SQD ____ PLT ____ CO ____	May be used for all types of direct fire weapons.	MAGNETIC NORTH



DATA SECTION

POSITION IDENTIFICATION	DATE
WEAPON	EACH CIRCLE EQUALS _____ METERS

NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS:

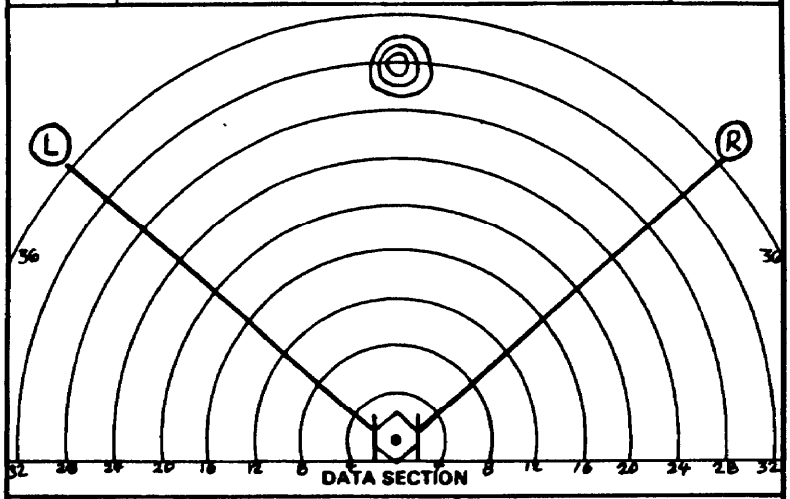
DA FORM 5517-R FEB 86

Figure E-3. Example of placement of weapon symbol and left and right limits.

STANDARD RANGE CARD

For use of this form see FM 7-8. The proponent agency is TRADOC.

SQD ____ PLT ____ CO ____	May be used for all types of direct fire weapons.	MAGNETIC NORTH



POSITION IDENTIFICATION	DATE
WEAPON	EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS:

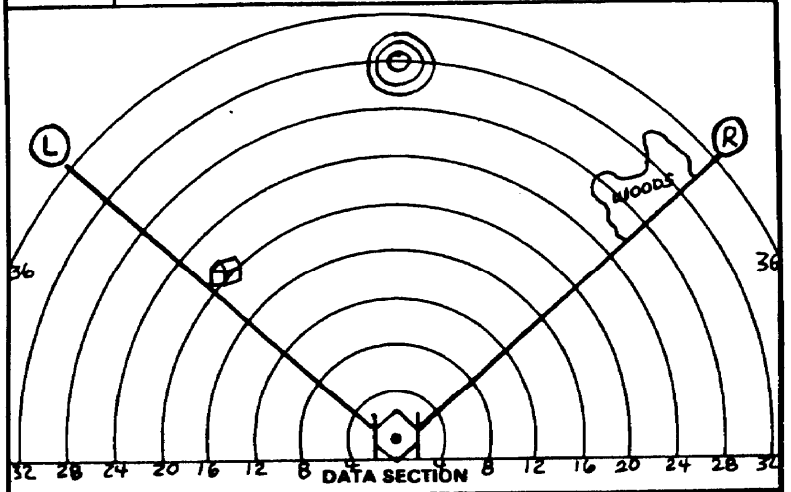
DA FORM 5517-R FEB 86

Figure E-4. Example of circle value.

STANDARD RANGE CARD

For use of this form see FM 7-8. The proponent agency is TRADOC.

SQD ____ PLT ____ CO ____	May be used for all types of direct fire weapons.	MAGNETIC NORTH



POSITION IDENTIFICATION	DATE
WEAPON	EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS:

DA FORM 6517-R FEB 86

Figure E-5. Example of terrain features for left and right limits.

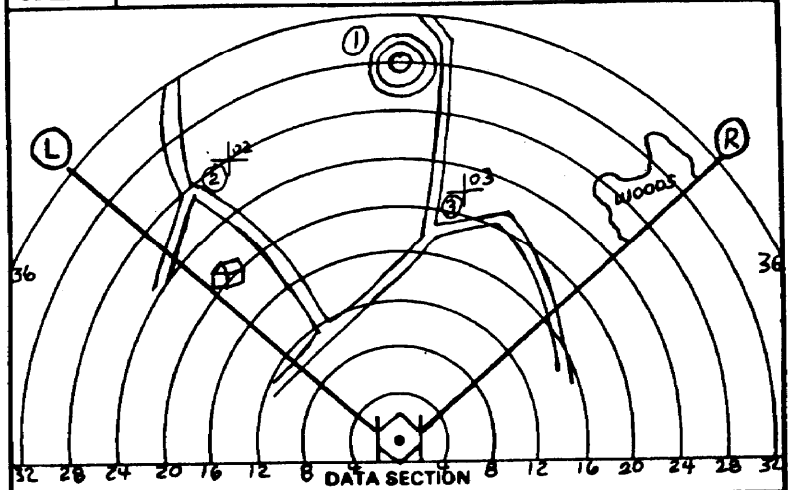
STANDARD RANGE CARD

For use of this form see FM 7-8. The proponent agency is TRADOC.

SQD ____
PLT ____
CO ____

May be used for all types of direct fire weapons.

MAGNETIC NORTH



POSITION IDENTIFICATION			DATE		
WEAPON			EACH CIRCLE EQUALS METERS 400		
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS:

DA FORM 6517-R FEB 86

Figure E-6. Example of target reference points/ reference points.

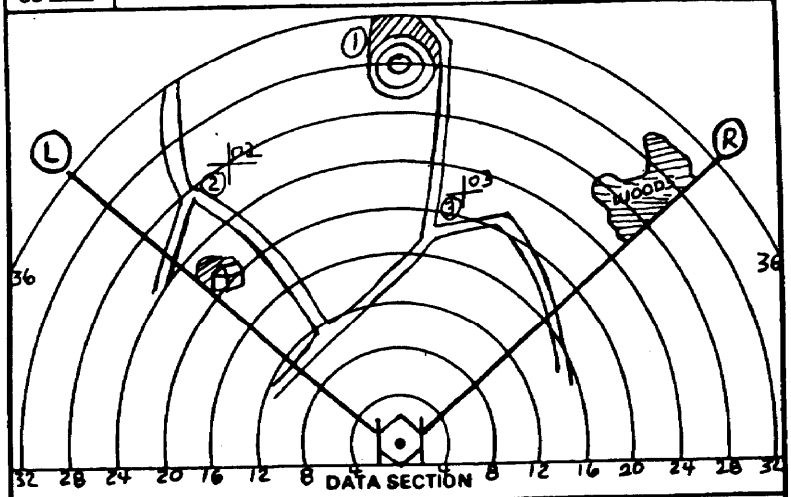
STANDARD RANGE CARD

For use of this form see FM 7-8. The proponent agency is TRADOC.

SQD ____
PLT ____
CO ____

May be used for all types of direct fire weapons.

MAGNETIC NORTH



POSITION IDENTIFICATION | DATE

WEAPON | EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS:

DA FORM 6517-R FEB 80

Figure E-7. Example of dead space.

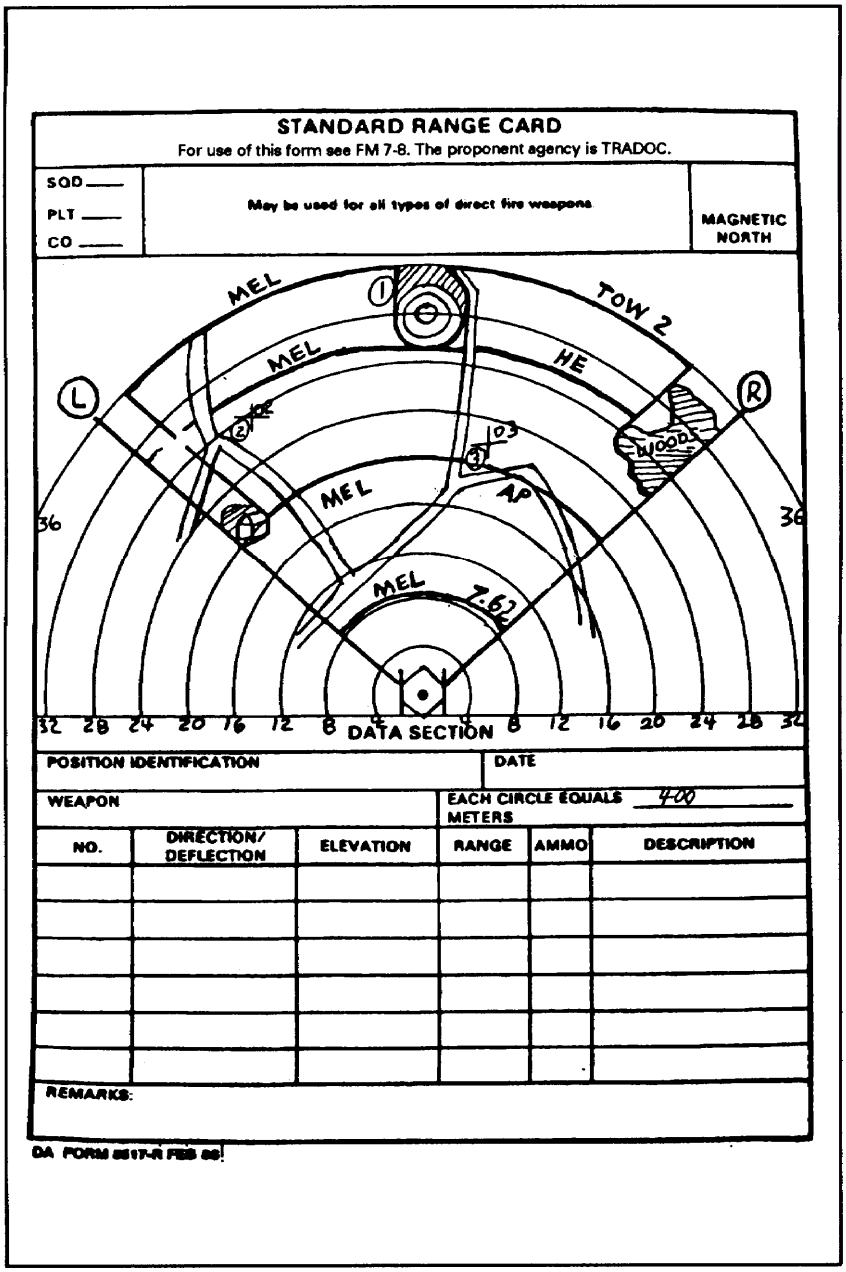


Figure E-8. Example of maximum engagement lines.

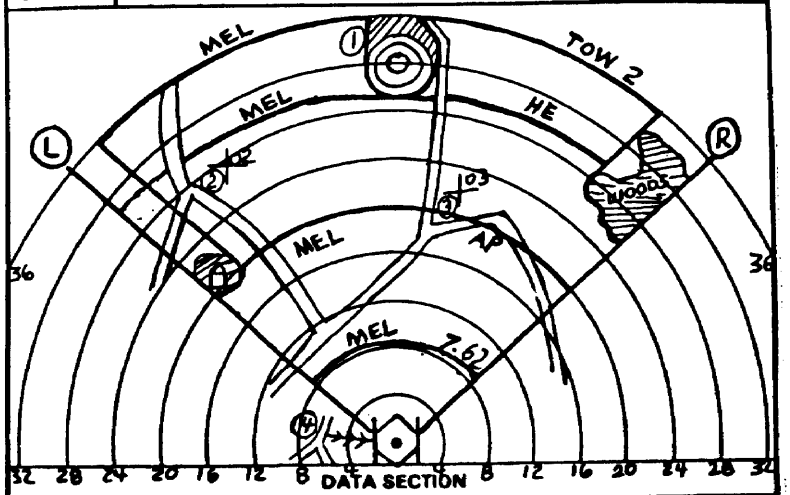
STANDARD RANGE CARD

For use of this form see FM 7-8. The proponent agency is TRADOC.

SQD ____
PLT ____
CO ____

May be used for all types of direct fire weapons.

MAGNETIC NORTH



POSITION IDENTIFICATION | DATE

WEAPON | EACH CIRCLE EQUALS 400 METERS

NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION

REMARKS:

DA FORM 5517-R FEB 80

Figure E-9. Example of weapon reference point.

c. Complete the Data Section. (Figure E-11, page E-15.)

(1) *Position identification.* List either primary, alternate, or supplementary. Alternate and supplemental positions must be clearly identified.

(2) *Date.* Show date and time the range card was completed. Range cards are like fighting positions, constantly being updated. The date and time are vital in determining the current data.

(3) *Weapon.* The weapon block indicates M2 and the vehicle bumper number.

(4) *Each circle equals _____ meters.* Write in the distance, in meters, between circles.

(5) *NO (number).* Starting with L and R limits, then list TRPs and RPs in numerical order.

Note: The platoon leader may designate a vehicle to be dedicated for AP, HEI-T, or TOW targets. This is dictated by platoon SOP or as needed by METT-T.

(6) *Direction/deflection.* The direction is in degrees and taken from a lensatic compass. The most accurate technique is to have the gunner aim at the terrain feature, and to have the driver dismount and align himself with the gun barrel and the terrain feature to measure the azimuth. To achieve correct deflection and elevation readings of the terrain feature, select TOW. Show the deflection reading taken from the BFV's azimuth indicator in the deflection block next to the magnetic azimuth

(7) *Elevation.* Show the gun elevation reading in tens or hundreds of mils (Figure E-10, page E-14). The smallest increment of measure on the elevation scale is tens of mils. Any number other than "0" is preceded by a "plus" or "minus" symbol to show whether the gun needs to be elevated or depressed. Ammunition and range must be indexed to have an accurate elevation reading.

(8) *Range.* Distance, in meters, from vehicle position to L and R limits and TRPs and RPs.

(9) *Ammo.* List types of ammunition used.

(10) *Description.* List the name of the object; for example, farmhouse, wood line, hilltop.

(11) *Remarks.* Enter the WRP data. As a minimum, WRP data include a description of what the WRP is, a six-digit or eight-digit grid coordinate of the WRP, the magnectic azimuth and the distance from the WRP to the vehicle position.

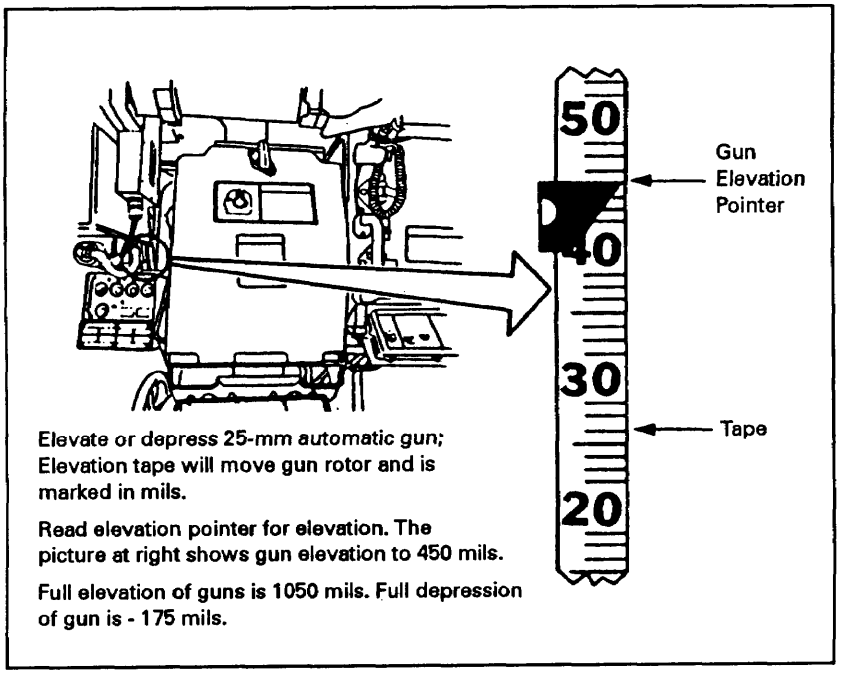


Figure E-10. Gun elevation pointer.

d. Complete the Marginal Information (at the top of the card) (Figure E-11).

(1) *Unit description* - bumper number, plt, co. Never indicate a unit higher than company.

(2) *Magnetic north.* Orient the range card with the terrain and draw the direction of the magnetic north arrow.

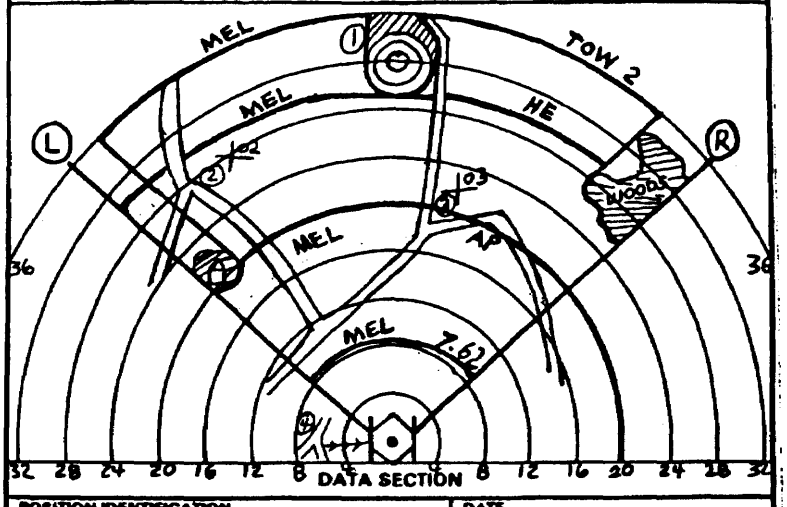
STANDARD RANGE CARD

For use of this form see FM 7-8. The proponent agency is TRADOC.

SQD 1
PLT 2
CO C

May be used for all types of direct fire weapons.

MAGNETIC NORTH



POSITION IDENTIFICATION	PRIMARY	DATE	3 MAR 89/ 1140 HRS
WEAPON	M2 C-21	EACH CIRCLE EQUALS METERS	400

NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
L	350°/5800m	0m	2000m	TOW2	FARMHOUSE
R	105°/ 920m	+10m	2600m	TOW2	R/SIDE WOODLINE
1	6400m	+30m	3200m	TOW2	RP - HILLTOP
2	5910m	+10m	2700m	TOW2	TRP - AB002 RJ
3	60m	-10m	1800m	TOW2	TRP - AB003 RJ

REMARKS:
4 WRP - RJ AT LN 13629411, 100° AT 320m

DA FORM [illegible]

Figure E-11. Example of completed range card.

E-3. FIRING POSITION

After a range card has been completed, the position should be marked with ground stakes. This enables the Bradley or a replacement Bradley to reoccupy the position and be able to use the range card data.

a. Stake the Position. Before the Bradley is moved, the position should be staked. Three stakes are required to effectively mark the position as shown in Figure E-12.

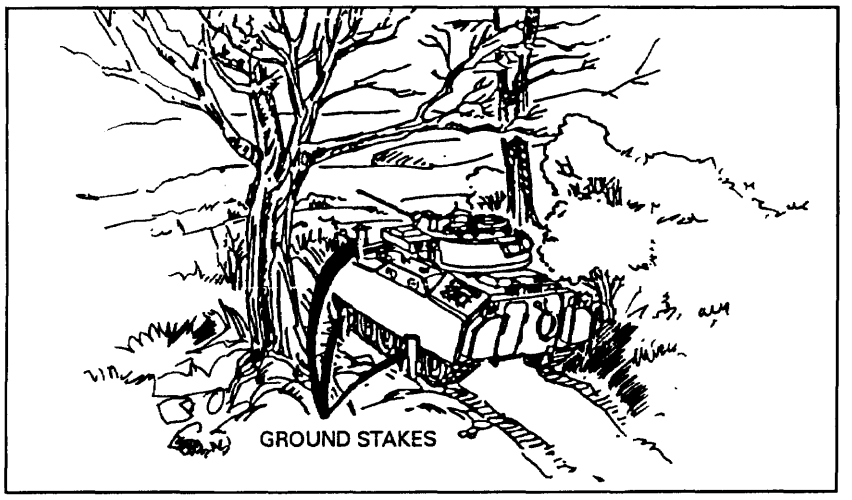


Figure E-12. Stake the position.

(1) One stake is placed in front of the Bradley. It is centered on the driver's station and just touching the hull. The stake should be long enough for the driver to see it when in position. The other two stakes are placed parallel to the left track and lined up with the hub on the front and rear wheels. The stakes should be placed close to the Bradley with only enough clearance to move the Bradley into position.

(2) The stakes should be driven firmly into the ground. Engineer tape or luminous tape can be placed on the friendly side of the stakes so that the driver can see them. A rock is placed at each of the front two corners of the vehicle to assist in reoccupation if the stakes are lost.

b. Move into the Position. If the situation permits, a ground guide can be used to assist the driver.

(1) If a ground guide cannot be used because of enemy fire, the driver moves the Bradley in, parallel to the side stakes, with the front stake centered on the driver's station.

(2) Once the Bradley is in position, the gunner should index the range and azimuth for one of the TRPs on the range card. If the sight is aligned on the TRP, the Bradley is correctly positioned. If the sight is not aligned on the TRP, the gunner should tell the driver which way to move the vehicle to align the sight on the target. Only minor adjustments should be necessary.

(3) If the stakes are lost and the position is not otherwise marked, the vehicle is moved to the approximate location. The BC or gunner can use a compass to find the left and right limits. The vehicle should be moved until it is within 6 to 8 inches of exact position, if time allows.

GLOSSARY

Acronyms and Abbreviations

AA	antiarmor specialist
AAR	after-action review
AC	Active Component; alternating current
ACE	armored combat earthmover
admin	administrative
AD	air defense
ADA	air defense artillery
ADR	air defense reticle
AGS	armored gun system
ammo	ammunition
AP	armor-piercing
APC	armored personnel carrier
APDS-T	armor-piercing discarding sabot with tracer
APFSDS-T	armor-piercing, fin-stabilized, discarding sabot with tracer
APFT	Army physical fitness test
AR	Army regulation; automatic rifleman
ARTEP	Army Training and Evaluation Program
ATGM	antitank guided missile
ATWESS	antitank weapon effect simulator system
aux	auxiliary
AVLB	armored vehicle launched bridge
az	azimuth
BAT	ballistic aerial target
BC	Bradley commander
BCE	Bradley crew evaluator
BCIS	battlefield combat identification system
BCPC	Bradley crew proficiency course
BELRF	Bradley eye-safe laser range finder
BFV	Bradley fighting vehicle
BGST	Bradley gunnery skills test

BMP	(a Russian-made vehicle)
BOT	burst on target
BPI	battle position indicator
BPPC	Bradley platoon proficiency course
BRDM	(a Russian-made scout car)
BSFV	Bradley Stinger fighting vehicle
BSSE	Bradley squad/section exercise
BT	Bradley table
BTR	(a Russian-made vehicle)
CALFEX	combined arms live-fire exercise
cbt	combat
CCTT	close combat tactical trainer
CEOI	Communications-Electronics Operation Instructions
CEV	combat engineer vehicle
CGE	command guidance electronics
CGF	computer-generated force
CGM	COFT gunner matrix
CIP	combat identification panel
co	company
coax	coaxial
COFT	conduct of fire trainer
comm	communication
CS	combat service
CSE	commander's sight extension
CSS	combat service support
CTC	Combat Training Center
CTT	common task test
CVC	combat vehicle crewman (helmet)
DA	Department of the Army
DA Pam	Department of the Army Pamphlet
DAWV	driver's all-weather viewer
DC	direct current

DCGE	digital command guidance electronics
DCS	digital compass system
def	defense
demo	demolition
DEROS	date eligible for return from overseas
DOD	Department of Defense
DODAC	DOD ammunition code
DT	dismounted table
EIB	Expert Infantryman Badge
el	elevation
ETS	expiration term of service
F	Fahrenheit
FLASHWESS	flash weapon effect signature simulator
FM	field manual; frequency modulation
FO	forward observer
FOV	field of view
FPS	feet per second
FPW	firing port weapon
FRAGO	fragmentary order
FT	firing table
FTX	field training exercise
gal	gallon
gnr	gunner
grn	grenadier
GTA	graphic training aid
HB	handbook
HE	high-explosive
HEDP	high-explosive, dual-purpose (grenade round)
HEI	high-explosive incendiary
HEI-T	high-explosive incendiary-tracer

HEMTT	heavy expanded mobility tactical truck
HET	heavy equipment transporter
Hind	(a Russian-made helicopter)
HMMWV	high-mobility, multiwheeled vehicle
hp	horsepower
hr	hour
HSG	home station gunnery
IAW	in accordance with
IFV	infantry fighting vehicle
IMTS	improved moving target simulator
in	inch
IO	instructor-operator
IRETS	infantry remoted target system
IRTT	infrared towed target
ISU	integrated sight unit
ITOW	improved TOW
IUH	Instructor's Utilization Handbook
km	kilometer
kph	kilometer per hour
LAV	light armored vehicle
lb	pound
ldr	leader
LFX	live-fire exercise
LTID	laser target interface device
m	meter
m	mil
MCD	missile countermeasure device
M-COFT	mobile-conduct of fire trainer
MEL	maximum engagement line
METL	mission-essential task list

METT-T	mission, enemy, terrain, troops and time available
mi	mile
MILES	multiple integrated laser engagement system
MLRS	multiple launch rocket system
min	minute
mm	millimeter
MOPP	mission-oriented protection posture
MOS	military occupational specialty
mov	moving
mph	miles per hour
MPRC	multipurpose range complex
mps	meters per second
MSR	missile simulation round
MTOE	modified table of organization and equipment
MTP	mission training plan
MTS	moving target simulator
NA	not applicable
NBC	nuclear, biological, and chemical
NCO	noncommissioned officer
NCOIC	noncommissioned officer in charge
No.	number
NOD	night observation device
NSN	national stock number
obj	objective
ODS	Operation Desert Storm
OIC	officer in charge
OP	observation post
OPFOR	opposing force
OPORD	operation order
PC	personnel carrier
PCS	permanent change of station

PDF	principal direction of fire
PGS	precision gunnery system
PLGR	precision lightweight global positioning system receiver
plt	platoon
PMCS	preventive maintenance checks and services
POL	petroleum, oils, and lubricants
PP	passage point
PQDR	product quality deficiency report
PSG	platoon sergeant
psi	pounds per square inch
pt	point
QDR	quality deficiency report
R	rifleman
RATELO	radiotelephone operator
RC	Reserve Component
RCMATS	radio-controlled miniature aerial target
rd	round
ROE	rules of engagement
RP	reference point
RPG	(a Russian-made weapon)
RSO	range safety officer
S2	Intelligence Officer
S3	Operations and Training Officer
SAAD	small-arms air defense
SALUTE	size, activity, location, unit, time, equipment
sat	satisfactory
sec	second
SF	standard form
SIMNET	simulations network
SL	squad leader
SM	soldier's manual

SMCT	soldier's manual common task
SOP	standing operating procedure
SP	self propelled
sqd	squad
sta	stationary
STLS	Stinger training launch simulator
STP	soldier training publication
STRAC	standards in training commission
STX	situational training exercises
TB	technical bulletin
TC	training circular
TDA	table of distribution and allowances
tech	technical
T&EO	training and evaluation outline
TG	trainer's guide
THT	tracking heat trainer
TL	team leader
tm	team
TM	technical manual
tng	training
TOE	Table of Organization and Equipment
TOT	tracer on target
TOW	tube-launched, optically tracked, wire-guided (missile)
TPDS-T	target practice discarding sabot-tracer
TP-T	target practice-tracer
TRADOC	United States Army Training and Doctrine Command
TRP	target reference point
TSC	Training Support Center
TSV	thru-sight video
TWGSS	tank weapons gunnery simulator system
UAV	unmanned aerodynamic vehicle
U-COFT	unit-conduct of fire trainer

unsat	unsatisfactory
US	United States
USAIS	United States Army Infantry School
VIGS	videodisc integrated gunnery simulator
WRP	weapon reference point
wt	weight

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BRADLEY CREW SCORE SHEET

For use of this form, see FM 23-1; the proponent agency is TRADOC

SEE BACK OF THIS FORM FOR INSTRUCTIONS

1. DATE:	2. RANGE:	3. UNIT:	4. TABLE:
5. VEHICLE ID:	6. COMMANDER:	7. GUNNER:	8. DRIVER:

9. BCE—DAY (Print name): _____
Initials:

10. BCE—NIGHT (Print name): _____
Initials:

11. ENGAGEMENT FM 23-1 Task NO.	12. TASK STANDARDS (Chap 9, para 9-2a-c)			13. CRITICAL SUBTASKS (Chap 9, para 9-3a-e)					14. LEADER TASKS (Chap 9, para 9-4a-e)					15. NONCRITICAL SUBTASKS (Chap 9, para 9-5a-d)				16. ENGAGEMENT ASSESSMENT (T, P, or U)	17. REMARKS
	a	b	c	a	b	c	d	e	a	b	c	d	e	a	b	c	d		
a.																			
b.																			
c.																			
d.																			
e.																			
f.																			
g.																			
h.																			
i.																			
j.																			

18. QUALIFICATION RATING: D S Q UQ

DA FORM 7354-R, FEB 96

1. **Date**. Enter the date of the last day engagement of the evaluation.
2. **Range**. Enter the name of the facility used, if two different facilities are used, both are listed in chronological order.
3. **Unit**. Enter the company, troop, or battery; battalion or squadron identification.
4. **Bradley Table Number**. Enter the Bradley table number fired.
5. **Vehicle ID**. Enter the bumper number of the vehicle assigned to the crew firing, even if the crew is using another vehicle, the bumper number of their assigned vehicle is used.
6. **Commander**. Enter the rank and last name of the Bradley commander.
7. **Gunner**. Enter the rank and last name of the Bradley gunner.
8. **Driver**. Enter the rank and last name of the Bradley driver.
9. **BCE—DAY**. Enter the last name and first name of BCE during day phase. BCE initials the form after conducting AAR.
10. **BCE—NIGHT**. Enter the last name and first name of BCE during day night phase. BCE initials the form after conducting AAR.
11. **Engagement Tasks**. Enter task numbers in order of engagement. If a gunnery event contains more than 10 engagements, use another score sheet. When using a second score sheet, complete items 1 through 10. Enter the task numbers of the Bradley table that is being evaluated in the order in which the tasks are fired.
12. **Task Standards**. (See Chapter 9, paragraph 9-2a through c.)
    a. Enter a "G" for GO or an "N" for NO-GO for target kill standards.
    b. Enter the target type and BFV exposure time to the target (for defensive engagements, use BFV's longest single-exposure time to a target).
    c. Enter a "G" for GO or an "N" for NO-GO for the BFV exposure standards.
13. **Critical Subtasks**. (See Chapter 9, paragraph 9-3a through e.)
    a. Enter a "G" for GO or an "N" for NO-GO for auxiliary sight engagements.
    b. Enter a "G" for GO or an "N" for NO-GO for NBC engagements.
    c. Enter a "G" for GO or an "N" for NO-GO for engagements requiring use of manual controls.
    d. Enter a "G" for GO or an "N" for NO-GO for engagements requiring use of the commander's handstation.
    e. Enter a "G" for GO or an "N" for NO-GO for engaging friendly targets.
14. **Leader Tasks**. (See Chapter 9, paragraph 9-4a through e.)
    a. Enter a "G" for GO or an "N" for NO-GO for use of proper fire commands.
    b. Ente a "G" for GO or an "N" for NO-GO for engaging most-dangerous targets first.
    c. Enter a "G" for GO or an "N" for NO-GO for using proper ammunition for the target.
    d. Enter a "G" for GO or an "N" for NO-GO for ensuring the vehicle moves the proper distance during defensive engagements.
    e. Enter a "G" for GO or an "N" for NO-GO for ensuring the gunner does not fire before receiving the command to fire.
15. **Noncritical Subtasks**. (See Chapter 9, paragraph 9-5a through d.)
    a. Enter a "G" for GO or an "N" for NO-GO for proper response terms.
    b. Enter a "G" for GO or an "N" for NO-GO for proper engagement techniques.
    c. Enter a "G" for GO or an "N" for NO-GO for proper driving techniques.
    d. Enter a "G" for GO or an "N" for NO-GO for proper defensive techniques.
16. **Engagement Assessment**. Enter the engagement assessment as T, P, or U.
17. **Remarks**. Annotate significant comments in the remarks column. Normally these comments are used as AAR points.
18. **Qualification Rating**. Circle the appropriate rating for crew qualification events: D - Distinguished, S - Superior, Q - Qualified, or UQ - unqualified.

FM 23-1

18 MARCH 1996

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

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01422

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