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FOREWORD

Marine Corps Warfighting Publication (MCWP) 3-14.1, *Light Armored Vehicle-25 Gunnery and Employment*, describes how the crew and section of the light armored vehicle-25 (LAV-25) conducts gunnery training for combat. MCWP 3-14.1 also provides the tactics, techniques, and procedures for use in engaging and destroying enemy targets with the LAV-25 weapons systems.

The target audience for this publication is LAV-25 crew members, vehicle commanders, unit master gunners, S-3 officers, and commanders of light armored reconnaissance units. MCWP 3-14.1 outlines a standardized way to train Marine LAV-25 gunners through the use of gunnery tables.

MCWP 3-14.1 supersedes FMFM 6-32, *Light Armored Vehicle Gunnery Employment*, dated 28 August 1992.

Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

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Unless otherwise stated, whenever the masculine or feminine gender is used, both men and women are included.

Light Armored Vehicle-25 Gunnery and Employment

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Chapter 1

Weapons Systems and Capabilities

Through its combination of lethal weapons systems, mobility, speed, and agility over rough and varied terrain, the light armored vehicle (LAV) gives its crew the means to survive as an effective fighting element.

The LAV-25 is a lightly armored, eight-wheeled, amphibious vehicle. It is equipped with a stabilized 25mm cannon, a pintle-mounted 7.62mm machine gun, and a coaxially mounted 7.62mm machine gun capable of engaging mechanized targets and personnel.

The LAV-25 also uses the LAV-25 Day/Night Sight to provide enhanced night/battlefield smoke fighting and thermal imaging/target acquisition. This fire control sighting system is capable of attaining a high percentage of first round, destructive target hits.

Manned and operated by a driver, a gunner, and a vehicle commander, the LAV-25 (fig. 1-1) is capable of carrying four infantry scouts in the

rear. A competent crew can bring accurate, high-volume firepower to bear against the enemy.

1001. M242 25mm Automatic Gun

The main armament of the LAV-25 is a 25mm, fully automatic, externally powered Bushmaster chain gun. (See fig. 1-2.) The M242 is turret-mounted with a 360-degree field of movement. The M242 is used to destroy lightly armored vehicles (BMPs, BRDMs, BTRs, etc.) and some aerial targets, such as helicopters and slow-flying aircraft. It is also used to suppress enemy positions such as troops in the open, in dug-in positions, or in built-up areas. See Technical Manual (TM) 08594A-10/1B, *LAV-25 Turret*, for detailed operator information.

a. Description

The dual-feed weapon system allows the crew to select and load two types of available service ammunition. The weapon system is externally

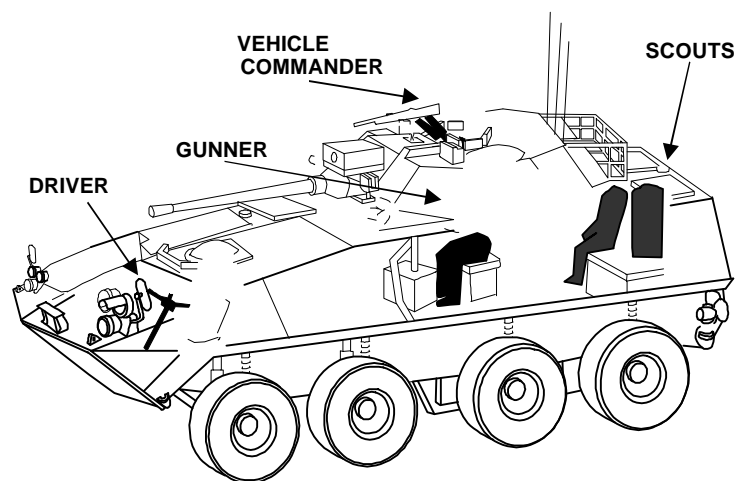


Figure 1-1. LAV-25.

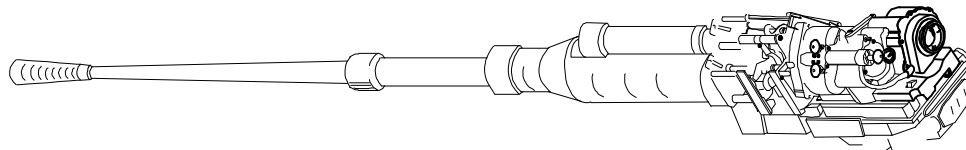


Figure 1-2. M242 25mm Automatic Gun.

WARNING

25MM DISCARDED SABOT PETALS MAY CAUSE DEATH OR SERIOUS INJURY TO UNPROTECTED MARINES LOCATED WITHIN THE WEAPON'S DANGER ZONE THAT EXTENDS FROM THE MUZZLE AT AN ANGLE OF 34 DEGREES ALONG THE LINE OF FIRE

powered by a 1.5 horsepower direct current (DC) motor; this allows selection of three rates of fire.

Single shot (as fast as the commander or gunner can squeeze the trigger).

Low rate (100 rounds per minute, plus or minus 25 rounds/minute).

High rate (200 rounds per minute, plus or minus 25 rounds/minute).

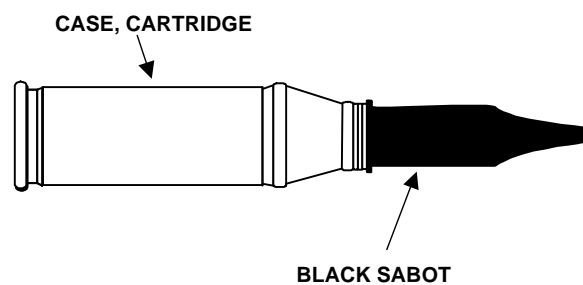
b. Ammunition

There are five basic types of rounds used with the 25mm gun. Each has its own unique characteristics and serves to fill a specific requirement for training and combat. Table 1-1 (page 1-6) presents each type of round, its capabilities, and uses. Appendix A provides details on proper procedures for cleaning, inspecting, and storing ammunition.

(1) M791 Armor-Piercing Discarding Sabot With Tracer (APDS-T). The M791 APDS-T cartridge (see fig. 1-3) penetrates lightly armored vehicles. Examples of lightly armored vehicles are BMPs, BMDs, BTRs, BRDMs, ZSUs, and self-propelled artillery.

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 windshield, pressed-in tracer pellets, molded discarding-type nylon sabot, pressed-on polyethylene nose cap, and staked aluminum base.

Gases produced by the burning propellant discharge the projectile from the gun at 1,345 meters per second (plus or minus 20 meters per second) and ignite the tracer. Setback, centrifugal force, and air pressure cause the sabot to separate on leaving the gun barrel. The discarding sabot leaves the barrel at about a 34-degree angle along the gun-target line (17 degrees off each side) for 100 meters. The tungsten penetrator (core) is spin-stabilized and penetrates the target solely by kinetic energy.



Projectile:	Penetrator (core)-Tungsten alloy Sabot-Nylon, aluminum base Nose cap-Polyethylene
Color:	Black with white markings
Muzzle velocity:	1,345 meters per second

Figure 1-3. M791 Armor-Piercing Discarding

The maximum effective range is 1,700 meters. This is based on the following factors:

Tracer burnout is 1,700 meters. It is difficult to accurately detect rounds beyond this range. 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.

Beyond 2,200 meters, the accuracy of the APDS-T decreases sharply.

As range increases, the APDS-T penetration decreases against BMP-1 and BMP-2, especially when these vehicles are equipped with appliqué armor. While some targets can be successfully engaged from the flank beyond 1,700 meters, the combined problems of “sensing” (observing impact), round expenditure, and longer engagement times demand that the vehicle commander make a careful estimate of the situation before engaging targets beyond 1,700 meters.

(2) M919 Armor-Piercing, Fin-Stabilized Discarding Sabot With Tracer (APFSDS-T).

The M919 APFSDS-T cartridge (fig. 1-4) penetrates lightly armored vehicles.

APFSDS-T is a fixed-type, percussion-primed round consisting of a sabot-encapsulated

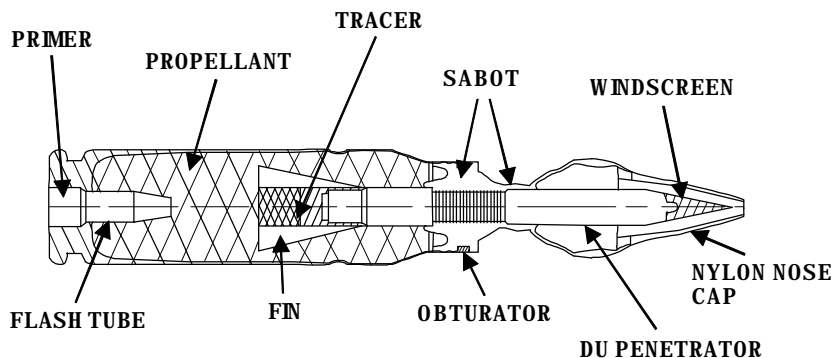
projectile body crimped to a steel cartridge case. The projectile body consists of a depleted uranium penetrator, pressed-on aluminum windscreen, screw-on fins with pressed-in tracer pellets, segmented discarding-type nylon sabot, and pressed-on polyethylene nose cap.

Gases produced by the burning propellant discharge the projectile from the gun at 1,420 meters per second (plus or minus 20 meters per second) and ignite the tracer. Setback, centrifugal force, and air pressure cause the sabot to discard on leaving the gun barrel. The discarding sabot leaves the barrel at a 17-degree angle on both sides of the gun-target line for 100 meters (total of 34 degrees). The tungsten penetrator with a depleted uranium core is fin-stabilized and

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penetrates the target solely by kinetic energy.



Projectile: Penetrator core
Depleted uranium (DU)
Sabot: Nylon
Nose cap, nylon Polyethylene

Muzzle Velocity: 1,420 meters per second

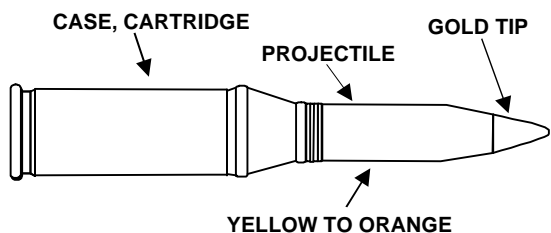
Figure 1-4. M919 Armor-Piercing, Fin-Stabilized Discarding Sabot With Tracer (APFSDS-T).

The maximum effective range is 1,700 meters. This round has increased penetration capabilities as well as tracer burn time, which allows engagement of targets at greater ranges.

Note: Current LAV-25 sights may not compensate for the flatter trajectory of the M-919. Also, the Marine Corps has not procured this round at time of publication because of cost and environmental issues. However, the round is available through the U.S. Army system, if needed.

(3) M792, High Explosive Incendiary With Tracer (HEI-T). The M792 HEI-T cartridge (see fig. 1-5) is used to destroy lightly armored vehicles and helicopters (armored and unarmored) and to suppress antitank guided missile (ATGM) positions, crew-served weapons, dismounted infantry, and likely enemy positions past coaxial 7.62mm machine gun range out to a distance of 3,000 meters.

The HEI-T cartridge is a fixed-type, percussion-primed round. The cartridge consists of a high explosive incendiary (HEI)-filled, one-piece projectile body crimped to a steel cartridge case. The projectile body consists of a hollow steel body, M758 fuse, 32 grams of an HEI-mix, and pressed-in tracer.



Projectile: High explosive incendiary (HEI)-filled, One piece

Color: Yellow to Orange projectile with Gold Tip

Muzzle velocity: 1,700 meters per second

Figure 1-5. M792 High-Explosive Incendiary

Gases produced by the burning propellant discharge the projectile from the gun at 1,100 meters per second (plus or minus 20 meters per second). On impact, the fuse (M758) functions and the HEI filler detonates, dispersing the incendiary mixture in a 5-meter radius. If the projectile has not impacted at about 3,000 meters, the mechanical fuse will self-detonate the round.

The maximum effective range for HEI-T is 1,600 meters. This is based on the following factors:

The round is designed to self-detonate at 3,000 meters.

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

Though accuracy severely decreases beyond 1,600 meters, the 5-meter bursting radius and rate of fire make it possible to achieve effect on both point and area targets out to 3,000 meters. However, the ballistic daysight organic to the LAV-25 only allows ranging for HEI-T ammunition, using the stadia lines in the reticle, out to 2,200 meters. Therefore, accurate sighting and ranging using that sight is limited to targets out to this distance. Beyond that, impacts can be observed using the sight, but there is no reticle pattern available for accurate adjustments. The thermal sight picture, using narrow field of view, terminates at the bottom of the reticle pattern, which is 2,200 meters for high explosive (HE). Therefore, using the thermal sight, targets cannot be acquired, nor can impacts be observed, past 2,200 meters.

(4) M910 Target Practice Discarding Sabot With Tracer (TPDS-T). The M910 TPDS-T cartridge (fig. 1-6) allows units to practice sabot engagements on limited distance ranges. TPDS-T is ballistically matched to the APDS-T, but instead of the 14,572 meter maximum range for APDS-T, the maximum range is 8,000 meters.

The TPDS-T is a fixed-type, percussion-primed round. It consists of an encapsulated projectile body crimped to a steel cartridge case. The projectile body is steel, where the APDS-T is tungsten alloy. It has a pressed-on aluminum

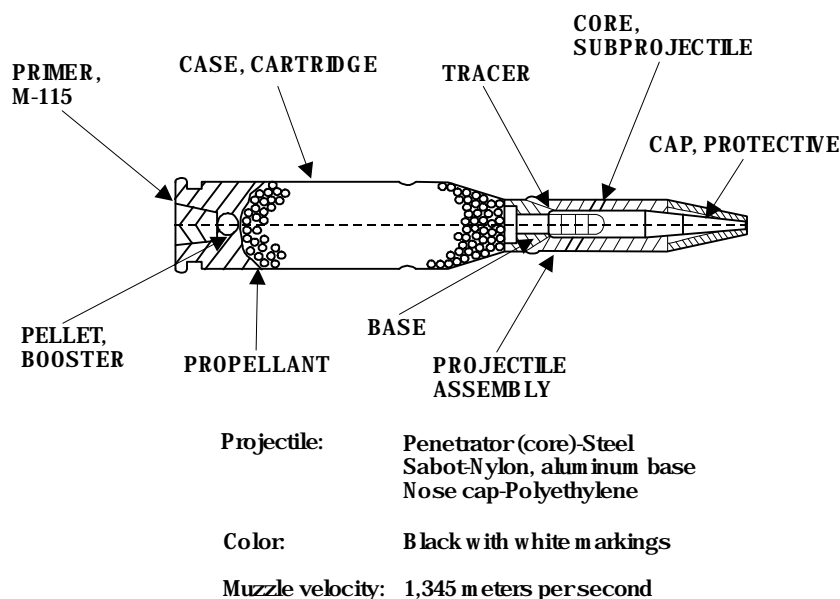


Figure 1-6. M910 Target Practice Discarding Sabot With Tracer (TPDS-T).

windshield, pressed-in tracer pellets, molded discarding-type nylon sabot, staked aluminum base, and pressed-on polyethylene nose cap. Gases produced by the burning propellant discharge the projectile from the gun at 1,540 meters per second (plus or minus 20 meters per second) and ignite the tracer. Setback, centrifugal force, and air pressure cause the sabot to discard on leaving the gun barrel. The discarding sabot may cause death or injury along a 34-degree angle along the gun-target line for 100 meters. The steel projectile body is spin-stabilized and penetrates the target solely by kinetic energy.

The TPDS-T cartridge is ballistically matched to the APDS-T with a slight increase in muzzle velocity (about 100 meters per second). The high mass flow tracer decreases the base drag, allowing the spin-stabilized core to match the trajectory of the armor-piercing round to a range of 2,000 meters. Upon tracer burnout, the lightweight core loses velocity rapidly and eventually tumbles when its velocity goes below the speed of sound.

Tracer burnout is 2,000 meters. However, since the round is used to simulate APDS-T, it should only be used out to 1,700 meters to match the maximum effective range of that round.

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(5) M793 Target Practice With Tracer (TP-T).

The M793 TP-T cartridge (fig. 1-7) is a

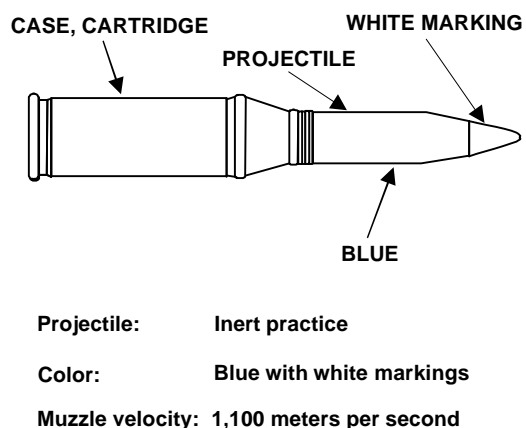


Figure 1-7. M793 Target Practice With Tracer

Table 1-1. Ammunition Data.

	M791 APDS-T	M919* APFSDS-T	M792 HEI-T	M910 TPDS-T	M793 TP-T
DODAC	A974	NA	A975	A940	A975
Muzzle velocity	1345 MPS	1420 MPS*	1100 MPS	1540 MPS	1100 MPS
Time of flight	seconds	seconds	seconds	seconds	seconds
1000 meters	0.8	0.8*	1.2	0.76	1.2
1500 meters	1.2	1.2*	2.2	1.26	2.2
2000 meters	1.7	1.7*	3.6	1.88	3.6
2500 meters	2.2	2.2*	5.3	2.72	5.3
Cartridge weight	458 grams	450 grams	501 grams	415 grams	501 grams
Projectile weight	105 grams	110 grams	185 grams	94 grams	185 grams
Tracer burn time	1.4 seconds	classified	3.5 seconds	1.88 seconds	3.5 seconds
Bursting radius	NA	NA	5 meters	NA	NA
Arming distance			0-100 meters		
Maximum effective range	1700 meters	1700 meters	1600 meters	1700 meters	1600 meters
Tracer burn range	1700 meters	1700+ meters*	2000 meters	1700 meters	2000 meters

*These specifications are pending final testing. See note on page 1-4.

fixed-type, percussion-primed training round that is used in place of the HEI-T round.

The TP-T cartridge is ballistically matched to the M792 HEI-T round. All other characteristics are the same as the HEI-T.

Tracer burnout is 2,000 meters. However, accuracy is greatly reduced if engaging point targets. The maximum effective range is 1,600 meters. Training with the round beyond tracer burnout should be done only to simulate HEI-T area engagements and only as long as the impact of the round is visible.

Note: Effective range of ammunition is based on the ability to adjust the round onto target. The effective range does not imply that the round's penetration or killing ability is impaired beyond the effective range.

1002. M240 Series 7.62mm Machine Guns

The secondary weapons systems of the LAV-25 consist of two 7.62mm machine guns. One M240

series machine gun is coaxially mounted in the LAV-25 turret with the M242 25mm weapon. The other weapon is a pintle-mounted M240E1 7.62mm machine gun that is located on top of the turret outside the vehicle commander's hatch. These weapons provide flexibility to the crew in engaging targets with weapons other than the main gun and also in engaging multiple targets simultaneously.

a. M240 7.62mm Coaxially Mounted Machine Gun

This machine gun is used to engage dismounted infantry, crew-served weapons, ATGM teams, and unarmored vehicles. (See fig. 1-8.)

(1) Description. This weapon is a belt-fed, gas-operated, fully automatic 7.62mm machine gun with a maximum effective range of 900 meters (tracer burnout). It is coaxially mounted on the right side of the M242 25mm main gun.

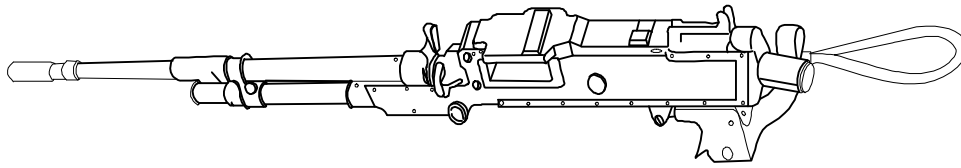


Figure 1-8. M240 7.62mm Coaxially Mounted Machine Gun.

(2) Ammunition. The preferred ammunition for this weapon is a ratio of four ball rounds to one tracer round (DODAC A131). There are other variations of 7.62mm ammunition available; however, the four ball rounds to one tracer round ratio mix allows the commander and gunner to use the tracer-on-target method of adjusting fire to achieve target kill. See TM 9-1005-313-10, *Operator's Manual for Machine Gun, 7.62mm M240, M240C, M240E1* for more operator information.

b. M240E1 7.62mm Pintle-Mounted Machine Gun

A M240E1 7.62mm machine gun is mounted on top of the turret in front of the vehicle commander's position. It is used to engage dismounted infantry, crew-served weapons,

ATGM teams, and unarmored vehicles. (See fig. 1-9.)

(1) Description. This weapon is also an air-cooled, belt-fed, gas-operated automatic weapon. The M240E1 is able to provide a heavy, controlled volume of accurate, long-range fire that is beyond the capabilities of individual small arms. For more detailed information on employment, see MCWP 3-15.1, *Machine Guns and Machine Gun Gunnery*.

(2) Ammunition. The M240E1 machine gun uses 7.62mm North Atlantic Treaty Organization (NATO) cartridge ammunition issued in disintegrating metallic split-linked belts. Like the coaxially mounted machine gun, the

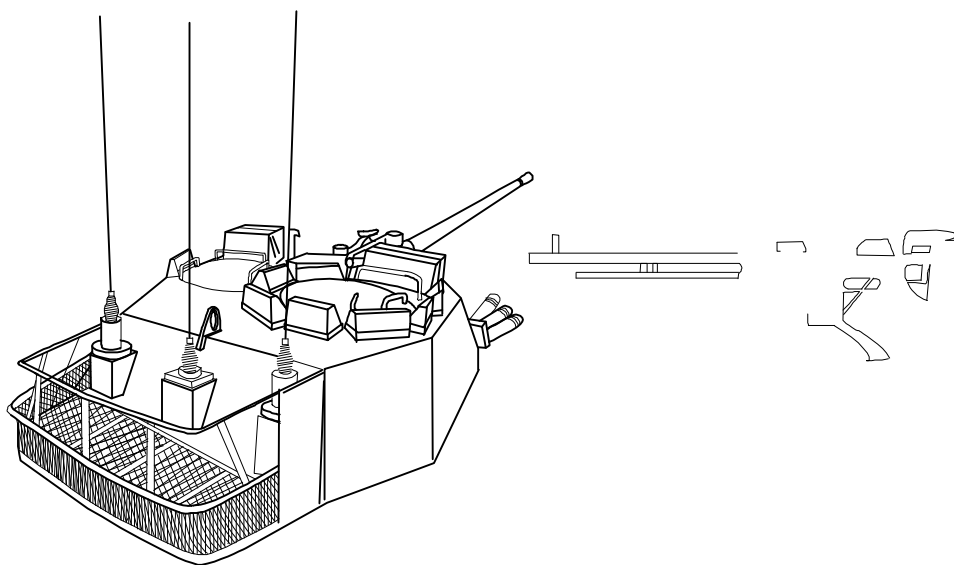


Figure 1-9. M240E1 7.62mm Pintle-Mounted Machine Gun.

pintle-mounted M240E1 normally uses the four ball rounds to one tracer round ratio mix.

1003. M257 Smoke Grenade Launcher

There are two 4-tube electrically fired smoke grenade launchers on the LAV-25. One launcher is located on each side of the 25mm gun. When activated, grenades conceal the vehicle by providing smoke cover that blocks visual observation.

a. Description

Each launcher fires four smoke grenades. They can be fired either on the right side, left side, or both sides at once. Upon activation, the smoke grenade creates enough smoke to screen the

LAV-25 within 3 seconds. The vehicle commander or gunner fires the launchers from inside the turret.

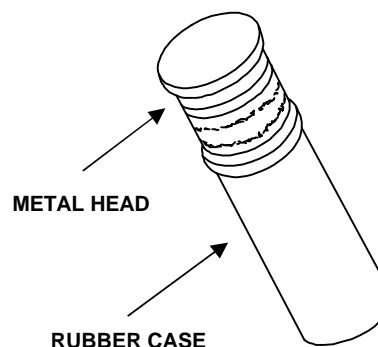


Figure 1-10. L8A1/A3 Smoke Grenade.

b. Ammunition

L8A1/A3 red phosphorus smoke grenades are filled with a red phosphorus and butyl rubber mix. (See fig. 1-10.) The burst is in the direction the turret is pointed. The bursting radius is a 170-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. See TM 08594A-10/1B for more operator information.

Chapter 2

Target Acquisition Process

On future battlefields, the tempo will be such that an LAV-25 crew must be prepared to move and to rapidly acquire and engage multiple targets. Platoons may be operating within irregular battle lines over extended distances. Threat targets may be intermixed with friendly and neutral or civilian vehicles. The LAV-25's speed and mobility, coupled with battle drills, increase the likelihood of opposing and allied forces becoming intermingled during combat operations.

Survival in these situations depends on the crew's ability to effectively search for, detect, locate, identify, classify, confirm, and rapidly engage threat targets. LAV-25 crews must take advantage of the tactical situation and engage first. Speed and accuracy of an engagement depend on the degree of crew proficiency in target acquisition techniques and gunnery procedures.

This chapter describes the target acquisition process, including night sight acquisition, and the methods for acquiring and classifying targets. It also describes the acquisition report and relates target acquisition confirmation to conduct of fire.

Target acquisition is the timely detection, location, and identification of targets in enough detail to accurately attack by either direct fire or supporting weapons. The target acquisition process is a series of progressive and interdependent steps (or actions). The steps in the target acquisition process are observation, detection, location, identification, classification, and confirmation. (See fig. 2-1.) The process leads to engagement of the target, covered in chapter 3 of this manual. The target acquisition process is heavily dependent on active observation, called "crew search" for the LAV-25, the results of which feed the process throughout. Crew members must observe the battlefield continuously whether in the offense or

defense and whether the vehicle is stationary or moving. Effective target acquisition for an LAV-25 crew requires the combined efforts of each crew member. The target acquisition process can take minutes or just seconds to get to the command of execution.

2001. Observation

Observation, accomplished on the LAV-25 by crew search, is the act of carefully and continuously surveying the battle area for indications of targets. *Observation is vital.* Crew members use both the unaided eye and the vehicle optics to

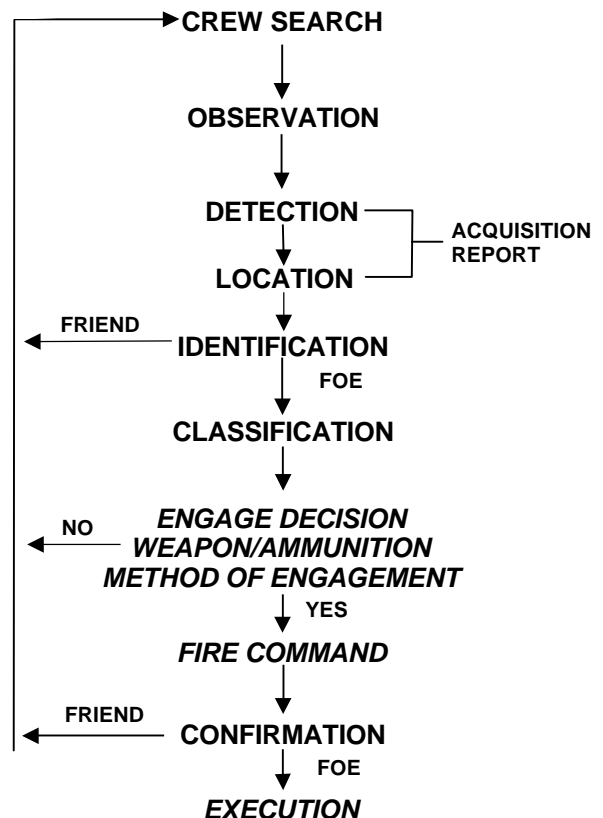


Figure 2-1. Target Acquisition Process.

search or scan predetermined sectors to acquire (detect, locate, and identify) targets.

a. Planning Considerations

(1) Assign Sectors of Observation. The vehicle commander assigns specific sectors of observation to each crew member for target acquisition. The vehicle commander normally has 360-degree responsibility, including that for overhead observation. Every other crew member is assigned a specific sector of observation, including crew members riding in the rear of the vehicle, to ensure all around coverage of the battlefield. When the crew operates as a section or a platoon, each LAV-25's all around coverage will create overlapping fields of observation.

(2) Consider Observation Limitations. During operations in which the vehicle is buttoned-up, the vehicle commander's and gunner's ability to observe and acquire targets are reduced by at least 50 percent. Their observation responsibilities must be adjusted to compensate for the reduction. If the LAV-25 is operating in a nuclear, biological, and chemical (NBC) environment, acquisition is further hampered due to wearing the protective mask.

(3) Use Dismounted Observer(s). When an LAV-25 is halted in a hide position, an observer, equipped with sufficient binoculars or optics and communications, should dismount and locate forward of the vehicle position. Depending on the

mission or the vehicle's assigned area(s) of responsibility, more than one observer may be required to provide sufficient coverage.

(4) Conduct Observation Continuously. To be effective, crew members scan their areas of observation continuously to detect targets or possible target locations. Intermittent observation increases the opportunity for enemy vehicles to approach undetected.

b. Ground Search Techniques and Methods

There are three ground search techniques that enable crew members to quickly locate targets: the rapid scan, slow (50-meter) scan, and detailed search. All three techniques may be used by all crew members using the unaided eye, binoculars, or vehicle optics during both favorable and limited visibility. These techniques may be modified at night by using the off-center vision method.

(1) Rapid Scan. The rapid scan method quickly detects obvious signs of enemy activity. (See fig. 2-2.) It is usually the first method used by the observer, whether the LAV-25 is stationary or moving. The vehicle commander may use binoculars, night vision devices, or the unaided eye; the gunner may use the M36 sight or the unity view window. The observer—

- Starts in the center of the sector and rapidly scans from the nearest to farthest visible point.

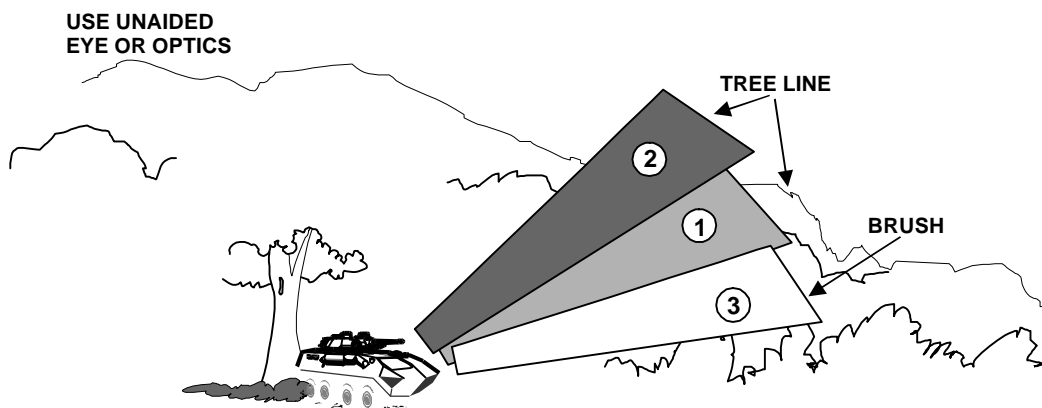


Figure 2-2. Rapid Scan Technique.

- Orients left or right and conducts a rapid scan, viewing from near to far. This sweep must overlap the center area of the previously scanned sector.
- Scans the remaining side in the same manner once one side of center is completed.

(2) Slow (50-Meter) Scan. If no obvious targets are identified in the rapid scan, crew members conduct a more deliberate scan of the terrain by using internal optics or binoculars. (See fig. 2-3.) When in a defensive position or from a short halt, the vehicle commander or gunner—

- Pauses at short intervals to give the eyes time to focus, searches a strip of the target area 50 meters deep from right to left.
- Searches a strip farther out from the left to right, overlapping the first area scanned.
- Stops and searches the immediate area thoroughly when a suspicious area or possible target signature is detected, uses the detailed search technique.

(3) Detailed Search. If no targets are found using the rapid or slow scan techniques and time permits, crews should use the optics (day and night) to make a careful, deliberate search of specific areas in their assigned area. (See fig. 2-4.) This method is also used to search, in detail, small areas or locations with likely or suspected avenues of approach. Concentrate on one specific area or location and study that area intensely. Look for direct or indirect target signatures in a

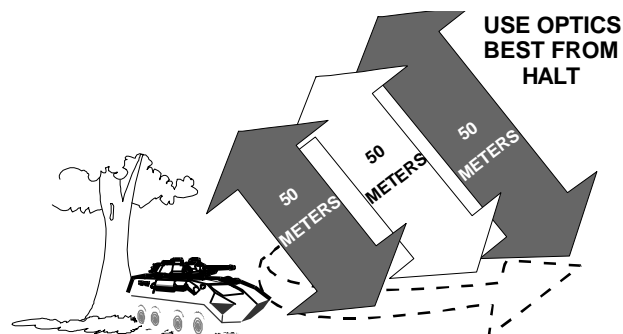


Figure 2-3. Slow (50-Meter) Scan.

clockwise manner around the focal point (terrain feature) of the area. Some signature examples are—

- Dust created by movement of vehicles.
- Diesel smoke or exhaust.
- Track or tire marks.
- Light reflections (flash) from glass or metal.
- Angular objects that do not conform with the surrounding area.
- Vegetation that appears out of place.
- Flash or smoke from a weapon or missile.
- Entrenchments or earthworks.

(4) Off-Center Vision Method. Day and night scanning techniques (rapid, slow, and detailed) are similar with one exception. At night, using daylight optics or the unaided eye, do not look directly at an object, but a few degrees off to the side of the target object. Move the eyes in short,

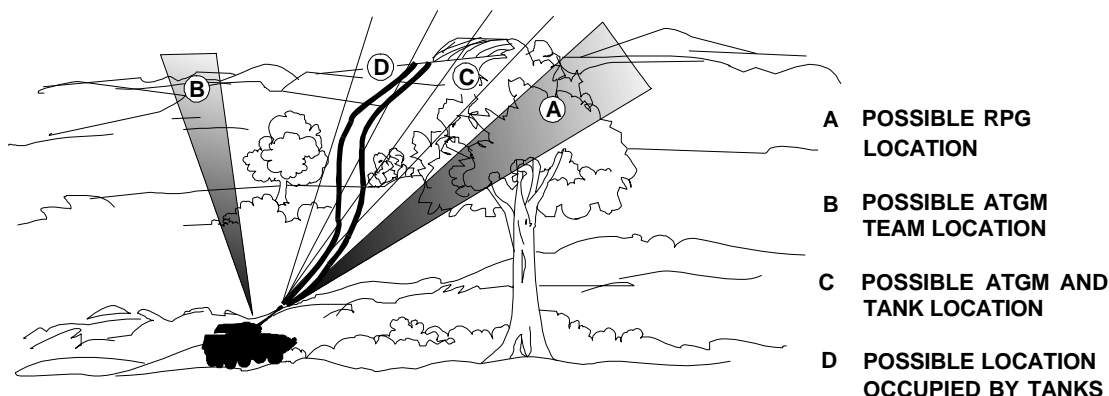


Figure 2-4. Detailed Search Technique.

abrupt, irregular movements. At each likely target area, pause a few seconds to attempt to detect a target or any movement. If an object is detected as a possible target, use off-center vision to observe it. While observing the object, use frequent eye movement to prevent object fadeout. Cupping the hands around the eyes will also decrease night vision loss.

c. Air Search Techniques

There are two air search techniques to detect aerial targets quickly: flat terrain scan and hilly terrain scan. Both of these techniques are based on the slow (50-meter) scanning technique discussed previously. While using a ground search technique, crew members should always search from near to far for possible targets. When using an air search technique, crew members should always search from far to near.

(1) Flat Terrain Scan (Air Search). In flat terrain, search the horizon by moving the eyes in short movements from object to object. (See fig. 2-5.) More detail is registered this way than with a continuous scan of the horizon.

(2) Hilly Terrain Scan (Air Search). In hilly terrain, search the sky beginning just below the

horizon and move upward. (See fig. 2-5.) Use prominent terrain features as points of reference to ensure overlapping areas of search.

When using air search techniques, concentrate just below the tops of trees or vegetation to detect helicopters in hide positions.

Ground and air search techniques may be combined. This allows crew members to scan for targets in the air and on the ground at the same time. Combinations used will depend on the area of operations and mission, enemy, terrain and weather, troops and support available, time available (METT-T). Air search at night is similar to searching for ground targets at night.

Threat aircraft normally operate in pairs. If aircraft are acquired, a second pair of aircraft should be expected, and possibly another pair after that. There may be a number of pairs of aircraft encountered.

d. Crew Search Tips

The following observation tips are based on lessons learned. All of the optical devices on the LAV-25 may be used to acquire targets. These devices include binoculars, night vision devices,

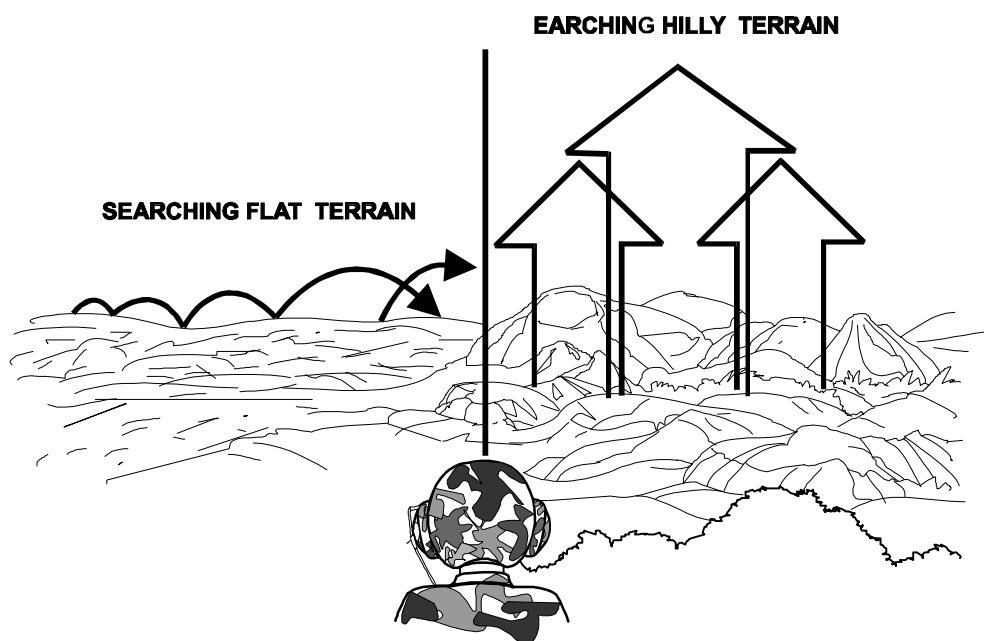


Figure 2-5. Air Search Techniques.

M36 day sights, passive and thermal night sights, and the driver's night vision viewer. The following tips will help crews increase their effectiveness in observing:

- Initial scanning is done without optics, then with optics (such as binoculars or sights).
- Target search is continuous. Possible target(s) missed in the first or second scan may be seen on the third or fourth scan.
- The entire crew should look for likely targets and target locations using proper scanning techniques.
- While on the move, the gunner should use the rapid scan technique.
- The gunner should dim the brightness of his reticle, and the turret dome lights should be off or in the filtered position. Marines should do the same with the dome lights in the troop compartment. This will aid in acquisition and location of targets during day or night operations, and it will aid in detection avoidance.
- The observer should be aware that targets on the edge of the peripheral fields of view are harder to detect and locate.
- Operations during NBC conditions limit the crew's ability to acquire and locate targets. Continuous scanning is required to make up for narrowed fields of view while wearing protective masks.
- Concentrate the search in areas where targets are more likely to appear such as identified avenues of approach, wood lines, and reverse slope firing positions.

2002. 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. Usually, the target emits indicators, or signatures, that help the observer to detect it. The observer should be aware of unique battlefield signatures that will key the observer to possible targets.

a. Target Signatures

Target signatures are telltale indicators or clues that aid in detecting potential targets.

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 a vehicle 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.

Look for targets in areas where they are most likely to be employed. Tracked vehicle signatures are most likely to be detected in open areas and rolling terrain. Threat antitank positions are normally sited to visually cover primary avenues of approach where tanks and armored personnel carriers (APCs) travel. Look for helicopters behind wood lines, ridge lines, and significant folds in the terrain. Crews 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.

(1) Infantry Signatures

- Fighting holes.
- Broken vegetation.
- Footprints.
- Signs of new or old fires.
- Noise.
- Trash.

(2) Tracked Vehicle Signatures

- Vehicle tracks on the ground.
- Engine noise.
- Exhaust smoke.
- Dust clouds from movement.
- Weapon firing and/or smoke from weapon.

- Bright white flash at night.
- Prominent heat source.

(3) Antitank Weapons Signatures

- Missile launch “swish” sound.
- Long, thin wires from fired ATGMs.
- Sharp crack of the ATGM being fired.
- Destroyed armored vehicle.

(4) Artillery Signatures

- Loud, dull sound.
- Grayish-white smoke cloud.
- Bright orange flash and black smoke from airburst.
- Rushing noise several seconds before impact.
- Same thermal infrared signatures for self-propelled artillery as tracked vehicles.
- Varied towed artillery signatures according to the towing vehicle.

(5) Aircraft Signatures

- Glare of sun reflecting off aircraft canopies, wings, fuselages of fixed wing aircraft, and windows and rotor blades of helicopters.
- Aircraft noise.
- Dust and movement of foliage from hovering helicopters.

(6) Obstacles and Mine Signatures

- Loose or disturbed dirt in a regular pattern.
- Destroyed or disabled vehicle that appears to have struck a mine.

b. Challenges

Some targets are more difficult to detect than others. Increased crew training, experience, and greater concentration are needed to detect and locate these difficult targets. Some examples of these more difficult targets and challenges are—

- Peripheral targets.

- Targets that are camouflaged or in shadows.
- Targets that can be heard but not seen.
- Targets positioned under less than ideal indirect fire illumination. If the illumination is in front of the target, the resulting shadow will appear darker than the target. If the illumination is behind the target (and not in such a position as to “wash out” the crew’s optics), the target should stand out distinctly from the background. Always keep one eye closed during search by illumination, and never look directly into the illumination source. This will help maintain night vision.
- Small, single targets such as a lone, dismounted ATGM or rocket-propelled grenade (RPG).
- Natural obstacles (weather and terrain). Weather can cause a wide variety of degraded effects to both the observer and electro-optic systems. Terrain can mask observation and therefore detection.
- Manmade obstacles (smoke and battlefield clutter) can also degrade the observer’s ability to detect targets.
- Behavioral or physical deficiencies (fatigue, eye reaction to gun flashes, night blindness) of the observer also affect ability to detect.
- Targets viewed at night in front of fires (from burning vehicles, battlefield clutter) may be washed out by the brighter background light.

c. Limitations of Passive Sight

Winters are generally characterized by more hours of darkness. The enemy may make the most of this condition by moving forces in the dark. The enemy may also dig in or continue the attack at night. To acquire targets at night, the crew must be proficient in the use of both the thermal sight and the backup passive sight. Since viewing through passive sights at night will reduce night vision, the gunner and vehicle commander should alternate turns on the sight every 10 to 15 minutes. Changing over every 10 to 15 minutes minimizes loss to both and minimizes eye fatigue. The passive sight may be used in conjunction with the thermal sight when conducting ground search techniques. The user of the passive sight must

remember that frequent adjustment of the image focusing ring will be required as viewing ranges increase or decrease. Reticle illumination should be adjusted to the lowest setting to allow the viewer to see clearly under all light conditions.

d. Use of the Thermal Sight

During the hours of darkness, the enemy can be expected to move their forces, dig in, defend, or attack. During the day, the enemy can be expected to cover movement by every means possible, including camouflage and obscuration. Some camouflaged targets are difficult to acquire with standard day optics but can be easily detected with the thermal sight. For example, a vehicle in a wood line may be seen as an irregular shape compared to the surrounding vegetation. A vehicle located behind a building with its engine running may give off a heat plume from the exhaust that can be detected through the thermal sight. The vehicle commander and gunner must be able to use the thermal sight to acquire targets during good and limited visibility.

The DIM-36TH sight, in the thermal mode, operates on the principle of sensing heat radiation or temperature differences against the background. This temperature difference is displayed as an electronic image. Any source of heat that varies with its surroundings can be detected by the thermal sight. Acquiring and engaging targets with thermal sights during periods of reduced visibility helps ensure surprise in the initial rounds of the engagement, enabling the LAV-25s to use their weapons and deny the enemy obvious targets of mounted light sources. There are five primary heat sources that are detected by the thermal sight.

(1) Solar Heat. Objects absorb heat from the sun at different rates depending on the material. The amount of heat absorbed by an object and the length of time the object can retain and reflect the heat determines how long the reflected heat can be seen using the thermal sight. Target signatures vary if heated only by solar heat. As the sun begins to set and objects cool, the objects' form may change.

(2) Fuel Combustion. The operation of a vehicle engine creates heat. Vehicles have a plume of heat from the exhaust and other cues around the engine compartment. The location of the engine and the direction of the vented hot exhaust differs between vehicle types. As a result, many vehicles create one or more images when viewed through a thermal sight. Also, the signature produced by a vehicle may vary with the duration of use.

(3) Friction. Moving parts of a vehicle cause friction that also is picked up as a heat source on thermal sights. These areas then appear as images in the sight: tracks, roadwheels, drive sprockets, wheel hubs, and support rollers are examples. Vehicles being driven through mud or snow are cooler and do not create as sharp an image. Vehicle tracks will leave an image for a short time from the friction of the vehicle driving over the surface. Vehicle track-shrouding materials can help hide thermal cues of road wheels and track shoes. The longer a vehicle has operated—generating friction—the more intense the heated areas become. A vehicle looks much different after a 12-kilometer road march than it does at rest in a defensive position.

(4) Thermal Reflections. Glossy, smooth surfaces, such as the windshield of a vehicle, can reflect radiated heat.

(5) Body Heat. Body heat is also detected by the thermal sight, and the signature is affected by the activity the body has undergone. The greater the activity, the greater the thermal signature.

Thermal imaging systems provide a definite advantage over passive sight-equipped systems during night operations. At the time of publication, few threat vehicles have thermal imagery; their common night systems are active infrared sighting systems. Night operations can be used to advantage since LAV-25 crews can maneuver and engage targets using their thermal sighting system. Conditions encountered during some daytime operations, such as periods of intense sunlight, fog, camouflage, or dust, may also be better accomplished through use of thermal imagery.

The capabilities of the DIM-36TH sight allow for manipulation of the electronic image for optimal viewing. Skilled manipulation of the *POLARITY*, *RETICLE BRIGHTNESS*, *BRIGHTNESS*, and *CONTRAST* controls can provide a clearer and more distinct picture of target signatures. For example, a simple switch of image polarity may provide the difference in clarity to make target identification possible, i.e., the difference between an APC or a tank. Crews should experiment to find which polarity is personally better.

2003. Location

Target location is the establishment or determination of where a potential target is physically located on the battlefield. Locating a target results from observation and detection during crew search.

A vehicle commander who locates a target may lay the gun and issue a fire command, which fixes the location of the target for the gunner. This is the default method for providing direction for the gunner. The vehicle commander may also announce *MY TURRET* if necessary.

Once a target is located by a crew member or scout in the rear of the vehicle, the target's location is communicated to all other personnel. Target location methods used to announce a located target depend on the locator's specific position in the crew, unit standing operating procedures (SOP), and time available. The five most common target location methods are described below.

a. Clock Method

The clock method is commonly used to get the vehicle commander or gunner's eyes on target. Twelve o'clock is based on the direction of vehicle movement while traveling or hull orientation (front of vehicle) when stationary. Drivers and scouts usually use the clock method to locate targets for the vehicle commander or gunner. (Example: *BMP, NINE O'CLOCK*.)

b. Sector Method

The sector method is similar to the clock method; it is quick and easy to use. It is based on the direction of movement (if moving) or hull orientation (if stationary) using the terms: center, left, right, and rear. Center sector is always to the direct front of the vehicle. (Example: *THREE BMPs, LEFT REAR*.)

c. Traverse Method

The traverse method is also a relatively quick method, primarily used by the vehicle commander to get the gunner on target. It is used when either the vehicle commander's handstation to traverse the turret is inoperable or it is more expedient than actually traversing the gun to guide the gunner on the target. In this method, the vehicle commander issues directions to the gunner until the gunner is on the target. (Example: *TRAVERSE LEFT [OR RIGHT], STEADY, ON*.)

d. Reference Point Method

The reference point method is normally used in conjunction with the vehicle's optics. The vehicle commander uses binoculars to determine the mil value and direction from a designated terrain feature or known position used as a reference point. The vehicle commander then announces the mil value and direction from the reference point to the gunner.

The gunner uses the mil reticle relationship from the reference point to traverse onto the target. The key to this location method is both the vehicle commander's and gunner's knowledge of the mil sight relationship and the establishment of target reference points (TRPs). (Example: *ATGM, TRP ONE FOUR, RIGHT FIVE MILS*.)

- The quick reference point method is used by all personnel to hand over targets *located near* a TRP. (Example: *TWO PCs, TRP ONE FOUR*.)
- The precise reference point method is used to locate targets *accurately* in relationship to a known reference point. (Example: *TWO PCs, TRP ONE FOUR, LEFT TWO FIVE MILS*.)

e. Grid Method

The grid method is the least desired technique because of the length of time it takes to bring the gunner on target. The vehicle commander receives the location of the target by map grid (usually from an observation post). The vehicle commander then uses the vehicle's map to orient the turret on target for the gunner.

2004. Identification

Target identification is the determination of affiliation of the potential military target (friendly, hostile, neutral, noncombatant) and the recognition of its particular type (such as a specific type of vehicle).

At a minimum, this identification must determine the target as friendly (one not to be engaged) or hostile (one which may be engaged). Crews must know what to shoot and what not to shoot. Currently, the crew's only method of positive vehicle identification is through visual or electro-optical (E-O) means. As engagement ranges increase, camouflage techniques become more effective, battlefield obscuration increases, and visual identification greatly decreases. Crews that can quickly and accurately identify targets have the advantage of engaging first and destroying the enemy at the weapon system's maximum engagement range. Crew sustainment training and evaluation on target identification is a prerequisite and requires continuous training.

Target identification training is an essential part of any weapon system proficiency training program. Vehicle commanders must continually train their crews in target identification. See the unit S-2 officer for more information on how to train for identifying specific or additional vehicles, aircraft, and equipment likely to appear on the battlefield. Graphic training aids (GTAs) are available for training crews to identify specific vehicle types. Field Manual (FM) 1-402, *Aviator's Recognition Guide*, and aircraft recognition cards are helpful tools to train crews on aircraft identification.

Recognition is closely related to target ID. Normally, the gunner will do this automatically once he recognizes a potential target. He can interpret

the cues that he is seeing. Thermal cues tell the gunner if a thermal hotspot is an APC, tank, or other type of vehicle assuming that the hottest spot is the engine or exhaust system.

Situational awareness is key. Through the use of passive or active means, the crew interrogates the suspect threat target. Passive means include painted chevrons, air panels, and thermal markings or chemlites. Active measures include the Battlefield Combat ID System and radio communications.

2005. Classification

Target classification categorizes potential targets by the level of danger that they represent. Classification also includes passing of information gained during the observation, detection, location, and classification steps to the vehicle commander in the form of a crew acquisition report.

To defeat multiple targets on the battlefield, the first engaged should be the most dangerous. This requires a quick decision on which target is the most dangerous threat. All crew members must know the designated engagement priorities of their unit and be able to prioritize targets; however, the vehicle commander is responsible for classifying targets and deciding which to shoot and when to shoot. Sometimes this determination may be made based on which target is closer to the LAV-25. Methods for determining range to targets are covered in detail in appendix B. The vehicle commander is responsible for deciding which method of engagement will be used based on the target's classification. This decision must be made rapidly so that all targets can be engaged efficiently and in an organized manner. Targets are classified by the level of danger they represent.

a. Classification Criteria

(1) Most Dangerous. When the crew observes a threat target with armor-defeating capabilities that appears to be preparing to engage them, the target is classified as "most dangerous." This type of target is the greatest threat and must be

engaged immediately. When faced with multiple most dangerous targets, the vehicle commander must further classify the targets based on which of the most dangerous targets are the greatest immediate threat. Generally, if two or more targets are of equal threat, engage the closest one first. When engaging more than two most dangerous targets from a stationary (hulldown) position, the crew should plan to use an alternate firing position.

Smoke (indirect fire) may also be used to keep the enemy from observing the vehicle. Minimizing the number of rounds fired from any one position (primary, alternate) aids in confusing the enemy as to the LAV-25's exact location and aids in avoiding detection caused by a firing signature. Generally, the most dangerous targets pose the following threats:

- Tanks at ranges up to 2,000 meters are the greatest threat to LAV-25s. Within that range, the tank has a greater kill probability. At ranges greater than 2,000 meters, a BRDM, BMP, or helicopter firing ATGM is the most dangerous threat.
- Helicopters, tanks, and BMPs, within their effective ranges, have greater kill probability against the LAV-25 than hand-held high explosive antitank (HEAT) weapons (for example, RPGs) within their effective ranges.
- Stationary vehicles deliver fire more accurately (and are therefore more dangerous) than moving vehicles.

(2) Dangerous. When the crew sees a target with armor-defeating capabilities, but the target is not preparing to engage them, the target can be classified as "dangerous." This type of target should be engaged after all "most dangerous" targets have been destroyed, unless otherwise specified by the priority of engagement. Multiple dangerous targets are engaged in the same manner as most dangerous targets. Engage the target which presents the greatest threat first. If the targets are of equal threat, engage the closest one first.

(3) Least Dangerous. A target that does not have an armor-defeating weapon system is

classified as a "least dangerous" target. Engage this type of target after all most dangerous and dangerous targets have been destroyed, unless it has a higher priority of engagement.

b. Engagement Priorities

Unit operations orders or standard operating procedures (SOPs) will designate certain types of targets as priority targets for destruction, irrespective of their antiarmor threat to the LAV. Engagement priorities can be established by—

- Classifying special targets based on their impact on the total force. (Examples of these special targets are command and control vehicles, engineer vehicles, reconnaissance vehicles, and artillery). Destroying these targets breaks up the combined arms capability of the threat forces.
- Establishing a specific type of target priority among specific friendly vehicles. (Example: Friendly LAV-25s might classify threat BMPs and other infantry carriers as most dangerous.)
- Establishing a specific type of target priority among specific elements in the unit. (Example: One platoon might prioritize enemy BMPs while another prioritizes ZSU-23-4s.)

c. Crew Acquisition Report

Targets detected by a crew member through the target acquisition process are reported to the vehicle commander immediately by way of a crew acquisition report. This target handover technique passes vital information about the target to the vehicle commander to then act on. The information in the report is passed before the classification step of the target acquisition process concludes. An acquisition report consists of three elements.

(1) Alert. An optional element, the alert tells the vehicle commander that the observer has sighted a target and additional information about it will follow. The acquisition report is normally given internally between Marines who can usually identify each other by voice recognition. Therefore, the

alert may be omitted, and the description element of the report then serves as the alert element also.

(2) Description. A short, concise description of the target is given. (Example: *TWO BMPS*.)

(3) Location. The location of the target is passed using the methods provided in paragraph 2003, page 2-8. (Example: *9 O'CLOCK*.)

The vehicle commander can now move to observe the target as described in the report and take action.

2006. Confirmation

Confirmation of the target is the last step in the target acquisition process before actual engagement. Target confirmation is the rapid verification of the initial identification and classification of the target as a hostile to be engaged. It is the last verification that the target is indeed an enemy and is completed during the conduct of fire. Confirmation takes place after the vehicle commander has issued all elements of the fire command except the execution element, and as the gunner is completing his precise lay on the target. Gunners also go through a confirmation step. While making the final precise lay, the gunner also assures that the target is hostile.

The vehicle commander (examining the target through the DIM-36TH sight commander's relay or the M36 sight, if necessary) evaluates the nature of the target based on the target's appearance and personal knowledge of the tactical situation. Situational awareness is key to avoiding fratricide. The vehicle commander who confirms that the target is hostile continues the engagement. The vehicle commander who determines that the target is friendly or neutral commands **CEASE FIRE**. If the nature of the target cannot be identified, the commander continues to observe until positive identification is made.

If the gunner also identifies the target as hostile, the gunner completes the final lay and engages the target on order. If the gunner identifies the target

as friendly or neutral, **CONFIRMED FRIENDLY** or **CONFIRMED NEUTRAL** is announced to the vehicle commander. If the gunner cannot positively determine the nature of the target, the gunner announces **CONFIRMATION DOUBTFUL**. The vehicle commander then decides whether to continue or terminate the en- gagement.

It is vital that the vehicle commander maintain situational awareness to assist in target identification. To do this, the vehicle commander must keep updated and informed on the tactical situation (e.g., friendly element movements within or between battle positions, the forward passage of lines, status of the withdrawal of any covering force, or the movement of civilian vehicle traffic in the area).

The vehicle commander must take an active role in maintaining situational awareness. The vehicle commander must always be aware of his position on the battlefield and monitor radio traffic to gain information on the movement/location of friendly forces. Understanding the mission (task and intent) and the scheme of maneuver will aid the vehicle commander in making sense of the apparent chaos associated with high tempo operations.

2007. Engagement

Once the target has been acquired through the preceding six steps and the vehicle commander decides to fire on it, engagement begins. Engagement is the directing and firing of vehicle weapons onto the correct target to achieve the effect desired. LAV-25 crews must be proficient in not only the techniques and procedures of target acquisition but also conduct of fire procedures to successfully engage the enemy in combat. Once committed to engagement, the vehicle commander has other decisions to make and pass on to the crew in the form of fire commands. These subjects are covered in detail in chapter 3.

Chapter 3

Fire Commands and Engagement Techniques

This chapter covers two linked subjects: fire commands and engagement techniques. Fire commands are explained in detail to include terminology, definitions, and various formats for types of fire commands that might be issued. Engagement techniques provide a detailed description of how each weapon system is used to destroy or suppress enemy targets. The goal of the LAV-25's crew is to engage and destroy or suppress various targets as quickly as possible. Also discussed are various additional uses for the employment of weapons found on the LAV-25 and kill indicators which allow the firer or observer to gauge the effectiveness of fires.

A fire command is a specific sequence of information given by a command authority (vehicle commander) that causes a crew to begin performing a sequence of actions and provides detailed direction to choose the ammunition type, aim the weapon, and engage the target. Each element given by the commander requires a response from a crew member to ensure correct aiming and engagement. After the initial fire command, subsequent fire commands using the same sequence of information can be used to adjust the point of impact to ensure the desired target effect. (MCRP 5-2A, *Operational Terms and Graphics*) Fire commands coordinate the crew's efforts and reduce confusion.

3001. Elements of a Fire Command

All fire commands are a derivative of the basic six-element fire command described in FMFM 6-5, *Marine Rifle Squad*. Fire commands normally include only those elements needed to instruct the crew to choose the correct ammunition, aim, and

fire the weapons. A fire command may contain as many as six elements or as few as two. The six elements of a LAV-25 fire command are alert, weapon/ammunition, description, direction, range, and execution.

a. Alert

The first element of a fire command alerts the crew to an immediate engagement.

b. Weapon/Ammunition

The second element of a fire command informs the crew of the weapon and/or ammunition to be used.

c. Description

The third element of a fire command identifies the target for the crew. If there are several similar targets, the vehicle commander tells the crew which target to engage first.

d. Direction

The fourth element of a fire command is given when the vehicle commander cannot lay the weapon for direction or elevation.

e. Range

The fifth element of a fire command is used if the vehicle commander chooses the precision gunnery method. The gunner chokes the target in the sight reticle and announces the range to the target.

f. Execution

Once the crew responds to the first five elements of the fire command, the vehicle commander gives the execution element. Before the execution

element, the vehicle commander reconfirms the target as hostile.

g. Omitted/Abbreviated Elements of a Fire Command

As a result of the speed at which the crew may have to engage targets in a battlefield environment, the vehicle commander may decide to omit one or more elements of the fire command. In this instance, the vehicle commander must ensure that the crew understands the command. Every fire command must contain the description and execution commands. All other elements are included as required to ensure acquisition of the target.

3002. Fire Command Terms

ELEMENT	REMARKS
Alert	Optional
Weapon/Ammunition	Optional
Description	Required
Direction	Optional
Range	Optional
Execution	Required

Example: *TROOPS, FIRE*

Listed below are common terms used during all fire commands.

a. Alert Element Terms

Various terms are used in the alert to identify who within the crew is to conduct the engagement. For normal conditions, the term *GUNNER* is used. When firing the commander’s M240G machine gun, the vehicle commander announces the alert element only. *TWO FORTY* alerts the crew that the vehicle commander will engage a target with his weapon. The gunner must then be ready to help the vehicle commander observe the effects of his firing.

b. Weapon/Ammunition Element Terms

The following terms are used for selection of weapon/ammunition:

c. Description Element Terms

Most targets can be described using the following

WEAPON/AMMUNITION	ANNOUNCED AS
25mm HEI-T	<i>HE</i>
25mm APDS-T, APFSD-T, TPDS-T	<i>SABOT</i> (pronounced SAY-BO)
25mm TP-T	<i>HE</i> or <i>SABOT</i> (Announce the type of ammunition that TP-T is simulating.)
M240 coax 7.62mm	<i>COAX</i>
Pintle-mounted 7.62mm M240E1	<i>TWO FORTY</i>

terms:

(1) Combination targets, such as a truck-mounted ATGM, can be identified by combining

TYPE OF TARGET	ANNOUNCED AS
Infantry fighting vehicle or armored personnel carrier	<i>PC*</i>
Unarmored vehicle	<i>TRUCK</i>
Helicopter	<i>CHOPPER</i>
Fixed-wing aircraft	<i>PLANE</i>
Personnel	<i>TROOPS</i>
Antitank gun or missile or towed artillery piece	<i>ANTITANK</i>
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. More descriptive terms for these targets might be used by the crew to clarify the level of threat each represents, although the briefest term possible should be used.

terms, as in this case, *ANTITANK TRUCK*.

(2) The gunner announces **IDENTIFIED** once the target is identified.

(3) If there are multiple targets, the vehicle commander identifies the number of targets, for example: **GUNNER, HE, THREE TRUCKS**. The commander then designates which target to engage first (**RIGHT TRUCK**).

(4) If the target is moving, the vehicle commander may announce **MOVING** as part of the description element.

d. Direction Element Terms

These terms are used to guide the gunner's aim into the target area.

(1) **TRAVERSE**. This method is used when one or more targets are outside the gunner's field of view. The vehicle commander commands **TRAVERSE RIGHT** (OR LEFT). The gunner traverses the turret rapidly in the direction announced. As the weapon's aim nears the target, the vehicle commander commands **STEADY**, and the gunner slows traversing. When the weapon is laid on the target, the vehicle commander announces **ON**, and the gunner stops traversing. At this time, the target should be in the gunner's field of view. If the target is not in the field of view, the gunner searches the target area until the target is identified or the vehicle commander issues a subsequent direction correction.

(2) **SHIFT**. This term is used when two or more targets are visible at the same time to the gunner through the sight. The vehicle commander commands **SHIFT LEFT** (OR RIGHT), **PC**. The gunner immediately shifts to the next target as commanded and engages.

(3) **Reference Point and Deflection**. The reference point must be one that the gunner can easily recognize. The vehicle commander uses binoculars 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, traverses right 30 mils, and tries to identify the target.

e. Execution Element Terms

There are four terms used to execute the fire command.

(1) **FIRE**. The command **FIRE** tells the gunner to fire the gun immediately. It is assumed that the gunner will fire and adjust on his own, since the vehicle commander may or may not issue a subsequent fire command.

(2) **FIRE AND ADJUST**. The command **FIRE AND ADJUST** tells the gunner to fire immediately; the gunner will not receive a subsequent fire command and must complete the engagement.

(3) **AT MY COMMAND**. The vehicle commander who wishes to delay firing commands **AT MY COMMAND**, then commands **FIRE** when ready to engage.

(4) **FROM MY POSITION**. Normally, the gunner engages all main gun targets. If the gunner is unable to identify the desired target, the vehicle commander engages the target by announcing **FROM MY POSITION**. The vehicle commander insures that the gunner has the correct sight picture, makes a final lay, announces **ON THE WAY**, and fires. If the gunner announces **IDENTIFIED**, the vehicle commander can return control to the gunner or complete the engagement.

f. Common Terms

Additional common terms used in fire commands are as follows:

(1) **IDENTIFIED**. The gunner uses this term to inform the vehicle commander that the target is within the field of view of the sight.

(2) **CANNOT IDENTIFY**. This term informs the vehicle commander that the gunner cannot find the target. The vehicle commander must either relay the weapon or engage the target from his station.

(3) **ON THE WAY.** This term informs all crew members that a weapon is being fired, alerting them to observe the impact of the round.

(4) **CEASE FIRE.** This term terminates the engagement.

(5) **TWO FORTY COMPLETE.** This term terminates the commander's weapon engagement.

g. Repeat Terms

A crew member who fails to hear or understand a part of the fire command announces the element in question. For example, the gunner announces **AMMO**. The vehicle commander repeats only that element.

h. Correction Terms

To correct an error in a fire command, the vehicle commander commands **CORRECTION** and corrects the element in error and repeats all elements following the corrected element. (Example: **GUNNER, HE, TRUCK, ONE SIX HUNDRED. CORRECTION, ONE EIGHT HUNDRED, FIRE.**)

3003. Crew Duties in Response to the Fire Command

In response to each element of a fire command, the vehicle commander, the gunner, and the driver have specific crew duties to perform. Crew duties common to the LAV-25 are shown in Table 3-1. Even though commands for the driver are not

Table 3-1. Crew Duties in Response to Each Element of a Fire Command.

FIRE COMMAND	COMMANDER	GUNNER	DRIVER
Alert: GUNNER	Lays weapon for direction.	Starts searching for target as commander traverses turret.	If moving and stabilized, continues moving, attempts to orient hull toward target and gives the gunner as stable a platform as possible.
Weapon/ Ammunition: HE	Announces the appropriate weapon or ammunition.	Selects appropriate weapon or ammunition. Arms system.	If moving and not stabilized, looks for hull down position, orients hull toward target, stops on command and attempts to sense rounds. Also helps identify target if stationary.
Description: TRUCK	Informs the gunner of the type of target.	Observes through the sight and tries to identify the target. On seeing target says IDENTIFIED .	
Direction: RIGHT FRONT	If needed, talks gunner into target area.	If issued, traverses the turret in search of target. On seeing target, says IDENTIFIED .	
Range: 1,000 METERS	If needed, announces range to target.	Determines range to the target using stadia ranging lines.	
Execution: FIRE	Assumes position to sense rounds and prepares to give subsequent fire command.	Uses correct sight picture, announces ON THE WAY , and engages the target.	

essential elements of the fire command, the driver's actions are very important during an engagement.

a. If an engagement is fired from a short halt, the vehicle commander commands **DRIVER, STOP** before giving the execution command. When the engagement is completed, the vehicle commander commands **DRIVER, MOVE OUT**. Following the completed engagement, the vehicle commander receives a crew report.

b. Once the vehicle commander has given control of the turret to the gunner, the vehicle commander's primary focus must be on observation over the engagement sector. The gunner should take over the engagement and continue the engagement until the target is destroyed, suppressed, or the command **CEASE FIRE** is given. The vehicle commander assists only as necessary, giving subsequent commands to adjust onto or shift targets, organizing other targets, and planning the vehicle's next activity.

c. Whenever hull down positions are available or are a tactical necessity, the vehicle commander commands **DRIVER, SEEK HULL DOWN** and initiates the fire command. The vehicle commander must then direct the driver into the hull down position while ensuring main gun clearance. Once the vehicle is in position and the gunner has identified the target, the vehicle commander issues the execution command to the gunner.

d. When the LAV-25 is in a turret-down, defensive position, the vehicle commander initiates the

fire command and commands **DRIVER, UP/STOP**. Upon destruction of the target, the vehicle commander terminates the engagement and moves back to the turret-down position by commanding **CEASE FIRE, DRIVER, BACK/STOP**. Consideration should be given to moving to an alternate position.

e. If firing on the move, the driver attempts to provide as stable a firing platform as possible. When the situation and terrain permit, the vehicle's front slope should be oriented toward the target.

3004. Choice of Method of Engagement

During target acquisition, the vehicle commander must decide how to engage the target. There are two methods of engagement used, depending on the situation—precision and battlesight. The characteristics and advantages of each are distinct. Precision engagements are characterized by a highly accurate sensing burst followed by killing bursts. A battlesight engagement is characterized by swift killing bursts fired in rapid succession. As a general rule, if the commander decides that the target is classified as a most dangerous target and is within the required ammunition's specified battlesight range band, then battlesight gunnery is used. In all other situations where targets of lesser classifications are involved, precision gunnery is highly recommended. (See fig. 3-1.)

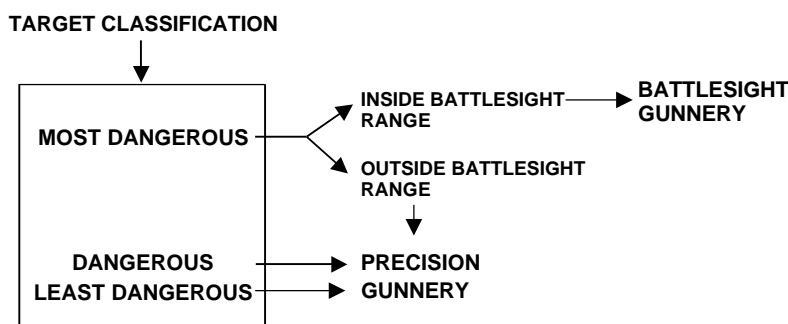


Figure 3-1. Determination of Method of Engagement.

a. Precision Gunnery

Precision gunnery is the method of engagement in which a deliberate range to target is estimated and applied, then corrections made to further engage the target. Precision gunnery is recommended in all engagements with the exception of an engagement where the target is either classified a most dangerous target or is outside battlesight range for the required ammunition. When the target is classified dangerous or least dangerous, or when the crew has the advantage of surprise, precision gunnery is recommended. The only exception to this rule is when the crew is in a position where an extended, reduced, or ballistic battlesight has been established. In this case, the crew will *mathematically* determine the aiming point based on target appearance probability. These types of engagements are accurate enough to preclude the use of precision gunnery techniques. The advantage that precision gunnery has over battlesight gunnery is accuracy. Time to engage is slower, but once the engagement has started, time to kill is as rapid and generally, less ammunition is used per engagement. Targets outside of battlesight ranges are destroyed more quickly and efficiently using precision gunnery. Precision gunnery can be used from the halt or from the stabilized weapons platform. The best results come from precision gunnery used on a halted LAV-25, which provides a stable firing platform. However, stabilized precision gunnery can still be used on the move, but it is more reliant on the efficiency of the crew.

The LAV ballistic sight reticle is designed so that ranging and aiming at targets are accomplished simultaneously. The advantage to this system is that the gunner is not tasked to determine or index range prior to aiming at the target. Additionally, the vehicle commander is not required or encouraged to give a range estimation in the fire command, because the gunner can usually estimate range with the sight faster and with far more accuracy. This reduces the engagement time and, when used properly, increases the probability of first round impact on target. This is the ultimate goal of precision gunnery. Precision gunnery is based on the following principle: The gunner properly

ranges the target using the sight reticle stadia lines, fires a three-round burst and immediately adjusts the sight picture (using the burst on target [BOT] method, paragraph 3011), and then fires a subsequent three-round killing burst. The subsequent bursts are repeated as necessary to destroy the target, but with proper sensing, the initial killing burst should be sufficient to destroy or neutralize the target. The rate of fire for this type of engagement is 200 rounds per minute. The goal of precision gunnery is to kill the target without expending more than six rounds.

When the gunner engages multiple targets within the same range band (i.e., vehicles in column), it is not necessary to re-range subsequent targets with the ballistic sight reticle. For example, engaging two BMPs at 1,500 meters, the gunner would range and fire at the first target, apply a subsequent killing burst, and shift to the second target. The gunner would aim at this second target using the same reticle reference point (i.e., range), and apply a killing burst. The first burst on the second target should hit it if the same point of aim that destroyed the first target was used on the second target.

If a range or ammunition change is made between targets during a multiple target engagement, the gunner must re-range. It is also possible to have a multiple engagement that requires the use of both precision and battlesight engagement techniques. The gunner is directed on which method of engagement to use by the vehicle commander's fire command.

A precision fire command is used to execute the precision gunnery method; that is, the gunner determines the range to the target and may announce it, if required, before engaging. The gunner may also receive the range from the vehicle commander if the vehicle commander is confident that the estimated range is accurate. This passing of range is optional. The following shows who completes each element of a fire command for precision gunnery under most circumstances:

ELEMENT	COMMANDER	GUNNER
Alert	<i>GUNNER</i>	
Weapon/ Ammunition	<i>HE</i>	
Description	<i>TRUCK</i>	
		<i>IDENTIFIED</i>
Direction		
Range		<i>100 METERS</i> (optional)
Execution	<i>FIRE</i>	
		<i>ON THE WAY</i>

If issued a fire command composed of the above elements, the gunner is directed to use the precision gunnery technique and continue firing until either the command **CEASE FIRE** is given or the target is destroyed.

b. Battlesight Gunnery

Battlesight gunnery is the rapid engagement of targets based on range estimations within certain understood battlesight range bands. Battlesight gunnery is the quickest method of engagement. Battlesight gunnery is used when the vehicle commander determines that the target is most dangerous by classification and is within the appropriate ammunition's battlesight range band. This method of engagement is based on the ballistic properties of the fired ammunition and its projected flight path. The principle of battlesight gunnery is that

the selected ammunition will travel an established distance without rising above the height of the target. This principle allows the gunner to use a specified aim point corresponding to the required battlesight range band and to immediately fire and adjust 3-round bursts in rapid succession. Any target within the range band will receive impacts from these bursts. A battlesight range band is defined as an area where the height of the round will not pass above the height of the target throughout its trajectory. (See fig. 3-2.)

Battlesight gunnery *relies heavily* on the vehicle commander's ability to quickly determine if the target is within the battlesight range band. Targets engaged within the range band are rapidly engaged and destroyed, while targets outside of the range band are inefficiently engaged. Battlesight gunnery expends more ammunition than precision gunnery and is less accurate, but it is a superior method for engaging targets within the battlesight range bands when time is the most critical factor.

In a battlesight fire command, the weapon/ammunition element is always announced as **BATTLESIGHT**, and the range element is always omitted. The term battlesight tells the gunner that the target is within battlesight range, and if an ammunition change is required due to type of target, the vehicle commander announces the ammunition as well.

Because of the number of rounds fired in a burst, changing ammunition from what is preselected is

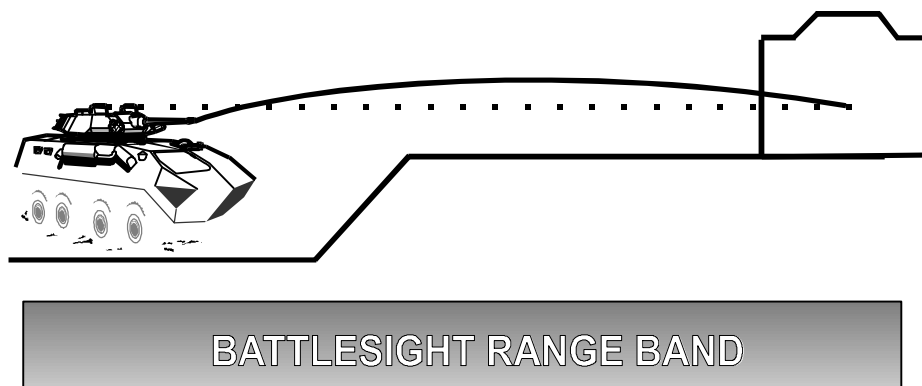


Figure 3-2. Battlesight Range Band.

ELEMENT	COMMANDER	GUNNER
Alert	<i>GUNNER</i>	
Weapon/ Ammunition	<i>BATTLESIGHT</i> (AP, if required)	
Description	<i>PC</i>	
		<i>IDENTIFIED</i>
Direction		
Range		
Execution	<i>FIRE</i>	
		<i>ON THE WAY</i>

not a problem. Observations and adjustments are still made from the final rounds, not the first round.

There are three types of battlesight gunnery available to use in various situations: Ballistic battlesight and the two variations of modified battlesight, which are extended battlesight and reduced battlesight. It is important to understand their origin. Battlesight data is derived from FT 25-A-2, *Firing Tables for Cannon, M242*. The information within the firing table assumes that line of sight is parallel with the point of aim and that the projectile travels over even ground. Obviously, this is not always the case. The height of the weapons platform, elevation of the target, and contour and elevation of the ground between the firing vehicle and the target are never constant. With this in mind, the vehicle commander must realize that all of the above aspects will affect battlesight gunnery range bands. Ideally, the vehicle is in defilade, or the point of aim is parallel with the line of sight. Any height disparity between firing vehicle and target will nullify the advantage of

battlesight gunnery. The line of sight must be parallel to the ground to achieve the maximum advantages of battlesight gunnery. Maximum ordinate and angle of fall are the primary data utilized to determine the following range bands. Knowledge of the firing table and its use are paramount to understanding the derivation of these range bands and techniques.

(1) Ballistic Battlesight. With a properly zeroed weapon, using the battlesight circle in the sight reticle as a sight reference when aiming will provide specific range bands for each type of ammunition.

(a) HEI-T/TP-T. (See fig. 3-3). If the line of sight is the same height as the point of aim (i.e., parallel to the deck), the battlesight range band for HEI-T is from 0 to 950 meters when firing at targets 2.2 meters in height (i.e., BMP). This data is based on the following information: Maximum ordinate for the HEI-T/TP-T at the battlesight circle range (800 meters) is 1.0 meters above the line of sight. This occurs at 430 meters and is the highest point of the round's trajectory. Line of sight is parallel with and 1.1 meters above the deck. Therefore, the round is 2.1 meters above the deck at its highest point (maximum ordinate). The angle of fall at 800 meters is 6 mils. This would require the round to travel to just over 1,000 meters before falling the 1.1 meters from point of aim to the deck. However, because of decreased velocity and gravity, the angle of fall for a round at 1,000 meters is 9 mils. To adjust the calculation, an average angle of fall is obtained for the distance between 800 and 1,000 meters ($6 \text{ mils} + 9 \text{ mils} / 2 = 7.5 \text{ mils}$). The resulting 7.5 mils equal 7.5 meters at 1,000 meters or .75 meters at 100 meters. Using this

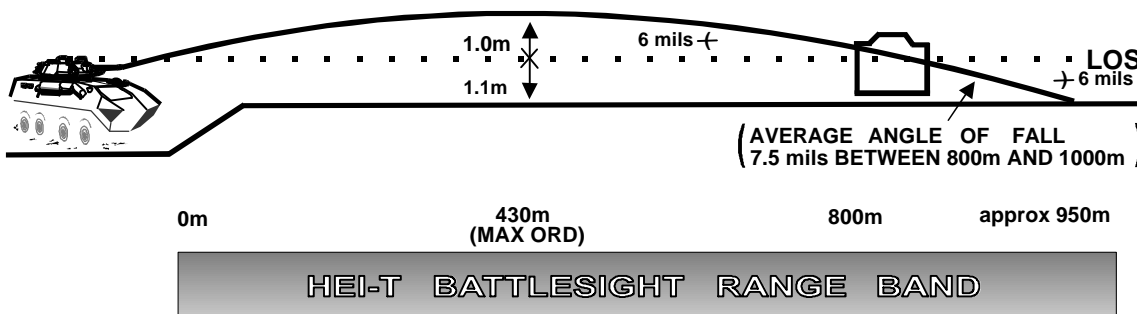


Figure 3-3. HEI-T Ballistic Battlesight Range Band.

adjusted fall rate, the round will fall the 1.1 meters to the deck at approximately the 950 meter mark. At 430 meters, the round will impact high on the target. Impacts will lower progressively until 950 meters where impacts will hit the ground short of the target.

(b) Armor Piercing, Discarding Sabot-Tracer (APDS-T). (See fig. 3-4). If the line of sight is the same height as the point of aim (i.e., parallel to the deck), and the aim point is center mass on the target, the battlesight range band for APDS-T is from 0 to 600 meters and from 825 to 1,600 meters. There is a dead space between approximately 600 and 825 meters where the round will exceed 2.2 meters above the deck. This is based on the height of the line of sight, which is 1.1 meters, maximum ordinate of 1.6 meters above the line of sight at 723 meters, and the angle of fall of 5 mils. The 600 meters is approximate since the firing table does not give an angle of rise with the exception of superelevation. The 1,600 meters is based on a 5 mil angle of fall, which requires the round to travel just over 200 meters past the point of aim to drop the 1.1 meters to the deck. At 1,600 meters the angle of fall is 6 mils. Obtaining an average angle of fall of 5.5 mils, using the same formula as HEI-T, the round will hit the deck at 1,600 meters. At 850 meters impacts of bursts will be high. They will lower progressively until they hit the ground short of the target at 1,600 meters.

To eliminate the dead space for the APDS-T ballistic battlesight, the maximum ordinate would have to be reduced to 1.1 meters. Adding this to

the height of the line of sight places the round 2.2 meters above the deck at maximum ordinate, thus eliminating the dead space occurring between 600 and 850 meters. In the firing table, 1.1 meters of maximum ordinate is obtained using 1,200 meters. There is not a 1,200 meter aim line in the sight reticle, but the top of the battlesight circle can be used. Placing the battlesight circle at 6 o'clock will artificially place the 1,200 meter aim point at center mass (see fig. 3-5). Assuming that line of sight is 1.1 meters above the deck, the battlesight range band is from 0 to 1,450 meters (see fig. 3-6). This band is figured in the same manner as the previous bands using the following data: Maximum ordinate of 1.1 meters at 617 meters. Angle of fall of 4 mils. (Requires 300 meters of travel to deck.) Angle of fall at 1,500 meters is 5 mils; average angle of fall from 1,200 to 1,500 meters is 4.5 mils. The round will impact high on the target at 617 meters. Impacts will lower progressively until they hit the ground short of the target at 1,450 meters

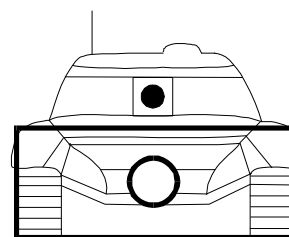


Figure 3-5. APDS-T Battlesight 6 O'Clock Aim.

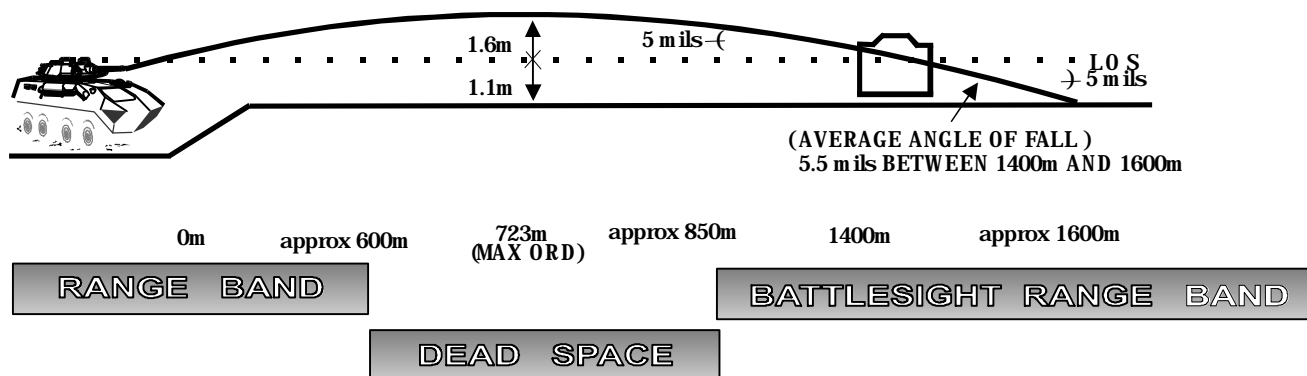


Figure 3-4. APDS-T Ballistic Battlesight Range Band.

Ballistic battlesight will provide the full range bands only under ideal conditions. The vehicle commanders must be aware of this and realize that in most situations their range bands will be decreased or altered depending on terrain and elevation disparity between firing vehicle and target.

(2) Modified Battlesights. Tactical events may present situations that allow vehicle commanders to predict engagement ranges. Examples are probable engagements on reverse slopes, at extended ranges along likely avenues of approach, and during reduced visibility from varying sources that will reduce engagement ranges. In these situations, the vehicle commander can modify battlesight by extending or reducing to capitalize on the situation and to guarantee accurate killing bursts. This is accomplished by *accurately* ranging the engagement area and modifying the point of aim.

(a) Extended Battlesight. Upon determining the predicted engagement range precisely (by laser range finder, map, etc.) the vehicle commander directs the gunner to use the aim point that corresponds to that engagement range.

Example: Firing vehicle is in defensive position, overwatching road with bend in the distance. Using a map, the vehicle commander determines the range to the road bend to be 1,900 meters. The vehicle commander tells the gunner to use the 1,900-meter APDS-T range line in all battlesight engagements.

Depending on the range, there will be a progressively increasing amount of dead space from line of bore and maximum ordinate. In most cases, this is irrelevant because extended battlesight engagements are predetermined aim points for engagements, as opposed to range bands for quick engagements. If the vehicle commander desires to create a range band at an extended range, the firing table is used and maximum ordinate, range to maximum ordinate, and angle of fall are checked for the selected aim point to ensure that occurring dead space will not overlap with the desired range band.

Example: Using the 2,400-meter APDS-T aim line will give a battlesight range band from 2,300-2,500 meters based on angle of fall of 11 mils.

Note: At extended ranges the range bands are significantly reduced. The range bands for HEI-T will be reduced more than the APDS-T because of reduced velocity and increased superelevation of the HEI-T round.

(b) Reduced Battlesight. Battlefield visibility or other conditions may allow the vehicle commander to predict an engagement range that is significantly reduced. Because of the flat trajectory of rounds when fired at shorter ranges, reduced range bands are significantly easier to determine than other range bands. As with ballistic battlesight, during its flight path, the round never rises above the height of a vehicle. However, to ensure that rounds impact as close to center mass as possible, the following applies: For

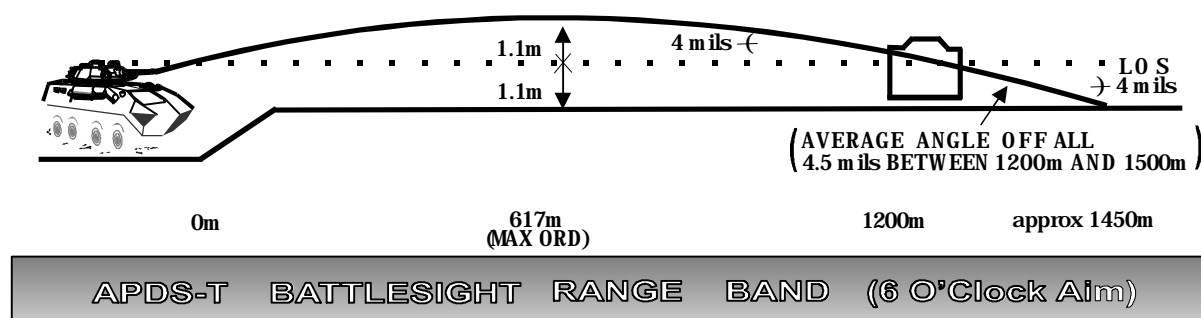


Figure 3-6. APDS-T Ballistic Battlesight Range Band (6 O'Clock Aim).

reduced engagements using HEI-T and the battlesight circle, the round will rise 1.0 meters above line of sight at 430 meters. Hence, rounds will impact high on the target (2.1 meters). To correct this and impact closer to the center for engagements under 600 meters, use the 600 meter HEI-T aim line. The round will not rise higher than 0.5 meters above line of sight, providing impacts within 0.5 meters of center mass. For reduced APDS-T engagements using the 1,000-meter aim line, the round will not rise above 0.8 meters above the line of sight. For engagements under 600 meters, there is no distinct aim line to use for reference. In short, reduced engagements can be accomplished with two aim points that cover the entire range band out to 1,000 meters. Either use the battlesight circle or 600-meter line for HEI-T, depending on range, or use the 1,000-meter aim line for APDS-T. In all cases, the round will impact any target that is 2.2 meters or taller.

3005. 25mm Point Target Engagement Techniques

Types of point targets likely to be encountered on the battlefield are unarmored vehicles, lightly armored vehicles, bunkers, RPG teams, and helicopters. The procedures for conducting point target engagements follow.

- a. The vehicle commander lays the gun for direction and issues a fire command.
- b. The gunner, while attempting to acquire the target through the sight—

- Selects ammunition and rate of fire.
- Arms the system.

c. Upon acquiring the target, the gunner announces **IDENTIFIED**.

d. The vehicle commander releases control to the gunner and commands **FIRE**. The vehicle commander then observes the battlefield, searching for other targets, directing movement, reporting, or performing other actions needed to ensure survival and mission accomplishment.

e. The gunner lays the reticle on the center of target visible mass, announces **ON THE WAY**, and fires.

f. The gunner fires a burst and then announces his observation and adjustment or observation and BOT. (See fig. 3-7.) The gunner then fires another 3-round burst, continuing until the vehicle commander commands **CEASE FIRE**.

(1) **Initial Burst.** While employing either battlesight or precision gunnery, the initial burst should contain 3 rounds. The likelihood of a well-trained gunner hitting the target using either method with the first burst is high, and in order to capitalize on this, the 3-round burst should be employed to yield a greater probability of a quicker kill.

(2) **Subsequent 3-Round Bursts.** To gain the higher probability of hitting and killing the target with a burst vice a single shot, use 3-round bursts with the 25mm chain gun. The 25mm chain gun has a dispersion factor of 0.5 mil. For example, at

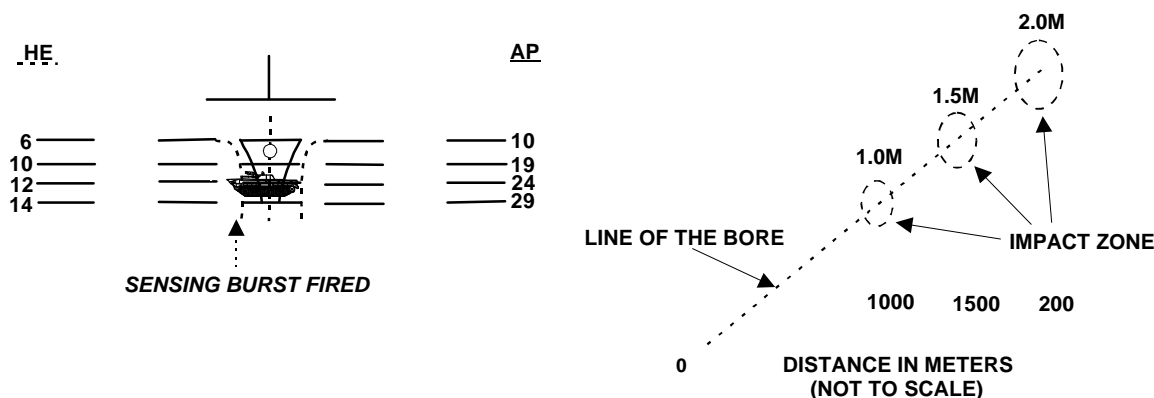


Figure 3-7. 3-Round Burst Against Point Target with Dispersion Factor.

1,000 meters, each shot fired in single shot mode will land within 0.5 meter of the point of aim, or within a 1 meter diameter circle. In order to maximize the potential for landing rounds within that 1 meter circle on the center mass of the target, a burst on the target should be used. At 1,500 meters the circle is 1.5 meters in diameter, and at 2,000 meters the circle is 2.0 meters in diameter.

3006. 25mm Area Target Engagement

One of the LAV-25's capabilities in combat is suppression of enemy positions in support of dismounted movement. The HEI-T ammunition, with its 5-meter bursting radius and built-in dispersion, supports this capability beyond coax range (900 meters) out to 3,000 meters.

Note: The ballistic daysight organic to the LAV-25 allows ranging for HEI-T ammunition, using the stadia lines in the reticle, only out to 2,200 meters. Therefore, accurate sighting and ranging is limited to targets out to this distance. Beyond that, impacts can be sensed using the sight, but there is no reticle pattern available for accurate adjustments. The thermal sight picture, using narrow field of view, terminates at the bottom of the reticle pattern, which is 2,200 meters for HE. Therefore, using the thermal sight, targets cannot be acquired, nor can impacts be sensed, beyond 2,200 meters.

a. An area target is one of the following:

- A target too large for point engagement techniques or
- Multiple point targets within a definable location that must be engaged together.

An area target could be a terrain feature, a man-made object, or a location defined by enemy fire. It may be identified by muzzle flashes, troop movements, or an unarmored vehicle column. The specific enemy units/weapons systems may or may not be identifiable. Area targets may have considerable width and depth, requiring extensive traversing of the turret. Enemy personnel dispersed over an area greater than 10 meters are engaged as an area target.

Accurate range estimation will enhance the effectiveness of area fire. Use of a 3-round burst is needed because of the engagement range band (900 to 3,000 meters).

To engage an area target with HEI-T, a **Z** pattern is used. (See fig. 3-8.) Since the area target has depth and width, the diagonal leg of the **Z** pattern is adjusted based on the depth of the target. The gunner should select 100 rounds per minute as the rate of fire when engaging area targets. Using this technique, sufficient bursts are fired to place rounds approximately every 10 to 25 meters in the target area. A continuous burst should be fired for each leg of the **Z** pattern. The size of the area will determine the number of rounds in each burst.

Suppressive fire is direct fire used on known or likely enemy locations to degrade one or more of the enemy's basic combat activities, such as moving, shooting, observing, or communicating. The

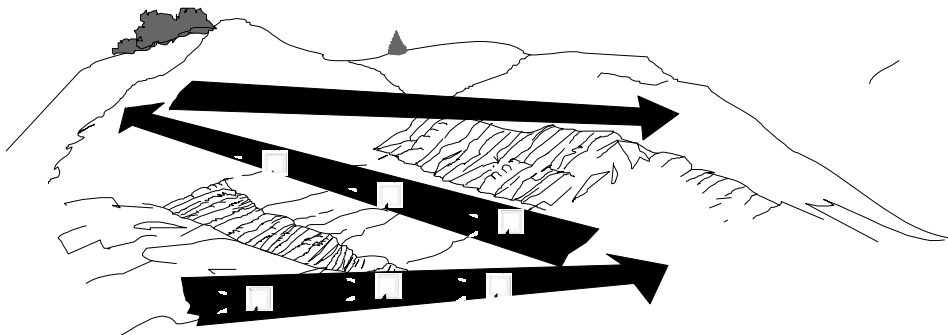


Figure 3-8. HE Against Area Target.

degree of success is based on the effectiveness of the suppression. Denying the enemy the terrain and impairing his ability to observe, engage, and command are factors upon which the success is measured. This technique is repeated as many times as necessary to achieve success.

b. The procedures for conducting an area target engagement follow:

(1) The vehicle commander lays the gun for direction and issues the fire command.

(2) The gunner, while attempting to acquire the target—

- Selects HEI-T and low rate of fire.
- Arms the system.
- Aligns the proper range line on the sight reticle.

(3) Upon identifying the target, the gunner announces **IDENTIFIED**. The vehicle commander releases control to the gunner and commands **FIRE**. The gunner lays the reticle on visible center-of-mass of target and announces **ON THE WAY**, before firing a burst. After impact, the gunner announces his observation and adjustment or BOT.

(4) After correcting the range by adjusting the reticle, the gunner lays the reticle on one edge of the target area and commences firing a sufficient burst to place a round in every 10 to 25 meters of width of the target area. Once the opposite edge has been reached, a second burst is fired diagonally across the target area to the far corner of the area. Finally, a burst is fired on the far depth of the target, left to right (right to left), covering its entire width. The number of rounds in each burst is dependent on the size of the target and the coverage desired.

This technique is continued until the target has been sufficiently suppressed and the vehicle commander commands **CEASE FIRE**.

Additionally, the 25mm using HEI-T can be used like the coax for designating targets, for causing incendiary fires, or for reconnaissance by fire at ranges from 900 to 3,000 meters. These

engagements can be against area targets or point targets.

3007. Coaxially and Pintle-Mounted 7.62mm Machine Gun Engagement

The coaxially mounted 7.62mm machine gun should be used to destroy unarmored point targets, to suppress area targets, and to conduct reconnaissance by fire. The pintle-mounted 7.62mm machine gun should be used to suppress targets when the coaxially mounted machine gun is not available. While point targets can be engaged, the nature of the pintle mount decreases the M240E1's effectiveness against these types of targets.

When possible, LAV-25 suppressive fire is accomplished using one or more of the 7.62mm machine guns. This conserves 25mm ammunition. At ranges beyond 900 meters, 25mm HEI-T is used for suppression. Machine gun suppressive fire is usually effective in bursts of 20 to 30 rounds (4 to 6 tracers) every 10 seconds. This is a sustained rate of fire of about 120 rounds per minute.

Engagement techniques include point and area target techniques and other special uses.

a. Point Target Technique

Point 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), use the point target engagement technique. This technique is used on this type of target because of the dispersion factor of the M240. Its dispersion factor is 5 mils. This would result, for example, in the rounds landing within 5 meters of the aiming point at 1,000 meters or within a 10 meter circle. At 500 meters, the rounds will land within 2 1/2 meters of the aiming point or within a 5 meter circle.

To engage a point target, the gunner or vehicle commander does a precise lay on target and fires a killing burst of 20 to 30 rounds. (See fig 3-9.) A killing burst kills as many enemy targets as possible with the initial burst of fire. The gunner or

vehicle commander fires additional bursts until the target is destroyed.

If the initial killing burst is short or long of the target, the gunner or vehicle commander adjusts by walking the tracers onto the target. This is called the tracer-on-target (TOT) method of adjustment. Once on target, the gunner or vehicle commander continues to fire killing bursts until the target is destroyed or until the gunner is told to cease fire.

b. Area Target Technique

Area targets can be engaged from either a moving or a stationary vehicle. For personnel dispersed over a large area (over 10 meters), use the area target engagement technique. (See fig. 3-10.)

To engage an area target before the enemy goes to the ground, sweep through the forward edge of

the target area with a killing burst, then switch to suppressive fires.

After the killing burst is fired, the gunner or vehicle commander suppresses the remaining target area using a **Z** pattern technique. The **Z** pattern technique is as follows:

- Fire across the front of the target area.
- Stop firing to maintain control of ammunition expenditure.
- Fire through and across the target area in a diagonal movement.
- Stop firing momentarily at the far end of the target area.
- Fire across the rear of the target area.

Note: During the entire firing sequence, the gunner or vehicle commander should be firing 20- to 30-round bursts.

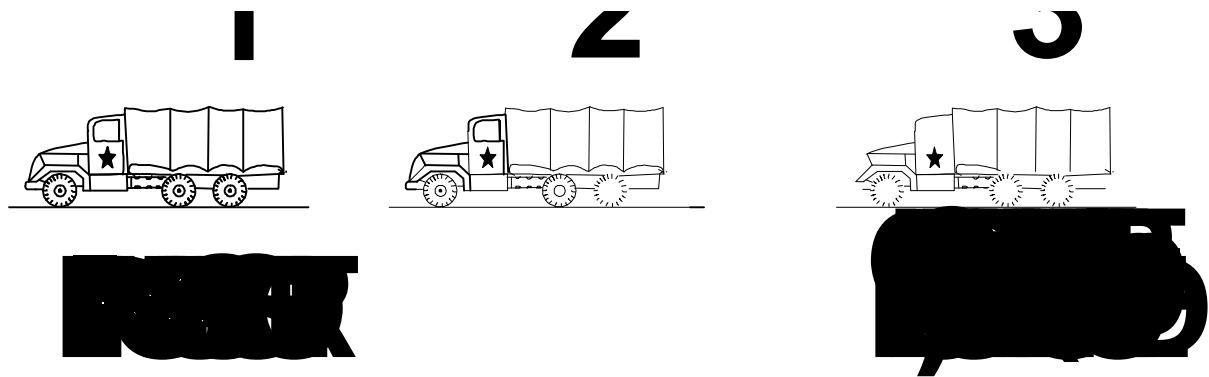


Figure 3-9. Point Target Technique.

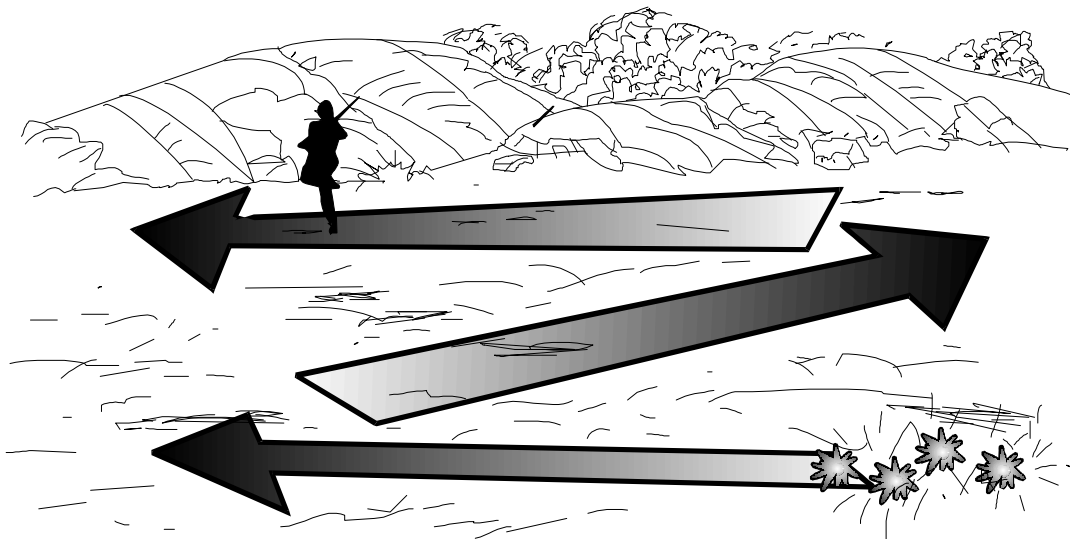


Figure 3-10. Area Target Technique.

When the LAV-25 is moving, it will carry the burst through a narrow frontal area when the target is presented. (See fig. 3-11.) Round dispersion will cover the target width.

From a stationary vehicle, the gunner must use the turret movement to form the **Z** pattern. The vehicle commander can move the pintle-mounted 7.62mm to form the **Z** pattern.

c. Special Uses of Turret-Mounted Weapons

In view of the favorable characteristics of the LAV-25 weapons platform, the crew is limited only by their ingenuity in special employment of these weapons. Some special uses are as follows:

(1) Reconnaissance by Fire. To conserve 25mm ammunition, the LAV-25 coaxially or pintle-mounted 7.62mm machine gun should be used in reconnaissance by fire to cause a hidden

enemy to react. (See fig. 3-12.) Fire a single burst while constantly observing for possible enemy movement or return fire.

(2) Designating Targets. Machine gun fire can be used by section and platoon leaders to designate targets for tank, artillery, close air support, or unit organic weapons. Machine gun tracers are effective as a marking round at ranges of 900 meters or less, and main gun HEI-T fire is effective at ranges beyond this. (See fig. 3-13.)

(3) Firing Through Concealment. Both 7.62 mm machine guns can be used to penetrate light concealment such as small trees, hasty barricades, or lightly constructed buildings that might be used by dismounted enemy personnel. (See fig. 3-14.) Treat such concealment as a point target. Heavier concealment may need to be penetrated by 25mm main gun fire.

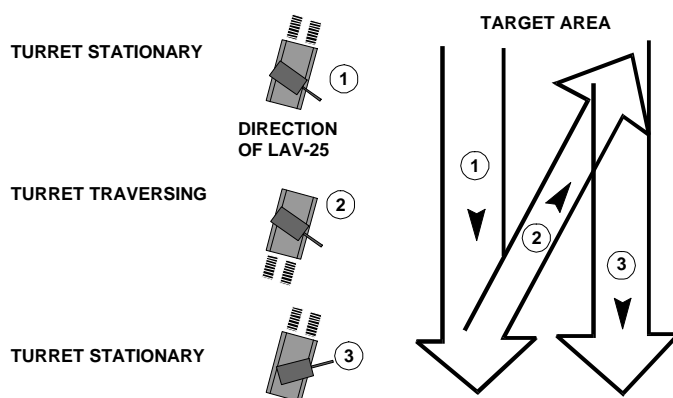


Figure 3-11. Z Pattern from a Moving LAV-25.



Figure 3-12. Reconnaissance by Fire.

(4) **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. (See fig. 3-15.) Fire denies a particular area to the enemy, and smoke from a burning field can be used to screen movements.

3008. M257 Smoke Grenade Launcher Engagement

To coordinate crew actions when firing the M257

command is used in conjunction with specific duties.

- a. While traversing the turret toward the area where the smoke screen is desired, the vehicle commander commands ***GRENADE LAUNCHER*** to alert the crew that the grenade launcher is to be used.
- b. Upon hearing ***GRENADE LAUNCHER***, the gunner closes the hatch.
- c. The vehicle commander, after laying the turret, checks to make sure that all hatches are

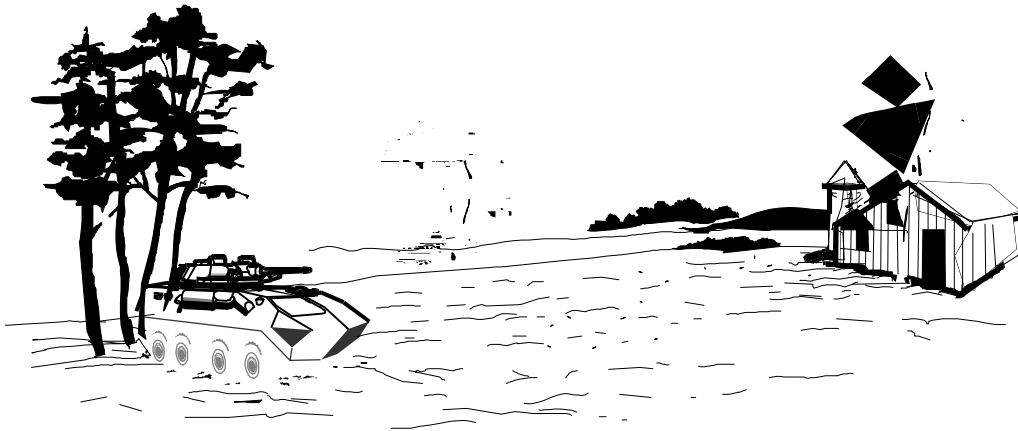


Figure 3-13. Designating Targets.

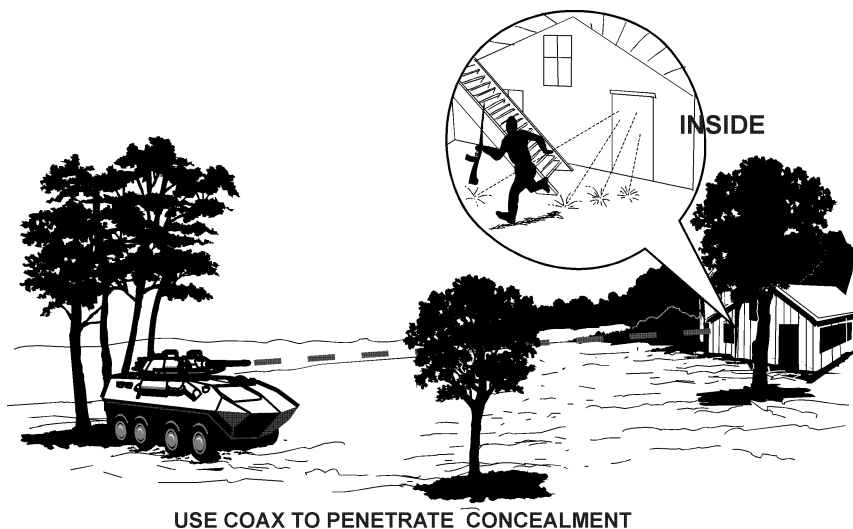


Figure 3-14. Firing Through Concealment.

smoke grenade launcher, the following fire

closed, then gets inside the turret and closes the hatch.

d. The vehicle commander or gunner selects a left or right salvo (or both) and then raises the protective cover over the spring-loaded **FIRE** switch. The vehicle commander commands **FIRE** and fires the grenades using the spring-loaded switch. After the grenades have been fired, the vehicle commander announces **GRENADES LAUNCHED** and then issues appropriate driving commands. The vehicle commander can then return to open hatch position to resume target acquisition.

In combat, LAV-25 crews may encounter and have to engage multiple and simultaneous targets. These engagements require speed and accuracy to successfully suppress or destroy all targets.

3009. Multiple and Simultaneous Target Engagements

a. Multiple 25mm or Coax Machine Gun Engagement

A multiple engagement is two or more targets engaged in succession. These engagements require rapid and accurate fire, target destruction, and quick shifts to new targets. The vehicle commander determines which target presents the greatest threat (most dangerous) and issues a fire command to engage that target first. When the crew engages multiple targets, some of the elements of the fire command for the first target may not have to be repeated. Although each target engaged requires essential parts of the fire command depending on the type of fire command used (precision or battlesight), the fire commands will become shorter as the battle progresses. Just as multiple engagements involve different kinds of targets, multiple fire commands are a combination of battlesight and precision fire commands.

For example, the vehicle commander acquires two BMPs to his front. He issues the following fire command.



Figure 3-15. Incendiary Fires.

ELEMENT	COMMANDER	GUNNER
Alert	<i>GUNNER</i>	
Weapon/ Ammunition	<i>BATTLESIGHT</i>	
Description	<i>TWO PCs, LEFT PC</i>	
Direction		<i>IDENTIFIED</i>
Execution	<i>FIRE</i>	<i>ON THE WAY</i>
Observation (optional)		<i>SHORT BOT</i>
Description	<i>CEASE FIRE SHIFT, RIGHT PC</i>	<i>IDENTIFIED</i>
Execution	<i>FIRE</i>	<i>ON THE WAY TARGET</i>
	<i>CEASE FIRE</i>	

Note: Only the description and execution were needed to engage the second BMP.

b. Simultaneous Engagements

A simultaneous engagement is one with two or more weapons engaging one or more targets at the same time. The vehicle commander issues an initial fire command for directing engagement with either the 25mm or coax machine gun. Before firing the M240E1 machine gun, the vehicle commander announces *TWO FORTY*. This type of simultaneous engagement is used when the additional (vehicle commander's) target represents a most dangerous or dangerous category threat. This type of engagement is difficult to fire on the move, but it should not be ignored as a possible engagement technique.

Although simultaneous engagements vary according to the gunnery technique used, they follow the basic fire command sequence shown below.

For example, the vehicle commander acquires one BMP and an infantry squad to the front. He issues the following fire command.

ELEMENT	COMMANDER	GUNNER
Alert	<i>GUNNER</i>	
Weapon/ Ammunition	<i>BATTLESIGHT</i>	
Description	<i>PC</i>	
		<i>IDENTIFIED</i>
Execution	<i>FIRE AND ADJUST TWO FORTY</i>	
		<i>ON THE WAY CEASE FIRE</i>
	<i>TWO FORTY COMPLETE</i>	

*Note: If the gunner's target is destroyed before the vehicle commander's target, the gunner will announce **CEASE FIRE** to notify the vehicle commander that the 25mm or coax is free for another mission.*

c. Multiple 25mm or Coax Engagements With Simultaneous Vehicle Commander Engagement

When the gunner is engaging multiple targets, he will make corrections or observations and continue to engage the target. If the target is destroyed, the gunner announces *CEASE FIRE, LEFT PC IDENTIFIED* and shifts fire to the next target. This enables the vehicle commander to physically adjust for the turret shift. The gunner continues the engagement until all targets are destroyed. When the vehicle commander finishes his engagement, he announces *TWO FORTY COMPLETE* and resumes control of the other engagements.

During some multiple-simultaneous target engagements, the vehicle commander may need to stop firing his weapon temporarily to assist the gunner engage the target. The two most common situations are when the gunner cannot—

- Identify the target (the vehicle commander lays the 25mm or coax on target).
- Observe the effect of the rounds (the vehicle commander helps sense and adjust rounds).

Multiple-simultaneous engagements involve different kinds of targets. The fire command varies depending on the gunnery technique used.

Example: The vehicle commander acquires two BMPs and an infantry squad to the front. The following fire command is issued.

ELEMENT	COMMANDER	GUNNER
Alert	<i>GUNNER</i>	
Weapon/ Ammunition	<i>BATTLESIGHT</i>	
Description	<i>TWO PCs, RIGHT PC</i>	
Direction		<i>IDENTIFIED</i>
Execution	<i>FIRE AND ADJUST TWO FORTY</i>	
Observation (optional)		<i>ON THE WAY SHORT BOT CEASE FIRE LEFT PC IDENTIFIED ON THE WAY</i>
	<i>TWO FORTY COMPLETE CEASE FIRE</i>	

*Note: When engaging simultaneous or multiple simultaneous targets, the vehicle commander will not announce **FIRE AND ADJUST** until the gunner announces **IDENTIFIED**.*

The gunner announces **CEASE FIRE** if he observes target destruction before the vehicle commander completes his engagement.

3010. Observation of Fires

An observation is a notation by the gunner or vehicle commander of where the round strikes in relation to the target. If the first round fails to hit the target, observation of where it did hit in relation to the target may enable the vehicle commander or gunner to adjust subsequent rounds. **TARGET**, **LOST**, **OVER**, **SHORT**, and **DOUBTFUL** are all observations made by the vehicle commander or gunner. (See fig. 3-16.) The meanings of these observations are as follows:

- **TARGET.** Any portion of the target is hit by direct fire.
- **LOST.** Neither the round nor its effects are observed in relation to the target.
- **OVER.** The round, tracer, or effects are observed above the target.
- **SHORT.** The round, tracer, or effects are between the firing vehicle and the target.
- **DOUBTFUL.** The round or its effects are observed 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.

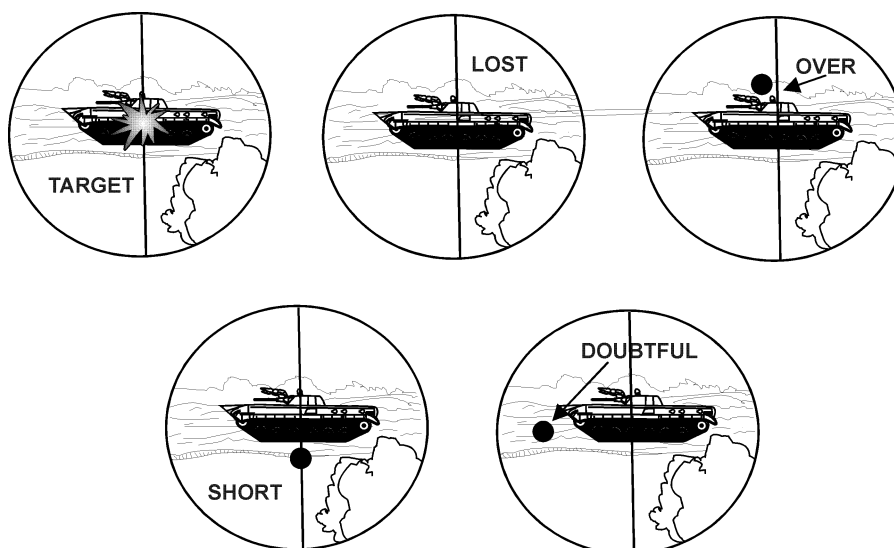


Figure 3-16. Target Observations.

The gunner has primary responsibility for observations and adjustments. The gunner should announce every observation and/or adjustment as made. This tells the vehicle commander that the gunner has control of the engagement and does not require assistance. The vehicle commander can then acquire additional targets, control the driver, navigate, or communicate with other leaders.

If the gunner fails to observe the strike of the sensing burst, reporting a **LOST** or **DOUBTFUL** observation, the vehicle commander announces his observation.

If the vehicle commander did not observe the strike, but the driver did, the driver should automatically report that strike.

Note: By crew SOP, the gunner may announce both observations and adjustments or simply announce observations. The gunner and vehicle commander may also choose not to announce adjustments unless the gunner is unsure of where the burst struck, as it is understood that the gunner will fire and adjust until the completion of the engagement.

3011. Direct Fire Adjustment

There are many techniques of direct fire adjustment: BOT, TOT, and adjustment techniques in conjunction with subsequent fire commands.

a. Burst on Target

BOT is the fastest method of adjustment. BOT involves moving the burst of the rounds impacting on the ground onto the target. It is most effective when engaging from a stationary vehicle or a vehicle that is moving toward the target. It is the default method of adjustment for the gunner.

(1) After the gunner has made the initial lay on the target and fires, to apply BOT, the gunner must—

- Observe through the sight.
- Maintain the correct sight picture.
- Concentrate on the target, noting the point on the sight reticle where the tracer or burst appears as it passes, strikes short of, or hits the target.
- Announce his observation.
- Adjust the aiming point of the reticle immediately to bring the point where the rounds last impacted to bear center mass on the target. The gunner must quickly and accurately make the adjustments and fire a burst.

(2) The gunner continues to fire, adjusting each burst onto the center of mass until the target is destroyed. The vehicle commander orders **CEASE FIRE** or takes over adjustment of fire.

(3) When the gunner applies BOT, the vehicle commander acts as an observer, observing the rounds fired and subsequent bursts of fire for deflection and range.

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

b. Tracer on Target

As the name implies, the gunner or vehicle commander firing a machine gun adjusts the strike of the rounds, based on tracers, onto the target area.

c. Subsequent Fire Commands

The vehicle commander uses subsequent fire commands to announce direct fire observations and adjustments. Only the elements necessary to continue the engagement are announced. There are three elements to a subsequent fire command; the alert with observation, the correction, and the execution.

(1) Alert. The vehicle commander announces the range observation as the alert **SHORT**. This also notifies the gunner that a subsequent fire command follows.

(2) Correction. Corrections are made based on deflection, range, or both.

(a) Deflection. The deflection correction is based on the vehicle commander's deflection observation. If the round went left of the target, the correction would be to the right. Deflection corrections may be given in mils or target forms.

(b) Range. The range correction is based on the vehicle commander's observation. If the round landed short of the target, the vehicle commander adds range. If the necessary correction is less than 200 meters, the vehicle commander may use the target form technique. To execute a range correction, the gunner must change range lines. The following two techniques are used to aid the vehicle commander in deflection and range corrections during the subsequent fire command.

1 **Target Form Adjustment Technique.** Target form is the simplest method of adjustment. One form is the visible height or width of the target. Since the visual size in width and height differ, the visual height is used for adjusting elevation and the visual width is used for azimuth adjustment. 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 standing operating procedure (SOP). Form changes are always given in full- or half-form increments.

2 **Mil Change Technique.** This technique is simple and accurate at all ranges for deflection, but it requires the vehicle commander to use an optical device with a mil graduation scale. The gunner does not have the capability to accurately correct range based on observations given with the mil technique. Therefore, the gunner's range corrections will be estimations.

(3) Execution. The vehicle commander completes the subsequent fire command with the execution command **FIRE**. The gunner will then announce **ON THE WAY**.

ELEMENT	COMMANDER	GUNNER
Alert	GUNNER	
Weapon/ Ammunition	SABOT	
Description	PC	IDENTIFIED
Execution	FIRE	ON THE WAY
Subsequent	SHORT, ADD 2 FORMS	ON THE WAY
	TARGET CEASE FIRE	

ELEMENT	COMMANDER	GUNNER
Alert	GUNNER	
Weapon/ Ammunition	SABOT	
Description	PC	IDENTIFIED
Execution	FIRE	ON THE WAY
Subsequent	OVER, DROP TWO FORMS	ON THE WAY
	DOUBTFUL, LEFT TWO FORMS	ON THE WAY
	TARGET CEASE FIRE	

3012. Target Leading

When engaging a target that is moving in a lateral direction in relation to the gun, the gunner must lead (aim in front of) the target to compensate for

the movement. The amount of lead applied depends on the velocity of the ammunition, target speed, and target angle. Lead rules are applied for moving targets classified as flank views.

When using armor piercing (AP) ammunition, use a 5-mil lead from center mass of target. (See fig. 3-17.)

The lead rule for HE and 7.62mm ammunition is 10 mils. (See fig. 3-18.)

When engaging targets moving toward or away from the position, the gunner may need to make a small vertical adjustment. (See fig. 3-19.)

If the target is approaching, aim at the center base of visible mass; if fleeing, aim at the top center of visible mass.

When a moving LAV-25 is firing over its flank (side) at a stationary target, lateral motion affects the projectiles as they leave the muzzle. This lateral motion must be compensated for, just as if a

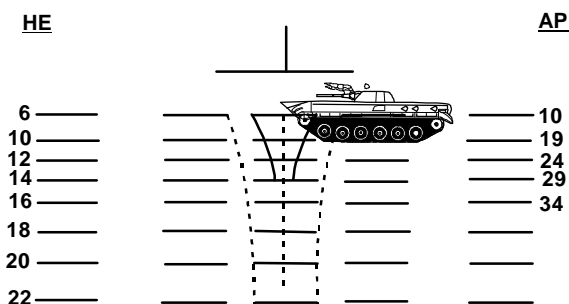


Figure 3-17. AP Lead Applied to a Moving Target.

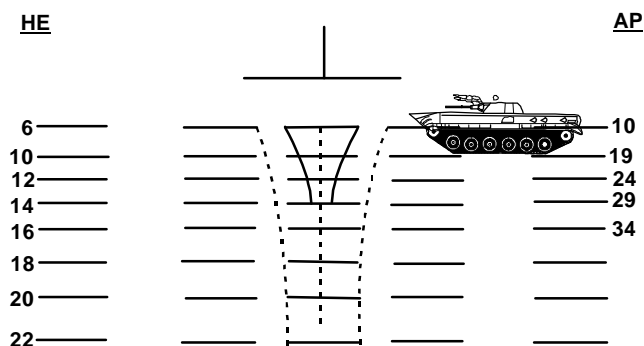


Figure 3-18. HE Lead Applied to a Moving Target.

moving target were being engaged from a stationary LAV-25. When firing over the left side of the vehicle, aim 5 mils to the left of the target's center of mass (see fig. 3-20); and when firing over the right side of a vehicle, aim 5 mils to the right of the target's center of mass.

If the LAV-25 and target are parallel to each other and moving in the same direction, no lead is required. The lateral motion of the projectiles compensates for any lead requirement.

If the LAV-25 and target are parallel but moving in opposite directions, a 10-mil lead is applied as shown in figure 3-21. (The LAV-25 is firing over its left flank.)

3013. Engagement Termination

The vehicle commander and gunner must determine when to cease fire against a target, when to shift fire against multiple targets, and when to move from one firing position to another before continuing direct fire engagements. The actual target effect may not be clear or visible; they may have to cease fire, shift fire, or shift position based on indicators of target effects.

a. Armored Vehicles

(1) Killing Standard. Most armored vehicle losses are repairable; nonrepairable losses are the exception. Based on the low probability of a nonrepairable loss and the additional ammunition and engagement time required to achieve destruction, the minimum standard for a direct fire engagement is to achieve a mobility or firepower kill. A *mobility kill* means that the threat vehicle can no longer

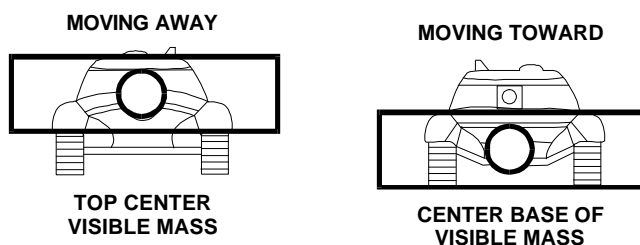


Figure 3-19. Target Moving Toward or Away From LAV-25 Positions.

move under its own power. A *firepower kill* means that the threat vehicle can no longer use its antiarmor weapon system.

(2) Kill Indicators. The gunner or vehicle commander may cease or shift fire from the targeted vehicle to a different target if the—

- Vehicle stops moving.
- Vehicle stops firing.
- Vehicle is smoking.
- Vehicle explodes.
- Vehicle is abandoned.

Note: When an armored vehicle is hit by a tank round or a 25mm round (sabot or HEI-T), an observable explosion with flash occurs. This is the effect of the round impacting on the target but not necessarily an indication of damage to the target. The crew must look for one or more of the indicators to determine if the vehicle has received a mobility or firepower kill. Obviously, several indicators together allow for a more reliable estimate of target effect than one indicator by itself.

b. Unarmored Vehicles

(1) Killing Standard. Threat unarmored vehicles use a grade of diesel fuel which does not explode easily. They are multi-wheeled, which allows them to continue operating with one or more tires punctured. The direct fire engagement goal against an unarmored vehicle is to cause a

mobility kill or cause the driver and crew to abandon the vehicle.

(2) Kill Indicators. The gunner or vehicle commander may cease or shift fire if the—

- Vehicle stops moving.
- Vehicle is smoking.
- Vehicle explodes.
- Vehicle is abandoned.

c. Dismounted Infantry/Antiarmor Systems

(1) Killing Standard. Destruction of dismounted point targets is difficult to measure. The goal of direct fire engagements 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 vehicle commander may cease fire or shift fire if—

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

Note: When the LAV crew is suppressing an area target, the duration of required suppression is based on the METT-T requirements of the

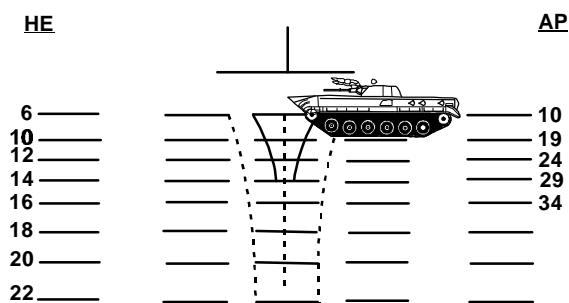


Figure 3-20. 5-Mil Lead Applied to a Stationary BMP When LAV is Firing Over the Left Flank.

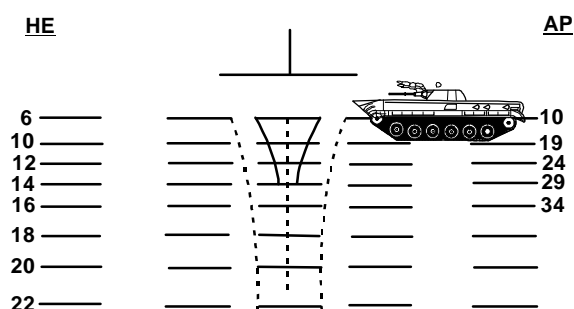


Figure 3-21. 10-Mil Lead Applied when a Target and an LAV-25 are Parallel and Moving in Opposite Directions.

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.

Chapter 4

Fire Control and Distribution

Fire control is the control of all operations in connection with the application of fire on a target (Joint Pub 1-02). Distribution of fire refers to either a planned pattern of projectiles about a point, or a planned spread of fire to cover a desired frontage or depth (Joint Pub 1-02).

The efficient use of available firepower is required to defeat the enemy, this can be accomplished by crew drills that emphasize proper use of fire commands and techniques of fire.

Fire control and distribution is achieved through the use of proper fire commands and disciplined use of standing operating procedures (SOPs) based on fire control and distribution measures that are reflected in fire planning and address fire distribution patterns and fire control techniques.

Much of the material in this chapter is information on how the section leader (of two or more vehicles) or platoon commander control the fires and effects of fires on targets.

4001. Standing Operating Procedures

SOPs are a set of instructions covering those features of operations which lend themselves to a definite or standardized procedure without loss of effectiveness. The procedure is applicable unless ordered otherwise (Joint Pub 1-02). Used properly, SOPs can save valuable time and help ensure fast, predictable action in combat situations by LAV-25 crews. To be effective, the SOP must be drilled repetitively. Every LAV-25 crew within a platoon must react automatically to the tactical

situation. SOPs should include actions in area coverage responsibilities, turret orientation, and weapons-ready postures for different situations such as road marches and various battle drills.

When forming platoon SOPs (see ARTEP 17-57-10 MTP, *Mission Training Plan for the Scout Platoon*), the platoon commander should consider—

- Actions on enemy contact.
- Reaction to artillery strike.
- Reaction to ambush.
- Formation and order of march.
- Techniques of movement.
- Alternate communication methods.
- Fire distribution patterns.
- Method of engagement.
- Reaction to air attack.
- Target responsibilities.
- Mission-oriented-protective-posture (MOPP) levels and hatch position.
- Deliberate ambush.

SOPs ensure the platoon is prepared to engage personnel carriers with sabot and to suppress ATGMs at long ranges with HE. The commander selects weapon systems to be used depending on the range to the target, the ammunition capability, and the type of target. The weapons-ready posture may have to be adjusted or the ammunition redistributed after an engagement to ensure that every LAV-25 has the ammunition needed.

4002. Fire Control and Distribution Measures

Fire control and distribution measures must be simple and clear. They must be rehearsed to be routine with no need for detailed or lengthy instruction to execute. Sectors of fire, target reference points (TRPs), phase lines, and engagement priorities are measures that can be used to effectively distribute and control fires.

a. Sector of Fire

A sector of fire is a defined area which is required to be covered by the fire of individual or crew served weapons, or the weapons of a unit (Joint Pub 1-02). Each LAV-25 crew or vehicle section (two vehicles) is assigned a sector of fire. The sector of fire must be covered by observation and fire. A sector of fire is designated by pointing out easily recognizable terrain features such as roads, streams, hills, or ridgelines that outline the sector.

Each sector of fire should extend from a firing position to the maximum engagement range of the weapons on the LAV-25. A number of sectors of fire can be used to build an engagement area, which is an area along an enemy avenue of approach where the commander intends to contain and destroy an enemy force with the massed fires of all available weapons (MCRP 5-2A). (See fig. 4-1.)

In most situations, the terrain and the number and type of weapons available to cover an area will dictate how sectors of fire are arranged and assigned. They should be assigned so that an engagement area is completely covered with the appropriate type of fire and so that mutual support can be established among the LAV-25s in the area. To gain mutual support, each LAV-25 is assigned a primary and secondary sector of fire. (See fig. 4-2.) The secondary sector of fire of one vehicle should correspond to another LAV-25's primary sector of fire to establish mutual support.

Fire is shifted to the secondary sector, on order, when there are no targets in the primary sector, or to cover another LAV-25 such as one that was forced to move to an alternate position, or is out of action.

If a mounted avenue of approach is narrow or there is a need to concentrate the fires of an entire platoon in one critical area such as a choke point, overlapping sectors of fire may be assigned. Because this increases the problem of control and the probability of target overkill, additional control measures such as engagement priorities, fire patterns, or TRPs are needed. Leaders must select positions that allow them to observe and coordinate the fires of their unit.

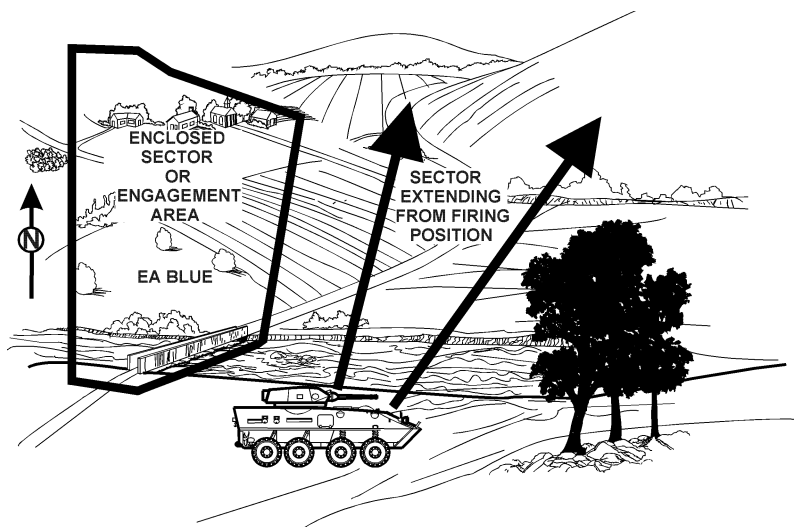


Figure 4-1. Sector of Fire and Engagement Area.

b. Target Reference Point

A TRP is an easily recognizable point on the ground (either natural or man-made) used to initiate, distribute, and control fires. TRPs are designated by maneuver leaders to define unit or individual sectors of fire. They are designated using standard target symbols and numbers issued by maneuver commanders (MCRP 5-2A). (See fig. 4-3.)

In the defense, TRPs are assigned for LAV-25s along avenues of mounted approach. In the offense, TRPs are assigned on likely enemy locations or prominent terrain features. To avoid confusion, the number of TRPs should be limited to the number required to distribute and control fire.

When referring to a TRP to hand off targets, use compass directions (north, east, south, or west) rather than right or left because each LAV-25 may be viewing the TRP from a different direction.

Essential TRPs may be used as indirect fire targets. If so, they are assigned a target identification

number (e.g., AB 1001) and are submitted to the appropriate fire support coordinator for inclusion on the list of targets.

c. Phase Lines

A PL is a line utilized for control and coordination of military operations, usually a terrain feature extending across the zone of action (Joint Pub 1-02). It is a linear control measure that can be used to control movement, but it can also be used to control and distribute the fire of several, widely spaced LAV-25s. Any prominent, natural, or manmade linear terrain feature (ridgeline, river or stream, road, or railroad track) may be designated a PL. (See fig. 4-4.)

In offensive or defensive operations, PLs can be used to start or stop firing, shift fire to another sector, or indicate when LAV-25s are to move to alternate or supplementary positions.

PLs are a simple and effective control measure. In figure 4-4, the platoon commander uses PLs to indicate to the LAV-25 crews when to fire and when to displace to an alternate position.

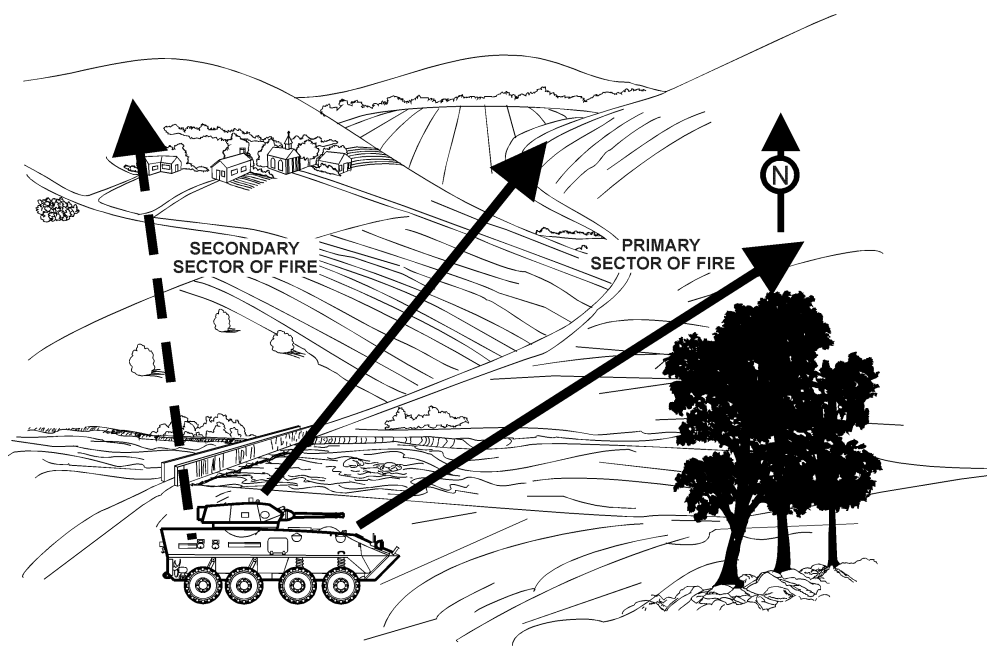


Figure 4-2. Primary and Secondary Sectors of Fire.

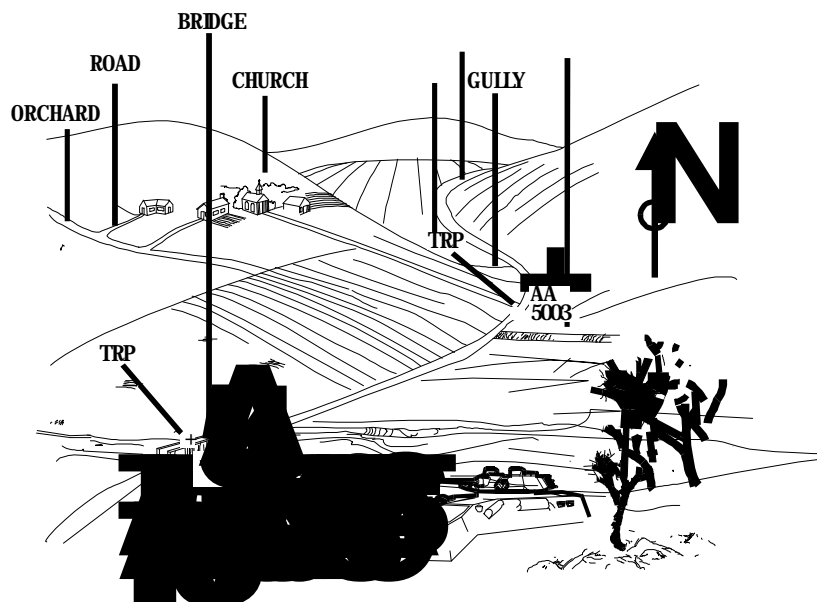


Figure 4-3. Target Reference Points.

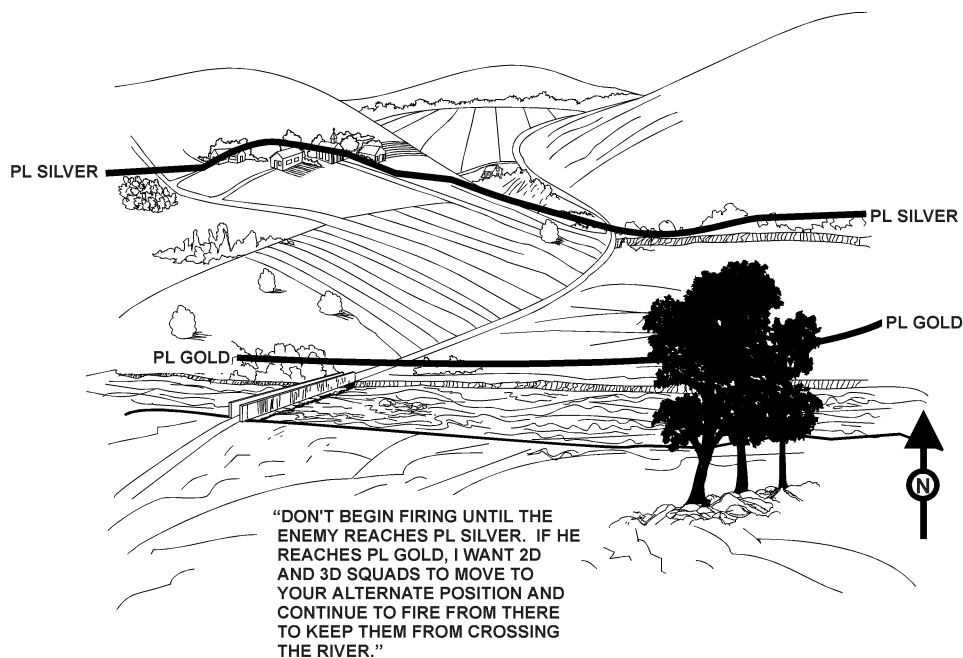


Figure 4-4. Phase Lines.

d. Engagement Priorities

Targets that present the greatest threat and targets that, when engaged, may break the momentum of an attack (such as command vehicles) should be engaged first. Usually, targets seen in

formations on the battlefield are various types—tanks, BMPs, BRDMs, or air defense vehicles. Engagement priorities are useful in determining which specific target to engage first when no sectors of fire have been assigned or when overlapping sectors of fire have been designated.

4003. Fire Distribution Patterns

Frontal fire, cross fire, and depth fire are the three basic fire patterns that can be used to distribute the platoon's (or section's) fire when multiple targets appear and no control measures have been assigned.

a. Frontal Fire Pattern

The frontal fire pattern is used when targets are positioned in front of LAV-25s in a lateral configuration. The left flank LAV-25 fires at the leftmost target; the right flank LAV-25 fires at the rightmost target. As targets are destroyed, friendly fires are shifted toward the center target(s) of the enemy formation. (See fig. 4-5.)

b. Cross Fire Pattern

The cross fire pattern is used when targets are positioned laterally but obstructions prevent LAV-25s from firing to the front. The left flank LAV-25 engages the rightmost target; the right flank LAV-25 engages the leftmost target. As targets are destroyed, the vehicles automatically shift their fires towards the target(s) located in the center of the enemy formation. (See fig. 4-6.)

c. Depth Fire Pattern

The depth fire pattern is used when targets are encountered in a column configuration. When the element commander gives no other instruction in the fire command, the left flank LAV-25 engages the rearmost target; the right flank LAV-25 engages the closest target. (See fig. 4-7.) As targets are destroyed, the vehicles shift fires to the target(s) in the center of the enemy formation. Depending on the orientation of the targets (e.g., echeloned left or right), the element commander may want the leftmost LAV-25 to engage the closest target, and the rightmost vehicle the rearmost target. If that is the case, the element commander would qualify his fire command by adding **LEFT**, **FRONT** or **RIGHT**, **REAR** after the command **DEPTH**. (See fig. 4-8.)

Note: The element commander can delineate sectors of responsibility by firing first to visually demonstrate a sector. However, there may be occasions when the element commander wishes to achieve massed, surprise fires. To do this, the element commander must assign sectors of responsibility through an alternate method. In many cases, this should be planned ahead of time much like an engagement area or ambush. When

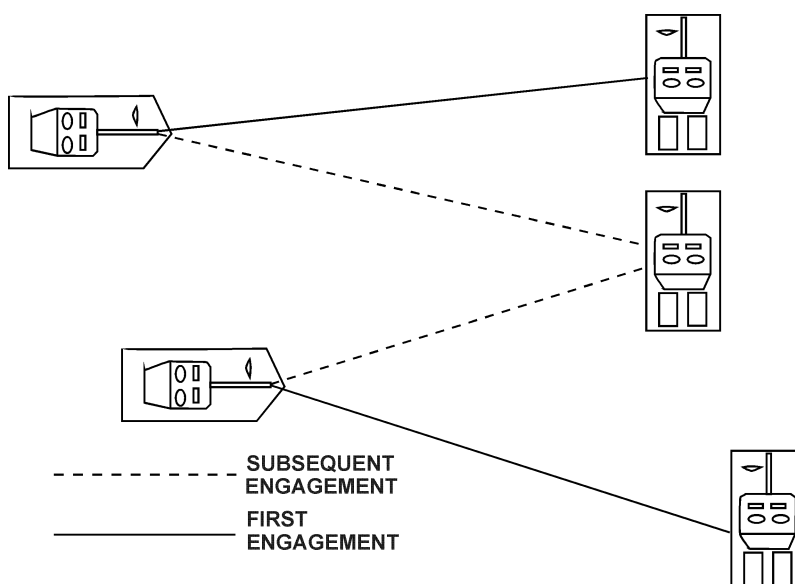


Figure 4-5. Frontal Fire.

it cannot be previously planned, the element commander delineates sectors of responsibility over the radio or land line.

4004. Section Fire Planning

Section fire planning is an integral part of the troop leading procedures and begins when the section leader receives a mission from the platoon commander. The platoon commander and each section leader coordinate separate but linked fire

plans. Fire planning is a continuous process; it does not stop until the mission is accomplished. The primary goal of fire planning is to prescribe how fires, direct and indirect, are to be distributed and controlled to best support the scheme of maneuver. The section fire plan provides the details of how the section plans to use fires to support their maneuver and the platoon commander with the information needed to distribute and control the fires of all available weapons in the platoon.

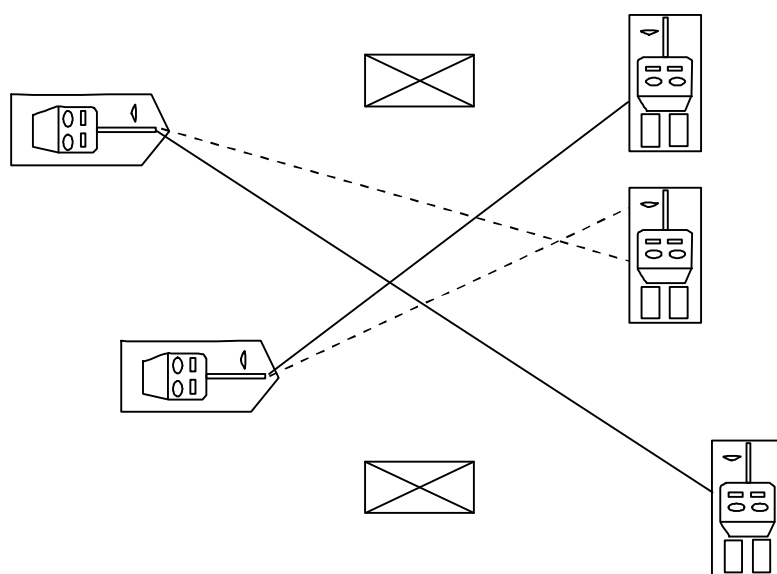


Figure 4-6. Cross Fire.

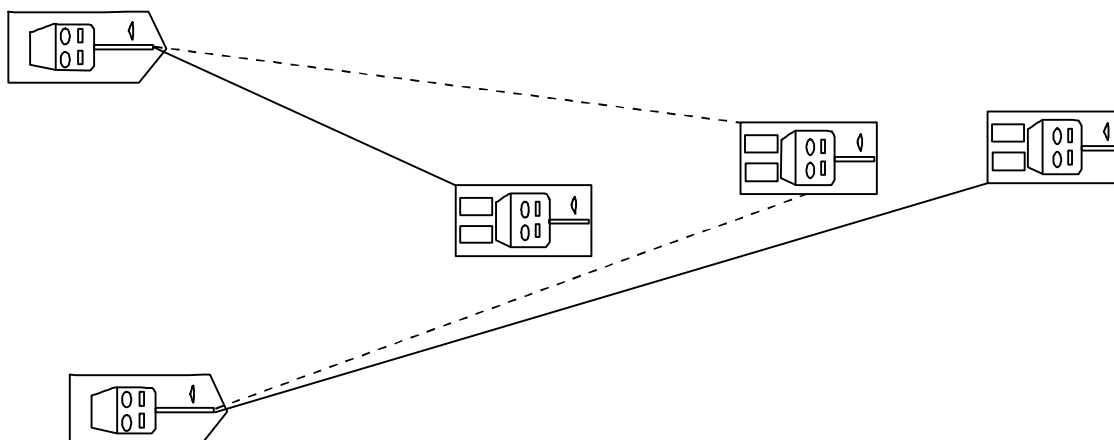


Figure 4-7. Depth Fire.

a. Defensive Fire Planning

Defensive fire planning is normally deliberate and detailed because sufficient time is available to consider planning and assigning—

- Individual LAV-25 direct fire targets.
- Section direct fire targets.
- Indirect fire targets.
- Fire distribution and control measures.

- Alternate and supplementary firing positions.

To develop a defensive fire plan (figure 4-9), the section leader—

- Assigns primary, alternate, and supplementary firing positions to each LAV-25 and assigns to each position a primary and secondary sector of fire.

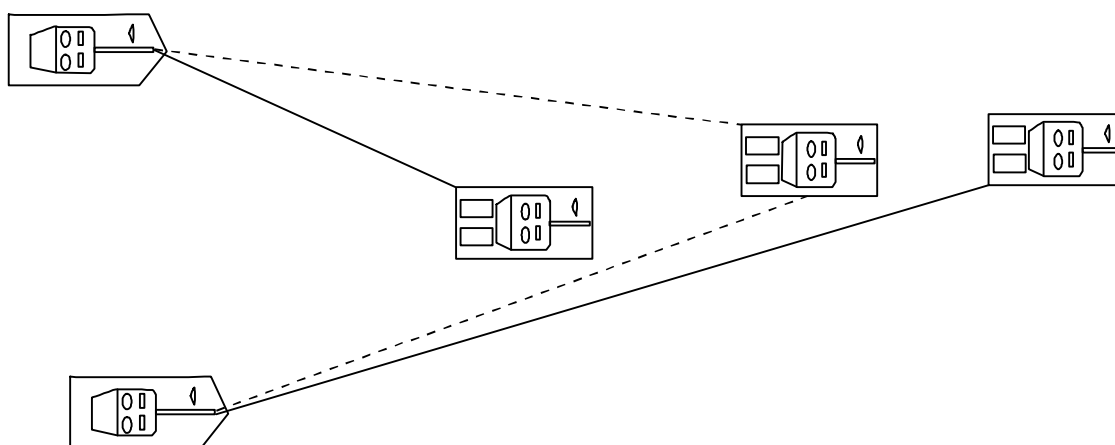


Figure 4-8. Variation of Depth of Fire.

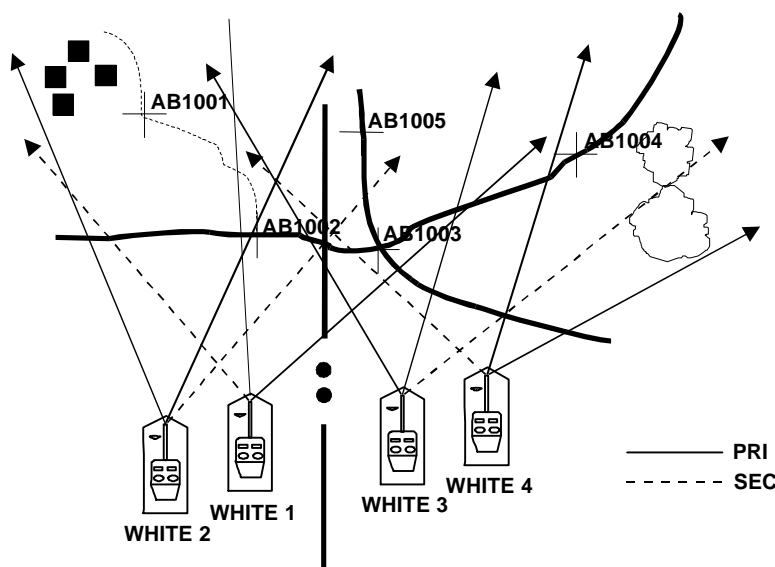


Figure 4-9. Defensive Fire Plan.

- Designates possible point or area targets and other control measures (TRPs, RPs, PLs, or target priorities) to coordinate the fire of the section when more than one LAV-25 is firing into the target area or sector.
- Receives information from vehicle commanders (provided on range cards). The section leader then reviews this information to ensure that fire is properly distributed across the entire section sector and that sufficient control measures have been established. This review will assist the section leader in determining if positions must be adjusted, if minefields and obstacles must be emplaced, and if additional indirect fire support must be requested.
- Completes the section fire plan, gives a copy of the section sector sketch to the platoon leader, and has each vehicle commander make a copy of the sector sketch. (If time is short, the section leader may only be able to give the vehicle commander a quick briefing on the sector sketch.)
- Coordinates with the platoon commander to submit their target requests to the support coordinators. Once the targets are approved, the section leader needs to backbrief personnel in the section about the indirect fire plan including types of preplanned targets and target numbers. If the section leader fails to coordinate all targets and target numbers with the section and the platoon, the result will be confusion once contact is made. All platoon members must be operating from the same fire plan.

b. Offensive Fire Planning

Time may not be available to plan fires in the same detail as in defensive fire planning. The section leader may have to rely more on fire commands and prearranged SOP signals to rapidly bring effective fire on the enemy targets. However, offensive action requires some planning. A section leader must plan how to engage known or suspected enemy targets, where suppressive fire may be needed, and how to control section fires

against planned targets and targets of opportunity.

4005. Section Fire Control

Section fire control may be conducted using simultaneous or alternating fire.

a. Simultaneous Fire

Simultaneous fire is used to achieve massed, surprise fires effect on the enemy. In this method, all vehicles of a section fire into their assigned sectors at the same time. This technique is used when all vehicles are able to or required (by target presentation) to fire at the same time. All vehicle commanders within the unit react to the section leader's fire command by firing simultaneously at targets within their sectors or at targets designated by a fire pattern unless given the command **ALTERNATING** after the fire pattern in the section fire command.

b. Alternating Fires

Alternating fires are used to prevent the enemy from getting a good fix on the firing vehicle's location. Alternating fires allow one vehicle to shift firing positions while the other vehicle engages targets. This method provides constant fire into the engagement area while hindering the enemy's attempts to acquire and suppress firing vehicles. At extended ranges (at least 2,500 meters), the pair can alternate firing and observing until both are satisfied they are delivering effective fire. To use alternating fire, the section leader must announce **ALTERNATING** in the control element of the fire command.

4006. Section Fire Commands

Speed and accuracy are vital when engaging targets, so commands must be concise and clear. In the stress of battle, a section leader or vehicle commander must quickly analyze a situation and issue concise and complete fire commands without delay.

A standard format for section fire commands ensures that all necessary information is given in minimum time, even under the worst conditions. The elements of a section fire command issued in proper sequence are as follows:

Element	Example
Alert	WHITE TWO, THIS IS WHITE ONE
Weapon/Ammunition (Optional)	SABOT/HE
Description	ONE BMP, TWO BTRs
Location (Optional)	500 METERS EAST OF TRP ZERO ZERO FOUR
Range (Optional)	ONE FOUR HUNDRED
Control (Optional)	DEPTH
Execution	AT MY COMMAND

Note: Weapon or ammunition is optional but may be given when BMPs and BTRs appear together. Range is optional and may be given if it can be

determined. Control is optional but may be given to control the fire pattern used by the section.

The following are examples of section fire commands.

Example 1: Section leader's fire command to engage assaulting BMPs with the section LAV-25s: **WHITE 2, THIS IS WHITE 1; SABOT** (optional); **THREE BMPs; FRONT, 1600** (optional); **CROSS** (optional); **FIRE**.

Example 2: Section leader's fire command to engage section of BMPs from primary and alternate positions: **WHITE 2, THIS IS WHITE 1; SABOT** (optional); **TWO BMPs; SOUTH OF TRP ONE TWO FOUR** (optional); **FRONTAL, ALTERNATING** (optional); **AT MY COMMAND**.

Section leader's command to break off the engagement: **WHITE 2, THIS IS WHITE 1; CEASE FIRE**.

Chapter 5

LAV-25 Unit Gunnery Training Programs

This chapter provides information to assist unit commanders and master gunners in developing successful gunnery training programs. Training guidelines, tips, and the progression from sustainment to intermediate to advanced training are addressed systematically. Hence, crewmembers are efficiently trained, training goals and objectives are met, and LAV-25 crews develop and maintain gunnery skill proficiencies.

5001. Developing LAV-25 Gunnery Programs

An effective program for unit training is the result of careful analysis and planning, supervised execution, and command emphasis. Command interest in the gunnery training plan is a key element to successful programs. Detailed information on development and implementation of unit training programs may be found in MCRP 3-0A, *Unit Training Management Guide*, and MCRP 3-0B, *How to Conduct Training*.

The training plan should be based on the current level of proficiency in the unit to be trained. Two factors that may affect a unit's overall proficiency level are personnel turbulence and normal deterioration of basic skills. Personnel reassignments, release from active duty, fleet assistance program/temporary additional duty, etc., can negatively impact on the experience level within a unit. This personnel turbulence may impair a unit's gunnery proficiency level and possibly weaken crew cohesion. Nongunnery-training requirements may take time and resources away from gunnery training, which may cause mastered skills to weaken. Without sustainment training, those skills can be lost. Unit and vehicle commanders, trainers, and master gunners need to be aware of the effect of these two factors and plan training to counter their effects.

Figure 5-1 outlines the preferred progression of LAV-25 gunnery training. Only gunnery-specific events are listed. Training progresses from the prerequisite initial skills training and testing to preliminary and basic gunnery qualification. Once a crew member is basically qualified in LAV-25 gunnery, training progresses to sustainment training level and into achievement of intermediate and advanced gunnery levels. Since commanders have many other competing training requirements that impact the overall training plan, gunnery training should be effectively incorporated into that plan.

5002. Training Analysis and Planning

LAV-25 gunnery training should be a continuous, challenging, well-planned, and progressive program. Commanders must assess their units to determine their levels of proficiency in gunnery and

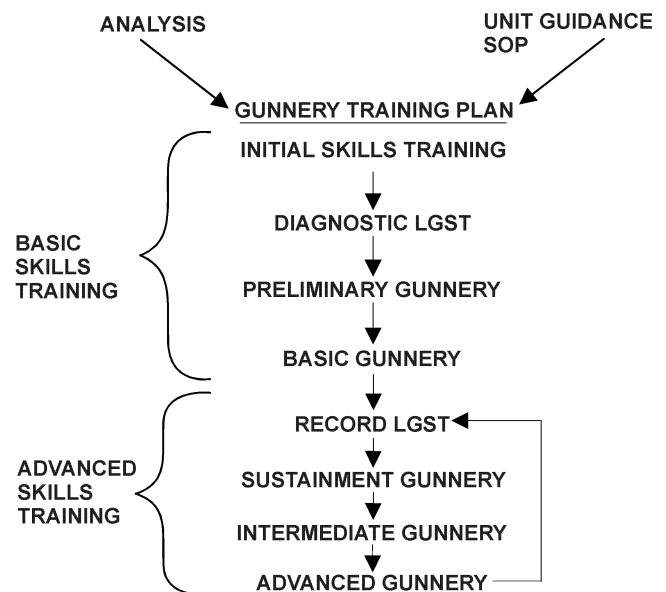


Figure 5-1. Training Progression.

tactics against existing standards. Recommendations come from all levels of the command; however, unit master gunners should be involved in recommending a training program for gunnery, as outlined in the following steps:

a. Analyze

All available data of the unit's performance during past gunnery training programs should be analyzed so that a clear picture of the unit's current gunnery proficiency level can be made. The analysis should focus on—

- Past results from gunnery table exercises.
- Specific results by type of task on all tables.
- Personnel turnover within the unit as it relates to experience and crew cohesion.
- The LAV-25 gunnery skills test (LGST) results.
- Training results relating to gunnery (i.e., performance in the turret trainer).
- LAV-25 crew evaluator (LCE) training.
- Other common training results.

b. Identify Strengths and Weaknesses

After careful compilation of all available data, the training planners and master gunner should identify specific unit strengths and weaknesses in gunnery proficiency.

c. Derive Recommendations

Once strengths and weaknesses have been identified, the master gunner develops courses of action and makes recommendations. Consideration should be given to availability of training aids/ areas so that recommendations are realistic.

d. Brief Commander

The master gunner briefs the commander on results of the analysis and makes recommendations on how to sustain strengths or correct weaknesses. The commander decides on a course of action which becomes the initial training plan. This briefing process may be repeated as necessary until the commander approves a basic plan for implementation.

e. Issue the Unit Training Plan

The commander issues the overall unit training plan for implementation. This plan provides both long-range and short-range goals to focus development of a short-range training plan that will provide detailed instructions for execution.

f. Update the Plan

The master gunner updates the plan approved under the commander's continuous guidance.

g. Develop Short-Range Training Plan (SRTP)

The master gunner develops and designs the complete training program into a briefing form for key personnel. Informing key personnel allows the commander's plan for gunnery training to be visualized by unit leaders. The SRTP should include the following:

- Cover sheet.
- Purpose, goals, and objectives of the gunnery training plan.
- Identified strengths and/or weaknesses.
- Recommendations.
- Personnel turnover issues as they relate to collective unit experience.
- Ammunition.
- Short-range and near-term calendars.
- LCE training.
- LGST issues. (See app. D.)
- Basic tables/sustainment tables. (See app. E and app. F.)
- Additional training.
- Intermediate tables. (See app. G.)
- Advanced tables. (See app. H.)

5003. Training Planning Tips

a. Start Early

All aspects of a training program should be thoroughly coordinated. This requires proper time management. Establish milestones for ammunition, resource, and maintenance requests as far in advance as possible. Involving unit commodity sections in the gunnery training planning and

execution phases help ensure successful evolutions. Information regarding ammunition forecasting and allocation is covered in detail in appendix I.

b. Be Thorough

Leave nothing to chance. Avoid wasting valuable training resources and opportunities. Issue unit leaders the appropriate guidance and assistance required so that they may train their units. Doublecheck the plan, and continuously coordinate with commodity sections to ensure nothing is missed.

c. Be Flexible

Continually adjust the training program to reflect changes in the unit's commitments. Have backup training prepared. Unit commitments, weather, range time, and availability of ammunition invariably affect a training plan. Have contingency plans ready for these eventualities.

d. Train Continually

Gunnery training must be recurring in nature to sustain skills through time. Plan proper use of all available time. Establish concurrent training for all aspects of the plan.

e. Reduce Unnecessary Personnel Turnover

Commanders should do everything possible to reduce the personnel turbulence within their units. Crew turnover will occur naturally throughout the year, but leaders should attempt to maintain a balance in experience.

f. Plan Around Availability of Training Aids

Some LAV-25 gunnery training relies on the use of training aids. Planners must ensure that they properly forecast and allocate the use of available training aids. If this is not done, the result may be an outstanding plan without the means to accomplish it. Do not overextend your assets.

g. Plan Around Range Availability

Gunnery training is heavily reliant on live fire ranges. A great plan means nothing if the range is not available.

5004. Prerequisites to Gunnery Training

All LAV-25 crew members are taught basic LAV-25 tasks during their initial military occupational specialty (MOS) school. The school teaches students the basic skills of gunnery. Gunnery skills are perishable. Commanders cannot solely rely on the retention abilities of personnel to ensure that they are prepared to conduct gunnery training. Actual live fire training is a precious commodity that cannot afford to be wasted. Preparation for gunnery training begins prior to the first round going downrange. For this reason, all personnel should train to meet certain prerequisites prior to beginning live fire gunnery training.

Since gunnery training can begin at either the basic or sustainment levels, planners should develop the training plan from each perspective. Prerequisites for each level should be taught and/or tested per existing unit SOPs prior to conducting gunnery training.

a. Basic Level

(1) **Safety.** All personnel must be familiar with the safety aspects of gunnery training. This includes range regulations, flag use and meaning, weapons clearing procedures, and ammunition handling procedures. Briefing general vehicle and unit safety SOPs is important.

(2) **Maintenance Procedures.** Prior to beginning gunnery training, personnel should be familiar with the care and maintenance of the turret and all turret-mounted weapons.

(3) **Prefire Checklists.** Personnel should be able to demonstrate the proper use of prefire checklists prior to training.

(4) **Immediate and Remedial Actions.** These procedures should become second nature to all personnel for a number of reasons. Safety is a major concern during these actions. Valuable training time can be lost due to inexperienced personnel handling weapons problems. These actions are included in appendix J.

(5) Diagnostic LGST. These tests are usually scheduled prior to training to identify weak areas in training. Information on the LGST is included in chapter 6, and details on stations of the test are in appendix D.

(6) Weapons Conditions. The use of weapons conditions for each of the weapons systems found on the LAV-25 must be mastered. These conditions denote the state of fire readiness and safety for each weapons system. Information on details regarding LAV-25 weapons conditions can be found in appendix K.

b. Sustainment Level

(1) Basic Gunnery Training. By natural progression, successful completion of basic gunnery training leads to sustainment gunnery training. Basic gunnery qualification tables can be found in appendix E.

(2) Crew Qualification. Crews who have qualified previously will naturally cycle into sustainment gunnery training.

(3) Record LGST. A record of LGST is required prior to any personnel starting full caliber gunnery. Planned properly, this allows a unit to meet all LGST requirements for the gunnery training plan and meet standard requirements of individual training standards (ITS).

5005. Continuation of Gunnery Training

Sustainment gunnery consists of firing tables 4 through 8. The sustainment gunnery tables (see app. F) are designed to reinforce, evaluate, and exercise precision and battlesight skills learned during crew qualification. Sustainment gunnery builds on basic gunnery skills and prepares crews for more intermediate and advanced gunnery training.

Intermediate Training

Intermediate gunnery is conducted to train a single vehicle crew using full caliber live fire. To reach the goal of full crew qualification, intermediate gunnery builds on skills acquired during sustainment gunnery training. Intermediate gunnery training consists of firing tables 9 through 12 (app. G). Point calculation worksheets (app. M) and scoring matrices (app. H) are used for firing full caliber tables 8 through 12. Point calculation worksheets are used for battlesight engagement scoring. Scoring matrices are used for precision engagement scoring.

Advanced Training

Advanced gunnery trains and evaluates LAV-25 scout section members in conducting section reconnaissance and security missions. Advanced gunnery training also evaluates the scout section leader's ability to control the scout section in tactical engagements. Advanced training is conducted using the advanced gunnery tables (see app. H) and the advanced gunnery performance checklists (see app. L). These tables and checklists are used as a baseline to tailor a challenging training exercise that accomplishes the successful completion of identified combat critical tasks. The goal of advanced gunnery training is the qualification of scout sections.

Master gunners should continually evaluate the training level of unit personnel. That assessment should provide the commander with an indication of the unit's training level and identify areas requiring training emphasis. It is important to train new personnel as rapidly as possible to ensure the entire unit is at the same training level. This may require firing of the basic gunnery tables a number of times during a training cycle to ensure all personnel are qualified and to meet the prerequisites for higher level training.

Chapter 6

LAV-25 Gunnery Skills Test

The LAV-25 gunnery skills test (LGST) evaluates each crewmember's ability to perform gunnery-related skills. Crewmembers are tested individually without the aid of technical manuals or publications. Tests are conducted prior to live fire exercises to serve as a way to ensure crewmembers have mastered required knowledge and skills and meet minimum standards for training and safety before advancing into live fire.

Appendix D contains a detailed description of a recommended LGST. The appendix lists testable subjects by test stations as well as information that supports the setup, administration, testing, and evaluation of required tasks. It also provides grading criteria for each task.

6001. Types of LGSTs

Diagnostic

The commander uses a diagnostic LGST as an evaluation tool to ensure the unit meets desired training levels. Information gained from results of a diagnostic LGST enables units to design training plans that capitalize on strengths and correct weaknesses identified during the LGST. Diagnostic LGSTs should be administered to units prior to starting gunnery exercises. In addition, diagnostic LGSTs can be administered to new personnel and used as a method for measuring proficiency levels when designing cross-training programs.

Record

Record LGSTs are conducted for score. Record LGSTs satisfy requirements during the conduct of gunnery exercises. In successful training plans, record LGSTs ensure that standards are met and that each crewmember has mastered or sustained the skills necessary to operate various weapons

systems. The frequency of conducting record LGSTs may vary, but tests should be given at least semiannually in accordance with individual training standards and at least 90 days prior to full caliber firing.

A well-orchestrated plan can accomplish both requirements simultaneously.

6002. Standards

The task tested at each station should have its own standards that govern the conduct of that station and the grading criteria. It is important that evaluation standards remain consistent throughout the LGST. Performance steps for each station should be clearly outlined in detail for the evaluator and not compromised. The following overall standards are recommended:

- To receive a **GO** on any station, a **GO** must be achieved for all subtasks (performance measures) within that station.
- **NO GOs** are given if the task—
 - Is not completed.
 - Is performed incorrectly.
 - Time standards are not met.
- The evaluation may be conducted either internally or externally. Internal evaluation, using unit personnel qualified as LCEs, should only be used for diagnostic LGSTs. Record LGSTs are best evaluated by external LCE-qualified personnel, thereby providing objective results.
- Critiquing at each station is important. Crewmembers should be made aware of where they failed to meet the standard and what corrective action is required for them

to meet the standards. LCEs should conduct critiques in this manner to allow the unit to enforce consistent standards.

- Retesting is accomplished in accordance with the unit SOP.

6003. Site Planning and Preparation

The goal of any unit conducting an LGST is that the testing site be organized to support consistent, predictable throughput of the evaluated unit. This equates to nothing more than proper time management, thorough planning, and detailed preparation.

Site Planning Considerations

Combine test stations based on the availability of time, evaluators, equipment, and the number of crewmembers to be evaluated.

Combine test station subjects in an organized fashion. See fig. 6-1. For example, do not require a student to perform downloading procedures before performing uploading procedures. Preparation time can be minimized by progressing in a logical fashion.

Combine related stations. For example, boresighting of and disassembly of the M240 are unrelated

subjects and if combined would damage consistent throughput.

Determine and balance the time allotted for testing of each station. This will allow predictable throughput and enable the evaluators to finish the test within the allotted time frame.

Establish an area for the crewmembers to wait and study between stations.

Ensure that backup equipment is on hand to replace faulty equipment. Backup equipment must be readily accessible; if not, throughput will be affected by delays.

Troubleshoot or wargame the LGST site. Thoroughly critique the site organization and test plan prior to testing. Often problems can be identified and corrected prior to evaluation.

Site Preparation Considerations

Ensure that all evaluators are qualified as LCEs, since they are solely responsible for the preparation of their stations.

Assign LCEs in advance, and ensure they understand the criteria of their stations.

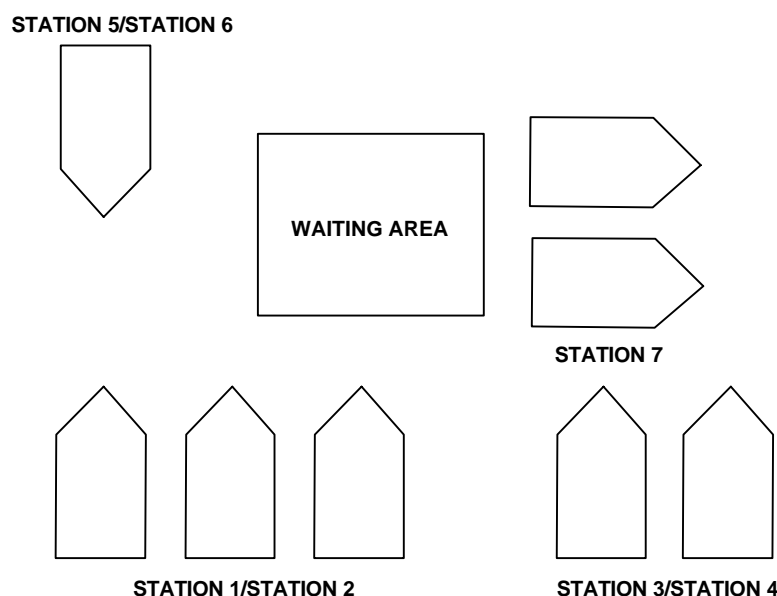


Figure 6-1. Example of an LGST Site Layout.

Ensure LCEs are familiar with the task, conditions, and standards of their stations.

Ensure all equipment and administration materials are present and in working order at each station.

Ensure that pretest preparation for each station is complete, to include the brief each crewmember receives on details regarding conditions and standards of each task.

Prior to conducting the LGST, the noncommissioned officer in charge (NCOIC) of the LGST site issues a site brief to personnel being tested.

Ensure evaluators are prepared to maintain notes to assist in the critique and debrief of each crewmember immediately after their evaluation.

Chapter 7

Training Devices

The high cost of ammunition and overcommitment of available training areas makes the use of training devices increasingly important. Training devices can enhance performance in all levels of gunnery training by simulating the conditions required for mastering, reinforcing, or executing gunnery skills. Some aspects of gunnery can best be evaluated with the use of training devices. For example, some exercises that evaluate gunner sighting skills are best accomplished by using training devices.

Some of the described training devices may be available through the local training and audio visual support center (TAVSC). Some may need to

be manufactured locally. The using unit is responsible for developing, purchasing, and maintaining locally manufactured devices.

7001. LAV-25 Turret Trainer

The LAV-25 turret trainer is a classroom training device (fig. 7-1) for teaching, maintaining, and evaluating basic turret operation, conduct of fire, and fire control skills. This trainer enables master gunners to use preprogrammed scenarios or to create scenarios that aid in accomplishing unit training goals. The turret trainer can be used in all phases of training as a reinforcement tool. Deficiencies identified in training can be corrected in

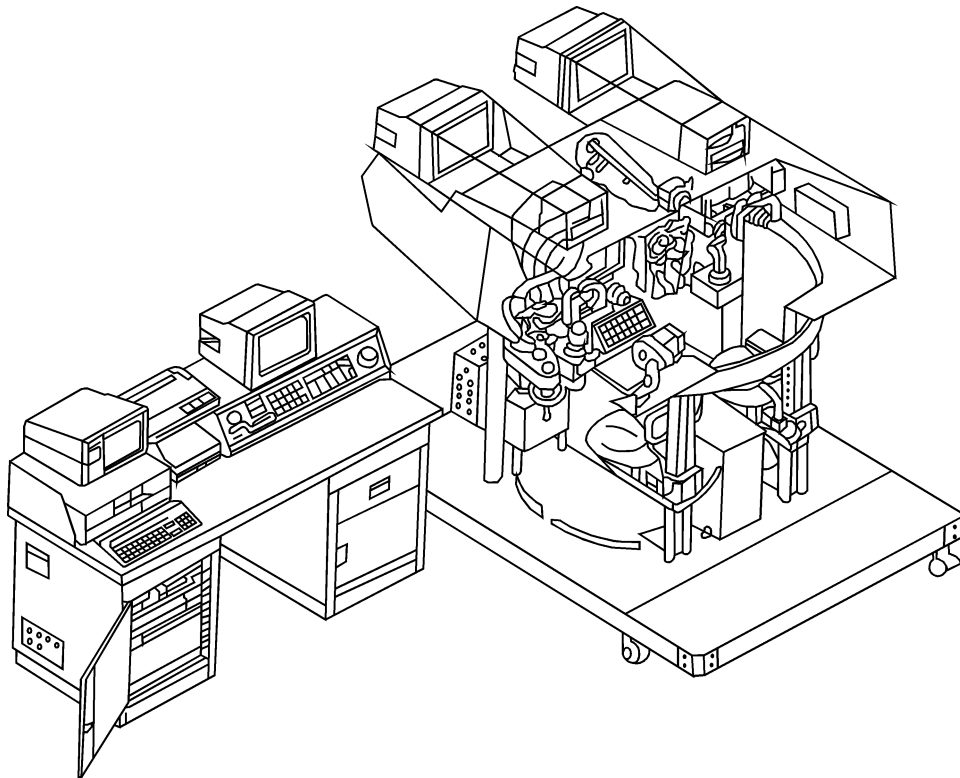


Figure 7-1. LAV-25 Turret Trainer.

the controlled classroom environment of the turret trainer.

The LAV-25 turret trainer should not be used alone to accomplish training goals. Because of its limitations, the turret trainer is best used as a supplemental tool to train or reinforce specific gunnery-related skills. Information on the use and care of the LAV-25 turret trainer can be obtained in Naval Training System Command (NTSC) P-5603, *Light Armored Vehicle (LAV-25) Training System Turret Trainer Device 17B19*.

7002. Precision Gunnery System

The precision gunnery system (PGS) is a vehicle-mounted training device that assists the crew in gaining and improving proficiency in gunnery skills without expending live ammunition. Gunnery and tactical training can be conducted anywhere that eye-safe laser firing is permitted. The PGS provides the crew with visual and sound effects to accurately simulate real firing conditions. The PGS —

- Simulates firing of the vehicle's main gun and the coaxially mounted machine gun.
- Simulates vehicle firing and ammunition effects on targets.
- Provides full fire control interface to enable the vehicle operator to train using normal engagement techniques.
- Provides gunnery training capabilities using a class 3A (conditionally eye-safe) laser.
- Provides interoperability and compatibility with other gunnery simulation systems.
- Provides panel gunnery training, target tracking, scaleable target capability, and combat training in a realistic environment with immediate feedback.
- Simulates visible effect of the main gun and coaxially mounted machine gun firing, include sensing.
- Provides all mission information in a form that can be downloaded by computer and analyzed for after action reviews.

- Provides the following firing sound effects over the vehicle intercom system:
 - Main gun firing signature.
 - Coax firing signature.
 - Hit indication.
 - Ammunition loading. Tracks the number of rounds fired to force the crew to upload once the initial upload is fired.
 - System error indication.

7003. M240 as a Subcaliber Device

The M240 coaxially mounted machine gun can be used to fire 1/10, 1/5, 1/2, and full scale ranges. The M240 coax requires 4,800 meters of impact area. If using the coax with a single-shot solenoid or the fire control box, crews can accomplish the same results as using the M16A2 with the subcaliber device, without having to mount and zero the LAV-25 subcaliber device. An additional benefit of using the M240 is that with increased ranges the trajectory of the 7.62mm tracer round is visible. This allows accomplishment of limited precision gunnery aiming training on 1/2 to full scale ranges. The M240 coaxially mounted machine gun can also be used when validating ranges or running gunnery table 13. The significantly lower cost of the 7.62mm round, as opposed to the 25mm, gives the unit an option and an advantage when intracrew coordination or tactical considerations outweigh full-caliber gunnery performance.

7004. LAV-25 Subcaliber Training Device

The LAV-25 subcaliber training device is a mount that fixes either the M16A2 or the visual aiming device (VAD) to the weapons system. (See fig. 7-2.) The subcaliber device's construction allows master gunners to precisely evaluate the sighting skills used by the gunner. The ability to use subcaliber devices allows units to conduct scaled range training within smaller range impact areas. The LAV-25 subcaliber device is connected to the fire control system of the LAV-25 by the fire control box.

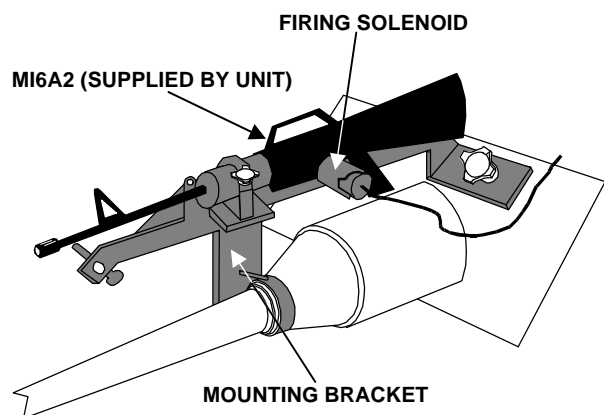


Figure 7-2. LAV-25 Subcaliber Training Device.

The fire control box is used for all subcaliber devices employed and is mounted on top of the control display assembly (CDA) by thumbscrews. Connect the P5 connector on the fire control box to the J8 terminal on the power display assembly (PDA). Disconnect the cable from the M240 solenoid connector. Connect the P3 and P4 connectors from the fire control box to the appropriate connectors from the M240 solenoid connector.

a. M16A2 as a Subcaliber Device

When using the M16A2, the LAV-25 subcaliber device (complete with wiring harness) must be used to fix the weapon to the vehicle and to allow the weapon to interface with the LAV-25 fire control system. The M16A2 can be used to fire either 5.56mm or .22 caliber ammunition depending on either the training requirements or the

impact area available for training. For safety, the .22 caliber requires a minimum of 1,400 meters of impact area, and the 5.56mm requires a minimum of 3,600 meters. Using the M16A2 subcaliber device allows crews to fire on scaled ranges and to observe the actual impact of the round by using tracers.

Crews can practice battlesight gunnery, moving target gunnery, and fire adjustment without the cost or range restrictions of full-caliber (25mm) ammunition. Crews cannot, however, practice precision gunnery skills because of the flat trajectory of the subcaliber rounds at the distance parameters used. Although fire adjustment can be practiced, the M16A2 will not simulate the bursts of the 25mm cannon. However, imaginative use of this training device will allow units to accomplish a number of goals in the early stages of gunnery densities.

(1) Firing 5.56mm. Use of 5.56mm ammunition is recommended if the impact area to support it is available. Use tracer rounds to get the full training benefit from this device. Wear and tear from firing large numbers of tracer ammunition must be considered to protect the rifle's serviceability.

(2) Firing .22 Caliber. To fire .22 caliber ammunition, the bolt and carrier of the M16A2 must be replaced by the .22 caliber rimfire adapter. The M261 conversion kit (see fig. 7-3) includes one bolt adapter assembly and three magazine adapter

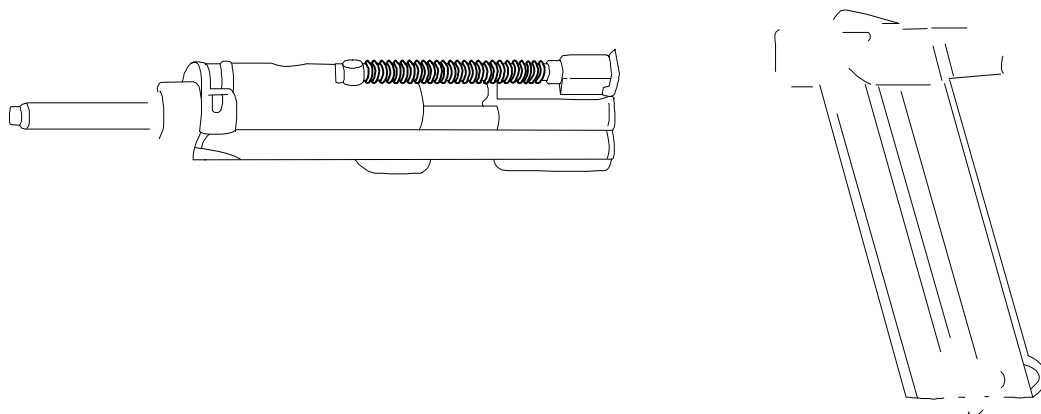


Figure 7-3. M261 Conversion Kit.

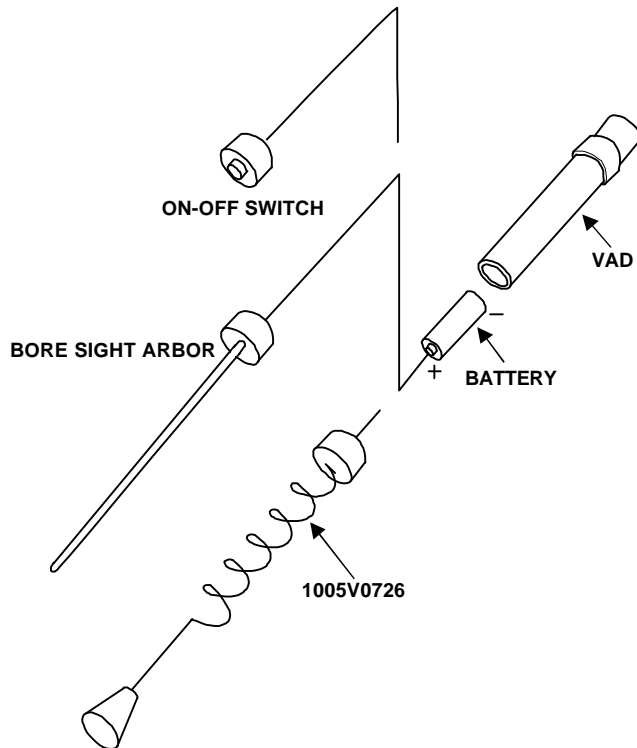


Figure 7-4. Visual Aiming Device (VAD).

assemblies. When this device is used, the weapon is accurate up to 50 meters in the semiautomatic mode only.

Tracer rounds should be used for training exercises. Standard M16A2 magazines are required when using the M261. The magazine adapter assemblies fit into the standard magazines.

Refer to TM 9-6920-363-12&P for the use and care of the M261 conversion kit, and refer to TM 43-0001-27 for authorized .22 caliber tracer ammunition.

b. Visual Aiming Device

The VAD (fig. 7-4) is a low-powered laser mounted on the LAV-25 subcaliber training device (fig. 7-5). The low-powered laser pulse is reflected in either the continuous or flash mode on any white target surface. The laser is fixed-focused at 60 meters. In the flash mode, the laser is eye-safe at 0 meters. The VAD allows evaluators to rate tracking and aiming skills. To use the VAD, the LAV-25 subcaliber training device

mount (complete with wiring harness) must be used.

The VAD is the only precise means that the master gunner has to evaluate precision gunnery aiming skills. However, the VAD will not allow crews to practice BOT, TOT, moving target, or fire adjustment techniques. This training device should be restricted to achieving desired training results and must be augmented by other devices. Refer to Army Regulation (AR) 385-63, chapter 19 and appendix B, for the use of lasers on training ranges.

c. Stout Board

The stout board is an evaluation aid used in conjunction with the VAD. The stout board (fig. 7-6) allows crews to fire on scaled ranges or manipulation boards while providing the evaluators a precise tool to evaluate the aiming techniques of the crews. The board is a 2-feet by 6-feet sheet of plywood or light metal coated with either a white

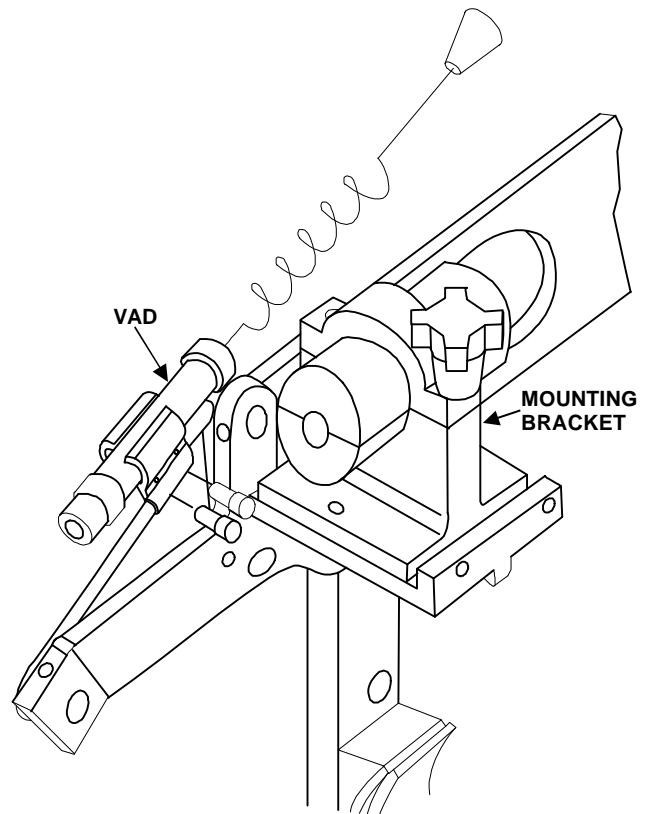


Figure 7-5. Visual Aiming Device (VAD) Installed on Subcaliber Training Device.

or a retroreflective surface. The board is placed 1 to 3 meters, on its self-supporting stand, in front of the vehicle, and 1/2-inch markers are used to correspond with downrange targets. The stout board can be locally manufactured, but it is included in the subcaliber training device kit. Using a sheet of plywood behind the reflective paper is strongly recommended to keep the wind from excessively moving the board and giving the evaluator erroneous results.

d. Zeroing

Regardless of which subcaliber device is used, it must be zeroed to the sight prior to use. Zeroing ensures the subcaliber device is properly aimed by that sight so the gunner hits where he aims.

(1) M16A2 With .22 Caliber or 5.56mm. Place a target 50 meters in front of the vehicle (50-100m for 5.56mm). The target should have a centered, well-defined aiming point visible to the gunner.

Connect the cable assembly (PN1005V0725) first to the solenoid lead (PN1005V0720) and then to the fire control box using the 90-degree connector at the port marked M16A2.

(a) Using manual controls, lay the battlesight circle on the aiming point and fire three rounds, re-laying the sight after each round.

(b) If the impact is on target, use the boresight knobs and adjust the battlesight circle to the center of the three-round shot group. If the impact is not on target, go to step (d).

(c) Re-lay the weapon and repeat steps (a) and (b) until the impact is consistently on the aiming point.

(d) If the impacts are not on target, determine which side of the target the rounds are missing. The LAV-25 subcaliber device must be moved to compensate for the error. To do this, loosen the device elevation and/or deflection wing screws

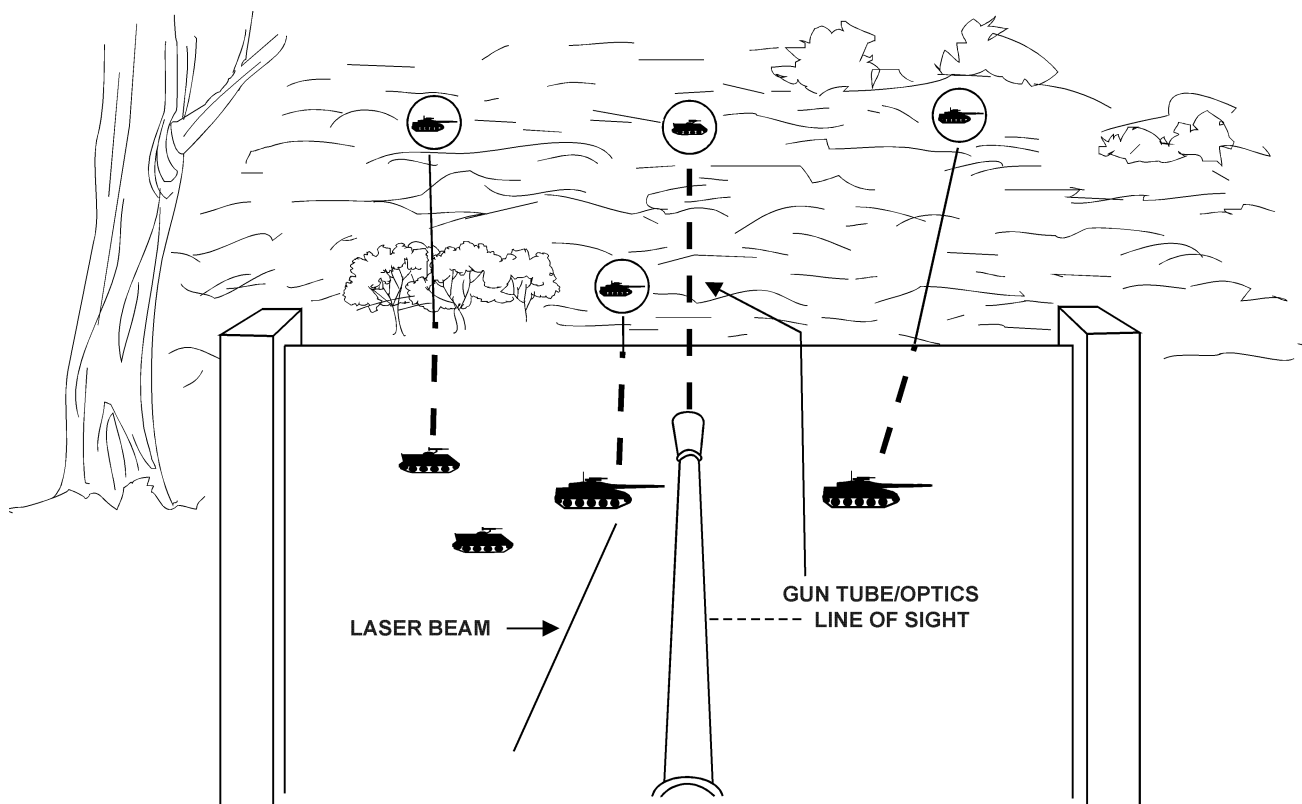


Figure 7-6. Stout Board.

and move the device toward the target. Fire check rounds, repeating as necessary until the group is on the target.

(e) Repeat steps (a) and (b) until the subcaliber device is zeroed.

(2) Using the Visual Aiming Device. There are two methods used when zeroing the VAD: point of aim and stout board. Use point of aim zeroing if the VAD is used to evaluate tracking skills or if the master gunner has determined that a single point of the sight will be used (i.e., battlesight gunnery). Stout board zeroing is used whenever the stout board is used for evaluation. Connect the cable assembly (PN1005V0725) first to the VAD lead (PN1005V0726) and then to the fire control box using the 90-degree connector at the port marked *VAD*.

(a) Point of Aim Method

1 Disconnect cable assembly from the VAD, and replace it with the *ON/OFF* switch.

2 Place the target (worm board, manipulation board, etc.) at least 15 meters in front of the vehicle (optic focal point).

3 Place the laser in continuous mode and select an aiming point for zeroing. Lay the battlesight circle on the aiming point.

4 Adjust the VAD's laser dot close (within gunner/vehicle commander sight picture) to the aiming point by adjusting the VAD in its mount.

5 Once the laser dot is close to the aiming point, adjust the sight to the dot by using the deflection and elevation knobs on the M36 sight.

(b) Stout Board Method

1 Place stout board directly in front of the vehicle (1-2 meters) and ensure that a downrange target (scaled range, manipulation board, etc.) is established. Place laser in continuous mode.

2 Aim turret to the left, center, right, top, and bottom of the downrange target and fire the laser to determine if the laser dot is on the stout board. If the dot is not on the board, get a wider stout board or move the target farther from the vehicle while maintaining appropriate scale. Place the turret to the center of the downrange target.

3 Adjust the LAV-25 subcaliber device using deflection and elevation bolts to point the laser roughly at the center of the stout board.

4 From the gunner/vehicle commander position, aim at the farthest left target. Squeeze and hold the trigger. An assistant at the stout board will place a marker on the stout board corresponding to that target.

5 Number each marker as it corresponds to each target.

Note: Markers should be roughly the same size as the laser dot for the most accurate evaluation of crews.

Chapter 8

LAV-25 Crew Evaluator Training

LAV-25 crew evaluators (LCEs) are used by the training unit to evaluate all aspects of gunnery. From LGST through firing the qualification table, LCEs are used extensively in establishing and operating gunnery training and in evaluating crew proficiency in both individual skills and crew duties. Qualified LCEs make it possible for master gunners to remain focused on their primary responsibility of planning and overall supervising unit training.

For LCEs to be effective in their duties, they must be properly trained. LCE training should be standardized at the battalion level to ensure all battalion evaluations are of consistent quality. It is the battalion master gunner's responsibility to ensure that standard training for LCEs is conducted. It is the company master gunner's responsibility to ensure that personnel assigned as LCEs to battalion training are qualified.

Personnel used for training prospective LCEs should be either master gunners or certified LCEs. The battalion master gunner should interview trainers to ensure that they possess the required skills—mental and communicative—to use the battalion's lesson plans for training.

8001. Prerequisites

Some common knowledge is required of personnel receiving LCE training. If the personnel assigned to receive training do not have an understanding of basic LAV-25 weapons, the task of training them to evaluate proficient crews becomes greater. The end product of the training may be less proficiency than is required. Since training time is valuable, the following prerequisites are recommended for prospective LCEs:

- 0313 corporal and above.

- LGST qualification within last 3 months.
- Gunner or vehicle commander qualification within last year.

The above prerequisites are recommended for the best end product. Units that cannot provide personnel meeting these requirements should nominate the best qualified personnel. Nominations are based on input from the chain of command and the master gunner, but the commander makes the final decision.

8002. Certification

Candidates that complete LCE training are certified by their command to evaluate all gunnery training. Training must cover the unit's entire gunnery program. Determination for certification should be based on each individual's ability to successfully complete performance evaluations

comprehensive. Successful results should ensure that candidates have mastered all topics and can work unsupervised in their duties as LCEs.

The abilities to work unsupervised and to adhere to the standards are highly important. LCEs may work as external evaluators throughout the conduct of their duties. If the candidate cannot undertake these duties without supervision, or cannot adhere to the standards, the evaluation rendered for an external unit may be suspect.

Certification of LCEs should be conducted on a regular basis to ensure that units have qualified personnel to evaluate training as turnover occurs. Certification lasts a period of 1 year from issue. Recertification can be accomplished by written examination. Qualified LCEs need not attend LCE training to be recertified unless there are new

training events. Qualified LCEs should receive only the new training. It is important for the battalion master gunner to maintain LCE training records in order to track an individual's qualifications and currency.

Training recommended for LCE certification is listed below according to the method by which the LCE is evaluated.

Performance Evaluation

- LGST.
- Turret trainer.
- Preliminary gunnery.
- Basic gunnery.
- Sustainment gunnery.
- Training devices.

- After-action review techniques.
- Target acquisition process.

Written Evaluation

- LGST.
- Turret trainer.
- Preliminary gunnery.
- Basic gunnery.
- Sustainment gunnery.
- Intermediate gunnery.
- Advanced gunnery.

LCE training should concentrate on the evaluation of training. It is a "train the trainers" program. Any other training requirements included in the unit's gunnery plan should be included as subjects for LCE training.

Chapter 9

Preliminary Gunnery Training Exercises

New crewmembers require an initial period of basic gunnery training on the LAV-25. Preliminary gunnery introduces the basic skills associated with LAV-25 gunnery. This preliminary gunnery training allows the new crewmember to reach a basic proficiency level and helps identify additional training requirements.

Preliminary gunnery teaches the skills necessary to acquire, lay on, range to, and track targets during good and limited visibility conditions. Training in these skills is done through exercises in weapons manipulation, target acquisition, range determination, passive and thermal sight employment, smoke employment, and pintle-mount machine gun employment.

9001. Weapons Manipulation Training

Manipulation training teaches new crewmembers who will act as vehicle commanders and gunners to rapidly lay the weapon on and track targets

over various types of terrain. Manipulation is a combination of eye-hand coordination and reinforcement training. There are two parts to manipulation training: gun lay and tracking.

a. Gun Lay

The purpose for gun lay training is to develop skills that allow the gunner and vehicle commander to quickly lay the turret on target and move rapidly from target to target. Emphasis is on speed and accuracy of the lay. The evaluation can be done with the visual aiming device (VAD) if desired. Figure 9-1 depicts a manipulation board used for training.

A typical manipulation board is constructed of plywood, paper, or even paint on a nearby wall and is placed 20 meters in front of the vehicle. This allows a 200 mil change in elevation and deflection between targets. At the discretion of the commander, any properly scaled and visible target can be used.

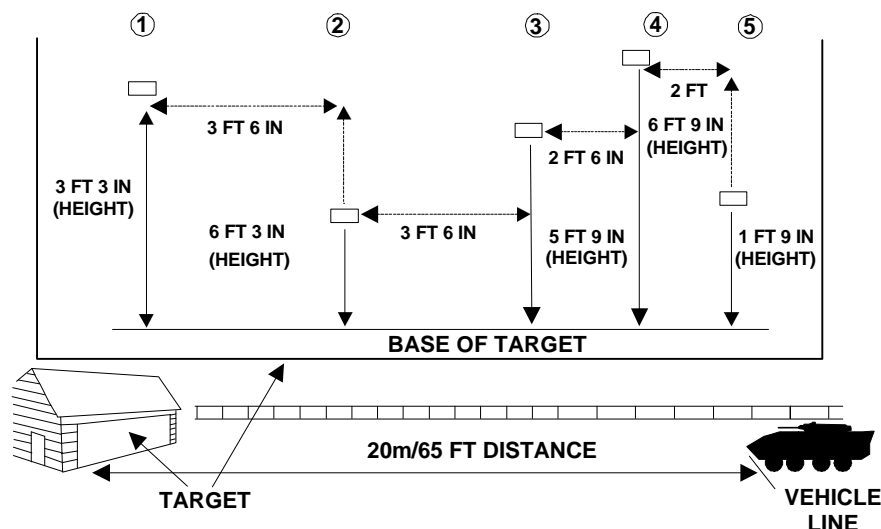


Figure 9-1. Manipulation Board Training Setup.

b. Tracking (Snake Board)

In tracking exercises, the training crewmember moves the sight reticle along a predetermined path at various speeds corresponding to target speed. The path requires the crewmember to make corrections in elevation to simulate the target traveling over different types of terrain. Emphasis is on accuracy at each of the speeds listed. The ultimate goal is for the crewmember to be able to successfully track a target moving 25 miles per hour. Crewmembers should master the track at slower speeds before increasing to faster speeds. Figure 9-2 depicts a snake board.

Manipulation tracking lines simulate the track of a moving target for a distance of 400 meters. The actual length of the lines, the width of the lines, and the width between the lines is scaleable and depends on the LAV-25 distance to the snake board. Once you have determined the range (the scale), use table 9-1 to develop the snake board. Snake boards are locally manufactured by the using unit.

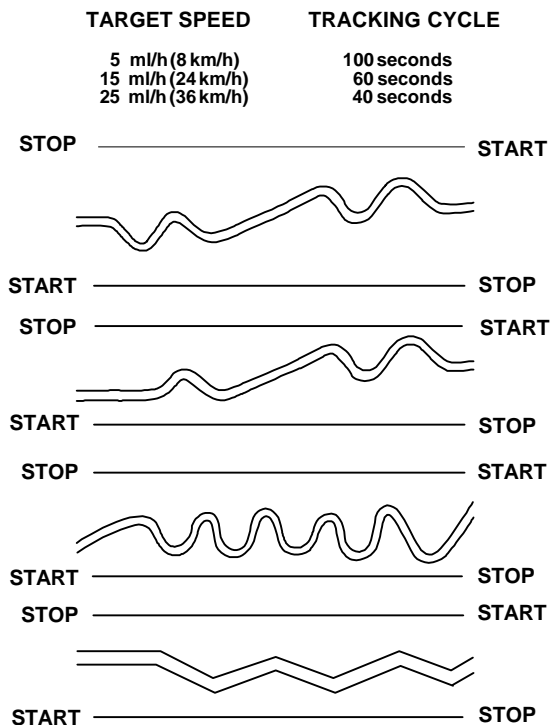


Figure 9-2. Example of a Snake Board.

Table 9-1. LAV to Target Distance.

LAV-25-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

Evaluation is accomplished either by using the VAD zeroed to the board and physically watching the gunner's track or by watching the gunner's track through the commander's sight. Table 9-2 (page 9-3) is a sample score sheet used for evaluating training with the snake board.

9002. Target Acquisition Training

Target acquisition training teaches the LAV-25 crewmember to rapidly acquire and designate targets. To be effective, all conditions—stationary and moving targets, day and night conditions, as well as single and multiple target situations—are depicted.

Target acquisition training may be conducted along with range determination training and passive and thermal sight training.

The unit designs the acquisition exercise to meet the needs of the crewmembers being trained. Initial screening and monitoring progress will help units to determine what level of acquisition training is required.

Scoring is based on the time the target is exposed to the crewmember until the crewmember acquires the target. The evaluator can serve as gunner and allow the crewmember to acquire targets and lay the turret on target.

Table 9-2. Sample Score Sheet.

Running Time		10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	Total	Distance	Evaluator/ LAV-25 Commander
Power 25mm	180																					
	*																					
Power 25mm	50																					
Power 25mm	40																					
Manual 25mm	180																					
Manual 25mm	50																					
Manual 25mm	40																					

*The gunner was tracking a target at 2,200 meters using the 25mm and turret power ON. An X indicates time frames when the vehicle was off target at the 50-second and 150-second point as called out by evaluator/LAV-25 commander.

Target acquisition training should be conducted from both a stationary and a moving vehicle, and it may also include vehicle identification and/or fire commands.

9003. Range Determination Training

Range determination training and exercises equip the crewmember with the skills to rapidly and accurately estimate target ranges. This exercise teaches crewmembers range determination techniques when using binoculars, the sight reticle, and the naked eye. All training should be in accordance with the procedures outlined in chapter 3 and appendix B.

A range determination exercise can be conducted with a target acquisition exercise. As each target

is exposed, the crewmember estimates range with either the naked eye, the sight, or binoculars.

Scoring is based on time and accuracy. Time begins upon acquisition and ends when the crewmember announces the range. The crewmember should be accurate to within 100 meters in 10 seconds.

9004. Passive and Thermal Sight Employment

The LAV-25 is equipped with both passive and thermal sights for target acquisition in reduced visibility. Exercises should teach the crewmember proper acquisition techniques for both sights. Training includes operation of the sights and instruction on vehicle identification with the sights.

The crewmember must properly identify thermalized targets. Emphasis is on speed and accuracy.

9005. Smoke Employment

Smoke employment exercises teach crewmembers to properly use the M257 smoke grenade launchers. Training includes principles of smoke employment and duties of the driver when using protective smoke. The exercise can be conducted on any available range area. The crewmember demonstrates proper employment of smoke in response to a threat. The crewmember also demonstrates the driving techniques required when employing smoke.

9006. Pintle-Mount Machine Gun Employment

Pintle-mount machine gun employment teaches crewmembers the proper techniques used when engaging targets with the M240 E1 pintle-mount machine gun. Training should include the principles and methods of employment for the weapon. The exercise can be conducted on any machine gun range. To ensure crewmembers become familiar with the use of the M240 E1, the exercise should include targets at various ranges and of various configurations. The principles and methods of employment are covered in detail in MCWP 3-15.1, *Machine Guns and Machine Gun Gunnery*.

Chapter 10

Live Fire Ranges

Live firing exercises require establishing or using live fire ranges. These ranges may be permanent or temporary, depending on the existence of local facilities and the type of live fire training required. A permanent LAV-25 firing range is normally part of a designated base range or facility. Each range has a surface danger area diagram, which is a map of the area and ground, designating a firing line or maneuver area and safety limits. Each range also has established procedures for its operation. Ranges are designed for a specific purpose—types of weapons, ammunition, and particular firing tables. These ranges usually cannot be modified or used for other types of firing without approval. Normally, the base or facility range control officer is the approving authority.

Temporary ranges are established to fill specific unit training requirements not resident on that base or facility. These requirements may range from subcaliber ranges to a special live fire exercise range. Requests to establish a temporary firing range must be accompanied by a surface danger area diagram, informing the approving authority of the specific requirements and desired area.

This chapter covers general guidelines for establishing, organizing, and operating live fire ranges.

10001. Establishing an LAV-25 Live Fire Range

Before selecting a site for a scaled or a full-caliber range, prepare a detailed map and perform ground reconnaissance of the available firing areas.

a. Site Selection

The range selected for live fire training must be large enough to accommodate all weapons systems to be used during training, the type of ammunition to be fired, and the scenario requirements of the table(s) to be fired. Realistic conditions not available within the selected terrain should be constructed to enhance training. The following are examples:

- Defilade stationary firing position.
- Sufficient maneuver areas and enough targets to provide multiple firing points and target locations.
- Targets arranged in realistic arrays and, if possible, unmarked using berms.

b. Firing Tables for Cannon, 25mm Gun, M242

The ballistic data in firing tables for LAV-25 ammunition is used to develop or modify surface danger area diagrams.

(1) Using ballistic characteristics combined with knowledge of the fire control system allows the crews to use the LAV-25 weapons more effectively. (See table 10-1 for an extract of a ballistic firing table; FT 25-A-2, *Firing Tables for Cannon, 25mm Gun, M242*).

(2) The following terms explain the data in all gunnery firing tables. Data columns may differ slightly among various rounds of ammunition and types of weapons.

(a) **Range.** Weapon-to-target distance.

(b) **Superelevation.** To ensure that the projectile hits a target at a given range, induce into the fire control system additional elevation to raise the ballistic flight of a given projectile.

Table 10-1. Extract of Ballistic Firing Table.

CARTRIDGE, APDS-T M791
M/S

MUZZLE VELOCITY, 1345

RANGE METERS	SUPERELEVATION MILS	DX/DSE M/MIL	DH/DX M/100M	DRIFT MILS	TIME OF FLIGHT SECONDS
1600	5.1	262	0.6	0.1	1.3
1700	5.5	257	0.6	0.1	1.4
1800	5.9	252	0.7	0.1	1.5
1900	6.3	246	0.7	0.1	1.6

CARTRIDGE, APDS-T M791
M/S

MUZZLE VELOCITY, 1345

10KM/H CROSS WIND DEFLECTION MILS	MAXIMUM ORDINATE METERS	RANGE TO MAXIMUM ORDINATE METERS	ANGLE OF FALL MILS	REMAINING VELOCITY METERS/SECONDS	RANGE METERS
0.2	0.9	564	4	1159	1100
0.2	1.1	617	4	1143	1200
0.2	1.4	669	5	1126	1300
0.2	1.6	723	5	1109	1400

(c) **DX/DSE.** The number of meters a 1-mil elevation change makes in linear range, on the ground, at a given range and superelevation.

(d) **DH/DX.** The change in height (in meters) of a projectile for a 100-meter change in linear range or on the ground at a given range.

(e) **Drift.** The number of mils the projectile moves to the right of the gun-target line because of the spin caused by the rifling.

(f) **Time of Flight.** The amount of time it takes a projectile to reach a target at a selected range.

(g) **10 km/h Cross Wind Deflection.** Generally, a round is most unstable when it exits the muzzle. This effect of wind deflection assumes a 10 km/h cross wind. The correction is applied into the wind. When wind speed is different from 10 km/h, 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 always occurs shortly beyond half the target range.

(j) **Angle of Fall.** The number of mils 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 Diagram

LAV-25 units establishing ranges or modifying existing ranges must submit a surface danger area diagram to the range control officer before firing. Surface danger area diagrams show range boundaries and safety features in overlay form,

including range limit markers for firing positions. FT 25-A-2, *Firing Tables for Cannon, 25mm Gun, M242* provides values for range, maximum ordinates, and superelevation for each ammunition type required to construct a surface danger area diagram. (See fig. 10-1.)

(1) Surface danger area diagrams on established ranges should be modified when these ranges do not make maximum use of available terrain. Restrictions and precautions for surface danger area diagrams are found in AR 385-63, *Policies and Procedures for Firing Ammunition for Training*,

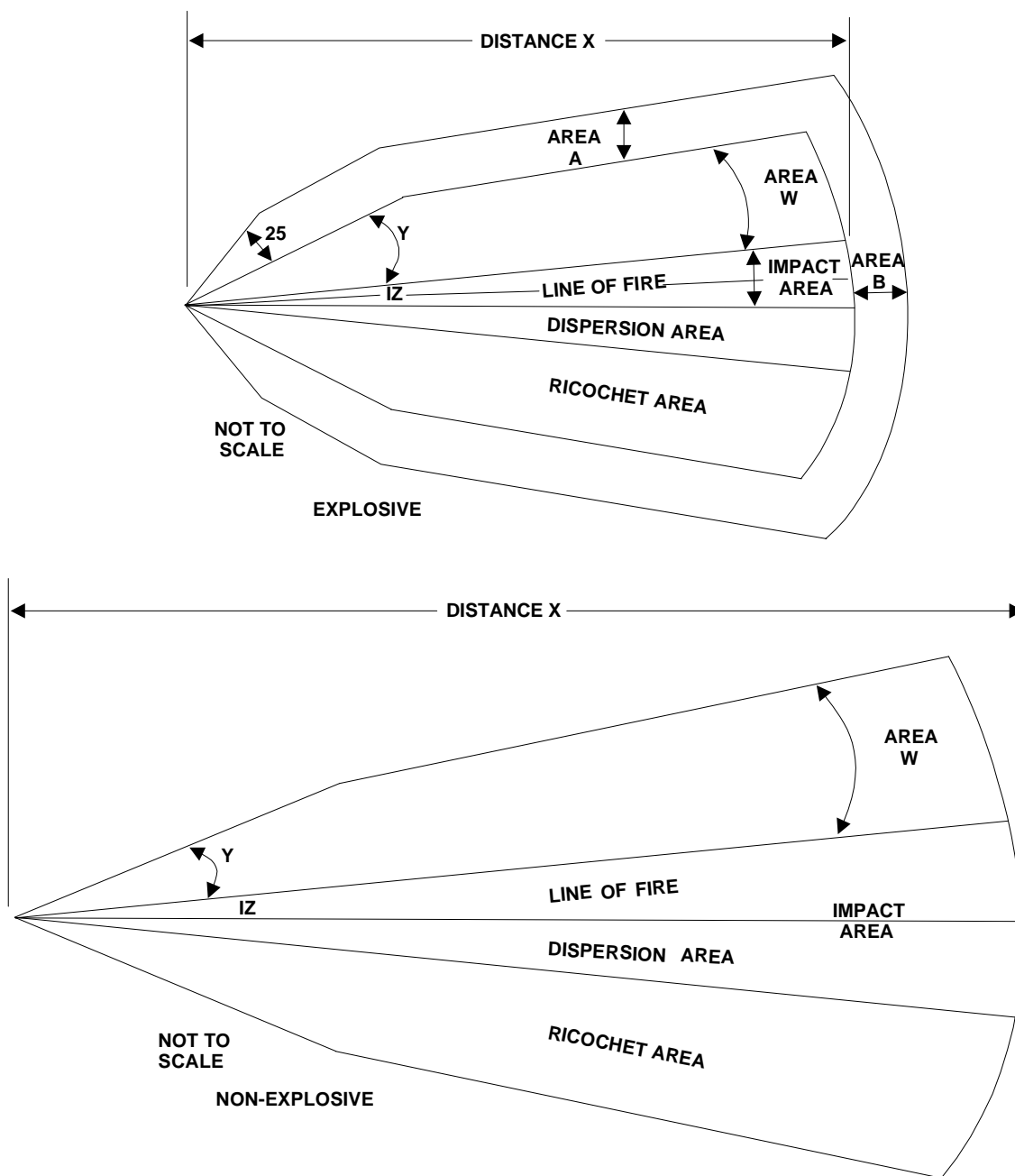


Figure 10-1. Range Safety Fans for Explosive and Non-Explosive 25mm Ammunition.

Target Practice and Combat. When engaging ground targets, distance **X** (maximum range) may be reduced to a 15-degree elevation, provided the firing elevation of the gun can be maintained at less than or equal to 15 degrees. (See table 10-2.) 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 an elevation of 15 degrees or less. This value was derived using data from the ballistic firing tables and ricochet data.

(2) When laser range finders (LRFs) are used, an additional buffer area (C) may be added. (See AR 385-63, chapter 19 and SPAWARINST 5100.12.) Every object the laser beam strikes reflects energy. In most cases, this energy is diffused and is not hazardous. Remove mirrors, plastic or glass, or other flat mirror-like objects with a vertical or near vertical surface in the target area that might reflect the laser beam and cause injury. If this is impractical, cover the surface with lusterless paint or some non-reflecting material, such as cloth or cardboard.

(3) In all cases, research range establishment requirements with the base or facility range control personnel.

10002. Range and Training Area Reconnaissance

The range officer in charge (OIC) of firing, master gunner, and company gunnery sergeant should personally conduct a reconnaissance and coordinate with range control before their unit occupies a range or training area. It is not possible to list everything checked during a reconnaissance, but the following questions may be considered as a minimum:

- Where are the routes to the range or training area?
- How many vehicles can fire stationary or moving course simultaneously?
- Are there hull-down 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 the day, reduced visibility, and night firing?
- What barriers and guard posts need to be closed and/or manned?
- Are surveyed boresight panels available?
- Who furnishes the targets, target supplies, and/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.
 - Head.
 - Briefing and debriefing areas.
 - Tower.

10003. Range and Training Area Personnel, Equipment, and Layout

Effectively planned and executed tactical exercises allow progressive training and proper unit evaluation. Administrative requirements for successfully planning and executing tactical training are found in AR 385-63, local range regulations, and unit SOPs. A range book that contains all the applicable regulations and reference materials (e.g., range schedules, firing tables, gunnery tables, maps, and range logs) is an invaluable tool that the OIC of firing can use to achieve efficient range operation.

Table 10-2. Data for 25mm Ammunition.

DIMENSIONS FOR M793, TP-T, 25MM

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 ³	19 5	6047	4792	5112
Water	NA	NA	1047	19 5	6047	4823	5112

DIMENSIONS FOR M791, APDS-T, 25MM

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	14572	7294	11550
Concrete	NA	NA	2208	34 5	14572	7622	11550
Earth	NA	NA	1466	18 5	14572	7402	11550
Water	NA	NA	263	6 5	14572	5665	11550

DIMENSIONS FOR M792, HEI-T, 25MM

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

¹Distance **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. For armor impact medium, use whichever distance is greater (ricochet range or 15-degree elevation range). When firing on the move over rough terrain, use distance **X**.

²When 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.

³Values listed for area **W**, angle **Y**, and ricochet range are the same as listed in the dimension for M792 since the M792 HEI-T projectile is ballistically similar to the M793, TP-T projectile.

a. Key Personnel and Responsibilities

The following personnel are key to the conduct of live fire range training.

(1) Officer in Charge of Firing. The OIC of firing has overall responsibility for conducting training safely and using facilities properly. The OIC of firing should appoint a range safety officer (RSO), when required, who—

- Helps perform safety responsibilities.
- Determines when it is safe to fire.
- Supervises the procedures for misfires, hangfires, and cookoffs.
- Ensures that required communications are established and maintained.

The OIC of firing can also designate other assistants who are responsible for specific areas of operation.

(2) Range Safety Officer. The RSO is a commissioned officer, warrant officer, or senior non-commissioned officer (SNCO) (E-6 or higher) who is weapons systems qualified. The RSO is the OIC of firing's direct representative. The RSO will not have any other responsibility during range firing other than performing the following duties:

- Conducts a safety briefing to all hands before all live fire exercises.
- Enforces all safety regulations.
- Ensures that all ammunition is handled correctly.
- Enforces smoking restrictions near vehicles, ammunition, petroleum, oil, and lubricants.
- Ensures that misfires are handled in accordance with 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 towards the impact area at all times.
- Ensures that personnel are clear of the danger area (except as authorized in AR 385-63 or applicable regulations).

- Checks all ammunition for suspended or restricted lots using TB 9-1300-385, *Munitions, Restricted or Suspended*.
- Ensures that barriers and guards are in place before starting the exercise.
- Checks for proper identification and qualifications and ensures transportation of medical personnel, if used or required.
- Inspects and clears all weapons following the completion of fire.

(3) Master Gunner. The master gunner is the commander's gunnery technical advisor. The master gunner assists the commander and the staff in planning, developing, and conducting gunnery training. The master gunner's range duties include—

- Preparing a surface danger area diagram and range overlay, if required.
- Preparing scaled ranges if required.
- Organizing and setting up range firing exercises.
- Ensuring that range firing exercises are properly conducted.
- Coordinating target array and layout for range firing and qualification.
- Establishing remedial training on site as needed, by coordinating with the LCEs and platoon sergeants to identify crew deficiencies.
- Ensuring that an effective LAV-25 crew evaluator program is implemented for standardization.

(4) Company Gunnery Sergeant. The company gunnery sergeant coordinates and supervises the various details and assists the OIC of firing and the RSO in operating the range or training area.

(5) Ammunition NCO. The ammunition non-commissioned officer (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 (verifies with RSO and TB 9-1300-385).
- Issues the correct type and number of rounds (as instructed by the master gunner) and keeps a running inventory to cross-check daily expenditures turned in to the RSO.
- Ensures that the ammunition pad is maintained in an orderly fashion and continually policed of links, brass, and packaging materials.

(6) Target NCO. Where target NCOs are required, their duties are to—

- Ensure that targets are the type, color, and scale (if applicable) required by the table.
- Ensure that targets are in the proper location on the range.
- Ensure that target detail is proficient in the operation and troubleshooting procedures for all target mechanisms used.
- Ensure that the target detail has the required equipment and supplies and that prepositioned targets are available when needed.
- Ensure that there are enough spare targets, target mechanisms, batteries, patches, and other related equipment on the range or training site to support training.
- Report to the master gunner any mechanical malfunctions that require prompt replacement to continue firing.
- Ensure targets are properly thermalized as required in accordance with TC 25-8, *Training Ranges*.

(7) LAV-25 Crew Evaluator. The LCE—

- Enforces required safety precautions.
- Acts as an instructor during practice and remedial training.
- Acts as an evaluator during qualification.
- Debriefs crew at completion of firing.
- Confers with the master gunner on any scoring discrepancy.

- Maintains a log containing records of crew performances.

(8) Fire-Fighting Detail. When a fire fighting detail is needed, the following points should be considered:

- Determine if range regulations allow for military personnel to fight fires that occur within the impact area.
- Availability of fire-fighting equipment.
- Designated vehicles for troops and equipment.
- Access routes to the impact or target areas.

(9) Corpsman. The corpsman must—

- Be assigned a safety vehicle and driver.
- Know how to get to the nearest aid station or hospital.
- Know radio telephone operating procedures to use during an air medical evacuation.
- Have an identification card (medical) or a disposition form from the commander stating that he is a qualified corpsman.
- Be properly equipped for emergencies.

(10) Radio Telephone Operators. These radio or telephone operators maintain communications as required during an exercise.

(11) Platoon Sergeant. The platoon sergeant's duties include, but are not limited to, the following:

- Ensuring that turret and gun preventative maintenance checks and services have been performed prior to occupying the range.
- Ensuring that pre-dry fire and dry fire checks have been done before occupying the range.
- Supervising the LAV-25 crews to ensure that proper boresighting and zeroing are accomplished to standard.
- Coordinating with the master gunner on the conduct of fire.

- Ensuring that vehicles are staged at the required places at the appropriate times and are ready to fire when required.
- Reviewing the platoon records to ensure that the guns are capable of firing; i.e., round count will not inhibit firing because of service life wear.

b. Range Equipment

The master gunner and company gunnery sergeant should make sure that the required equipment is on hand for the following exercises.

(1) 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.
- Recovery means.
- Evaluator communications.
- Briefing tent.
- Scorecards.
- Stopwatches.
- Binoculars.
- Night vision devices with batteries.
- Field telephones, as required.
- Fire-fighting equipment (if required).
- Vehicles for—
 - Target and scoring detail.
 - Fire-fighting detail (if required).
 - Backup aid vehicle.
 - Safety officers (moving range).
- Generators to power light sets.
- Equipment for concurrent training.
- Boresight equipment.
- Other table of equipment (TE) and expendable supplies.

- All other required regulations, SOPs, maps, and overlays.
- FM radio sets and antenna GRC-292, if required.

(2) Gunnery Exercises

- Range flag.
- Range lights or lanterns.
- Flag sets for vehicles and tower.
- Compass for marking round(s) out of impact area.
- Ballistic firing tables.

(3) Tactical Exercises

- Multiple integrated laser equipment system (MILES) equipment.
- Opposing force (OPFOR) equipment.
- OPFOR personnel.

c. Range and Training Area Layout for Gunnery Exercises

A well-organized gunnery range provides maximum firing and training time. If ranges are planned and organized and all items are collected before moving to the range, firing can commence on time and terminate in ample time to allow an orderly range clearance. (See fig. 10-2.)

(1) A battalion-level range operation SOP saves time and energy for the firing unit. Company master gunners may extract any necessary information from the battalion SOP that pertains to range operations at the company level. The SOP should include guidelines for occupying the range and describe actions to be taken for hand-over of specific tasks, such as the following:

- Coordinating with maintenance contact teams.
- Operating moving targets.
- Replacing targets.
- Repairing target mechanisms.
- Fighting range fires (if applicable).
- Determining range scenario.
- Conducting range brief/range safety brief.

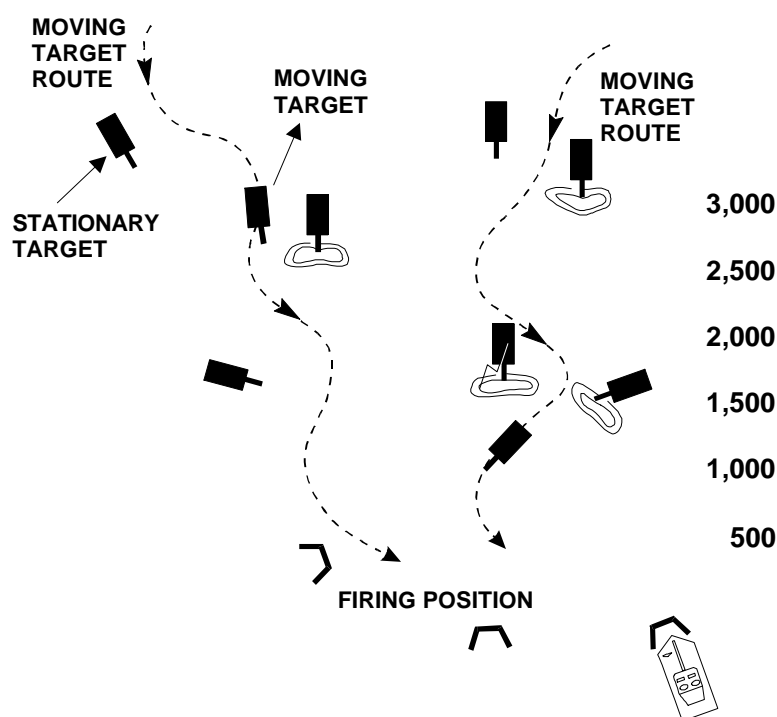


Figure 10-2. Sample Layout of an LAV-25 Stationary Firing Range.

- Firing orders.
- Policing the range.
- Departing the range.
- Breaking down ammunition.
- Moving vehicles to the ammunition point and to the ready line.

(2) Moving ranges have a maneuver box not found on stationary ranges. (See fig. 10-3.) If course roads are available within the training area, they should be used. The vehicle commander should also use available terrain for masking the vehicle's position. Master gunners frequently have to modify maneuver boxes based on what type of engagement is fired. 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. The maximum distance the vehicle could travel and still have the target exposed is the length of the maneuver box. Maneuver boxes must be clearly defined and adhered to (start and stop points). This area never extends or surpasses the exposure and engagement times because surface danger

area diagrams correspond to exact maneuver box length.

(3) To calculate the maneuver box length, the average vehicle speed for the course and target exposure time must be known. The calculation procedure is shown in the following example:

Vehicle Speed: 12 miles per hour
Target Exposure: 42 seconds

Convert the vehicle speed to meters per second (multiply the vehicle speed by the constant 0.4471416):

$$12 \text{ (miles per hour)} \times 0.4471416 = 5.3656992 \text{ (meters per second)}$$

Calculate the maneuver box length (multiply the meters per second by the target exposure):

$$5.3656992 \times 42 \text{ (target exposure in seconds)} = 225.35936 \text{ meters}$$

The maneuver box length is **225 meters**.

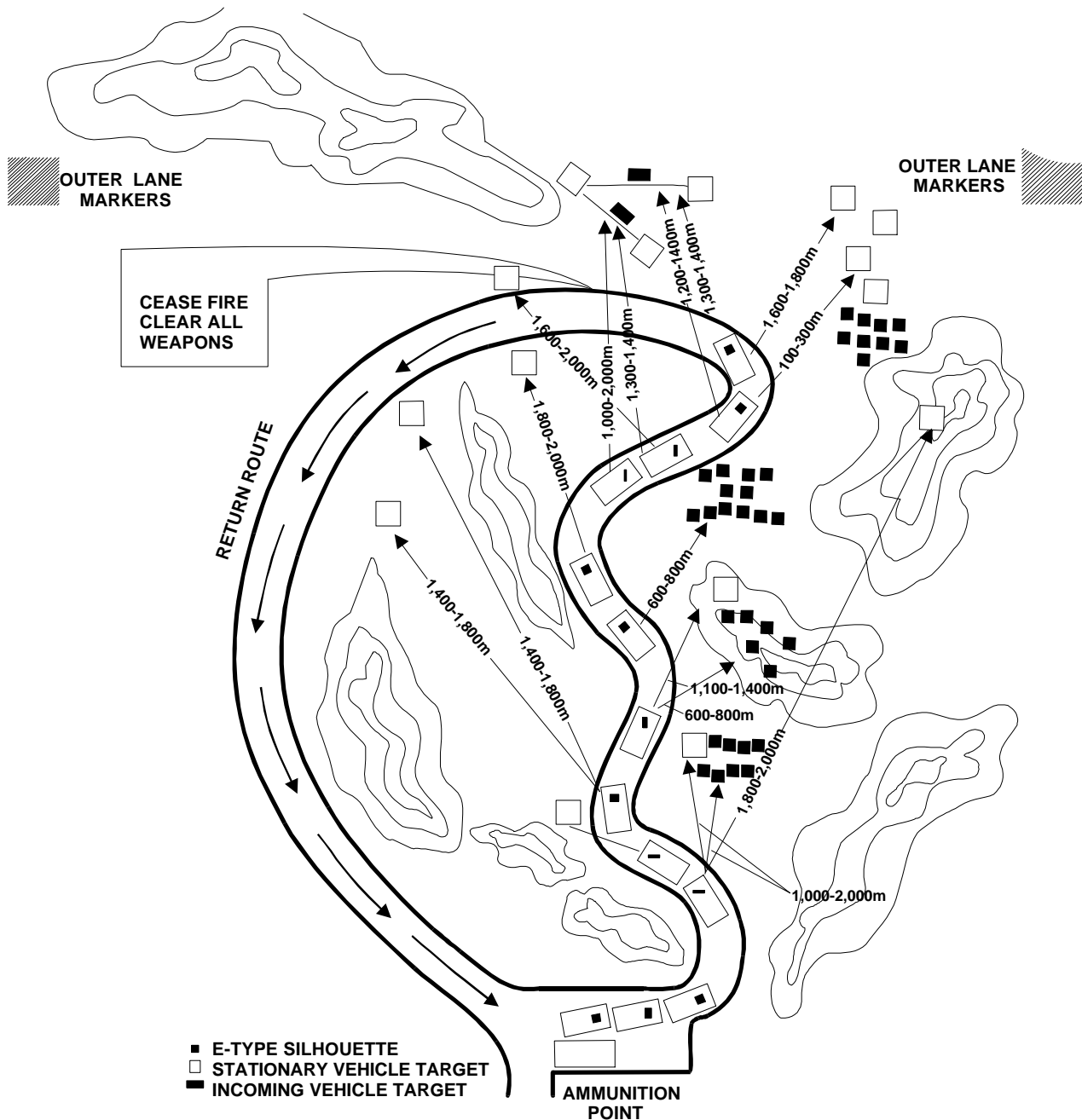


Figure 10-3. Sample Layout of an LAV-25 Moving Range.

Note: If the first number after the decimal point is 5 or more, round up to the next whole number.

d. Range and Training Area Layout for Tactical Training

Tactical training can be 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 fitted to a specific piece of terrain, so tasks will probably not be encountered in the order in which they appear in a particular table.

(2) As in gunnery tables, tactical tables need a range operation SOP that saves 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 the maintenance contact team (for MILES devices).
- Testing MILES equipment.
- Setting up a 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 and 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 following each engagement and assembling LAV-25 crews (resetting MILES equipment).
- Controlling movement on the course to prevent the congestion of LAV-25s 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 25mm service ammunition. Old tank hulls and turrets, APCs, 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.

f. Flags

On all ranges, each vehicle displays flags to visually indicate the vehicle's weapon status. The following flags will be used:

(1) Red. LAV-25 is engaging in firing. Weapons are loaded, pointing at the target area. Weapon arm switch is on fire and manual safety is off.

(2) Green. All weapons are cleared and elevated. Weapon arm switch is on safe and manual safety is off. There is no ammunition onboard the vehicle.

(3) Yellow and Red (or Green). Yellow indicates there is a malfunction on the vehicle. This flag is used in conjunction with the red or green flag to specify more information.

(a) Yellow and Red. The LAV-25 has a malfunction or misfire. Weapons are pointing at the target area and are not clear, or ammunition is on board. (The weapon arm switch is on safe and manual safety is on; if not, notify range safety personnel.)

(b) Yellow and Green. The LAV-25 has a malfunction and all weapons are clear. The weapon arm switch is on safe and manual safety is on. There is no ammunition onboard.

(4) Red and Green. The LAV-25 is preparing to fire or the crew is conducting a nonfiring exercise. The 25mm gun feeder may be loaded but the bolt is in the sear position, and the weapon arm switch is on safe and manual safety is on. The coax machine gun may be loaded, bolt to the rear, and manual safety on. Ammunition is either stowed onboard or loaded in the ready boxes.

g. Range Control

The range control officer is responsible for the coordination and safe conduct of range activity for all units using range facilities. Normally, unit leaders are required to receive a range briefing from the range control officer before occupying a range. Schedule this briefing 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 normally 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.

The OIC of firing controls all training activities, including firing, on that particular range by the best means available and always has a backup system.

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 of firing plans a backup communication system to prevent delay.

10004. Range Operations

A plan must be developed for conducting LAV-25 combat training. This plan usually varies with the tables to be trained. The plan should reflect consideration of the following areas.

a. Assets

Training can be conducted either by battalion or by company.

(1) Battalion Training. 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 Training. The company signs for, administers, and clears the range or training area. The company provides the necessary support in details, RSO, range guards, and administrative personnel.

b. Opening the Range or Occupying the Training Site (Sequence of Events)

Key personnel perform the following tasks:

(1) The OIC of firing—

- Moves to the range or training site before the unit arrives.
- Checks communications and, for live fire exercises, ensures that backup communications are available.
- Briefs the RSO, evaluators, and units to be trained.
- Ensures that range equipment is present and operational.
- Ensures that the correct range or firing position is occupied.
- Ensures that the impact area is clear of unauthorized personnel and that safety measures directed by the installation commander have been taken (use of barriers to deny access into the impact area and positioning of road guards).
- Ensures that clearance to fire has been obtained from range control.
- Ensures personal awareness of the surface danger zone for each ammunition and each firing position.

(2) The company gunnery sergeant—

- Sets up additional training areas.
- Supervises ammunition, targets, and administrative details.

(3) The RSO—

- Ensures that barriers are closed and/or range guards are posted and briefed of their duties.
- Ensures that no live ammunition is present on a nonfiring range.
- Inspects storage, handling, and lot number for restricted or suspended ammunition.
- Inspects corpsmen and vehicles.
- Gives safety briefing to everyone before all live-fire exercises.
- Ensures personal awareness of the surface danger zone for each ammunition and each firing position.

(4) The master gunner—

- Gives final briefing to the LCEs.
- Ensures that the concurrent training is set up properly.
- Moves to the range or training site before the firing unit.
- Briefs the OIC of firing and RSO on the surface danger zone for each ammunition and each firing position.
- Briefs the unit on the conduct of fire, and the tasks, conditions, and standards for each firing evolution.

c. During the Exercise

The following actions must be performed:

(1) The OIC of firing—

- Maintains all required communication.
- Ensures that personnel do not move to or from the small-arms or crew-served range firing lines without permission from the OIC of firing or RSO.
- Ensures that materiel is not removed from the firing line without permission from the OIC of firing or RSO.
- Monitors the surface danger zone to ensure that it remains clear.
- Ensures impact area observation to assure projectiles land within prescribed limits.
- Ensures misfires are handled in accordance with procedures established for the weapon.
- Ensures weapons are cleared and checked during temporary suspensions of firing.
- Maintains records (type of ammunition fired, number of rounds fired, number of duds with approximate locations).
- Ensures firing is promptly halted when an unsafe act is observed or reported.

(2) The company gunnery sergeant—

- Supervises all work details.

- Controls the movement of personnel from firing positions to additional training and other administrative areas.

(3) The RSO—

- Ensures that misfires are handled in accordance with safety regulations.
- Observes for any safety violation.
- Clears each LAV-25 upon completion of exercise.
- Ensures all vehicle firing status flags are displayed as per paragraph 10003f.

(4) The master gunner—

- Ensures that range firing is conducted in accordance with the appropriate gunnery table.
- Ensures remedial training is conducted by LCEs on site as needed.
- Ensures that correct zeroing is accomplished.
- Supervises the LCEs.
- Assists safety personnel to clear weapons, when required.
- Assists maintenance personnel to troubleshoot and correct fire control malfunctions, when required.
- Assists the commander to determine or verify alibi conditions.

d. Closing the Range

The following tasks must be performed.

(1) The OIC of firing —

- 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.
- Ensures all weapons are cleared. (The vehicle commanders will clear their weapons and the RSO will check them.)

- Reports the number of duds and their approximate location in accordance with local procedures.

(2) The RSO—

- Checks each vehicle or weapon system to ensure it is cleared.
- Ensures all firing status flags are displayed as per paragraph 10003f.
- Gives OIC of firing an ammunition expenditure report.

(3) The master gunner—

- Coordinates with range personnel for repair of any targets or equipment.
- Gathers appropriate computer and scoring data.
- Debriefs the LCEs.
- Debriefs the unit leaders.

(4) The ammunition NCOIC—

- Gives an ammunition expenditure report to the RSO.
- Ensures that no munitions are removed from the range by anyone other than authorized personnel.
- Ensures that all unexpended ammunition is accounted for and staged for pickup by ammunition personnel.
- Accounts for all misfires or duds and ensures turn in to ammunition personnel.

e. Tips for Training on the Range

The following tips are given for conducting training on the range.

(1) Brief Key Personnel. Before moving to the training site, brief key personnel in setting up the site and in reacting to unusual circumstances. This keeps downtime to a minimum and prevents wasting time and resources.

(2) Start on Time. Have the training site ready and communications set up early so that crews

can begin firing on time. Plan operations so that there are no interruptions to training for course maintenance until a prearranged time or normal shutdown time, which is posted in the range daily bulletin. This means there must be sufficient targets available to complete all training before the scheduled break.

(3) Use Range Marker Lights (Live Fire). Do not fire 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, consider placing two lights on each range safety marker, ensuring that a backup light is available. Make sure that lights are in good operating condition and batteries are fresh.

(4) Plan Illumination. Register weapons providing indirect illumination before dark. For ease of control and reduction of support requirements, locate indirect-fire weapons on the same range with firing vehicles (ammunition pads, OIC of firing, safety officers, transportation, and communications).

(5) Keep a Log. The OIC of firing maintains an accurate log. A log keeps the OIC of firing better informed of dry-firing times, live firing times, and other important events. At a minimum, the log should contain—

- When the unit occupied the range or training site.
- When permission to fire was received from range control for live fire.
- Who gave the permission to fire.
- When the range was in a cease-fire status.
- When the range was reopened.
- Compass azimuth to any stray impacts and when they were fired.
- When the unit cleared and departed the range.

(6) Brief Guards. Have a plan to check and change guards frequently. Also, make sure that the guards are briefed on their duties and their importance and ensure that they understand their instructions.

(7) Be Prepared for Fires. During dry seasons, there is always a danger that tracer illumination may cause grass and forest fires. Be prepared to quickly control the situation. It may be necessary to reduce the number of tracer rounds in linked ammunition, if allowed.

(8) Police the Area. Keep the area policed at all times. A clean training site reduces the chance of injury, especially at night. Police continuously to avoid spending valuable time cleaning up after firing.

(9) Brief Visitors. Have a plan for briefing visitors and designate a briefing NCO or officer. Brief visitors before escorting them to the primary training site. Ensure appropriate safety equipment is available for their use.

(10) Check Safety Markers. Make sure that range safety markers are present before any live firing begins; if light markers are used, check operations before darkness.

(11) Coordinate for Munitions. Coordinate with the support elements responsible 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. Be sure 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. Stress 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.
- Immediate action for the weapons system.
- Remedial action for the weapons systems.
- Armor identification.
- Maintenance of vehicles and weapons.

(13) Recovery Vehicle. Quickly remove disabled vehicles from the course to prevent loss of training time. A manned recovery vehicle must be in position to support the unit at all times.

(14) Opposing Forces Personnel. Brief OPFOR personnel on the role that they will play in the tactical training. Ensure that they know what to do and when to do it. Stress that their actions must be the same for each unit going through the course to provide consistent results.

(15) Maintenance. Have maintenance personnel on site to correct any sight, gun, or vehicle malfunctions as they occur.

(16) Support the Trainers. Ensure that the primary personnel responsible for the conduct of fires and the training of the unit are able to perform their duties and get the support they need.

Chapter 11

Scaled Ranges

Preparing and using scaled ranges requires only minor changes to the procedures used to conduct full caliber firing. Scaled firing helps to prepare crews and platoons for full caliber firing and qualification. It also allows units to train themselves in range operations during home-station training. (See fig. 11-1.)

The rising cost of ammunition, fuel, and spare parts makes it difficult to produce and maintain skilled LAV-25 crews, sections, and platoons. To minimize the cost, more gunnery training must be accomplished at the unit's home station, using subcaliber training devices and innovative training techniques. This chapter provides guidelines on

the uses and types of scaled ranges and the target types and mechanisms that may be encountered.

11001. Uses

The commander chooses the range scale that best suits the training needs and the facilities available. Using scaled ranges, units can realistically simulate day and night firing by single vehicles, sections, and platoons against single, multiple, stationary, and moving targets. Actual machine gun engagements can be incorporated where a unit has enough space for the larger range safety zones required for the machine gun. Targets representing friendly equipment can be placed in the

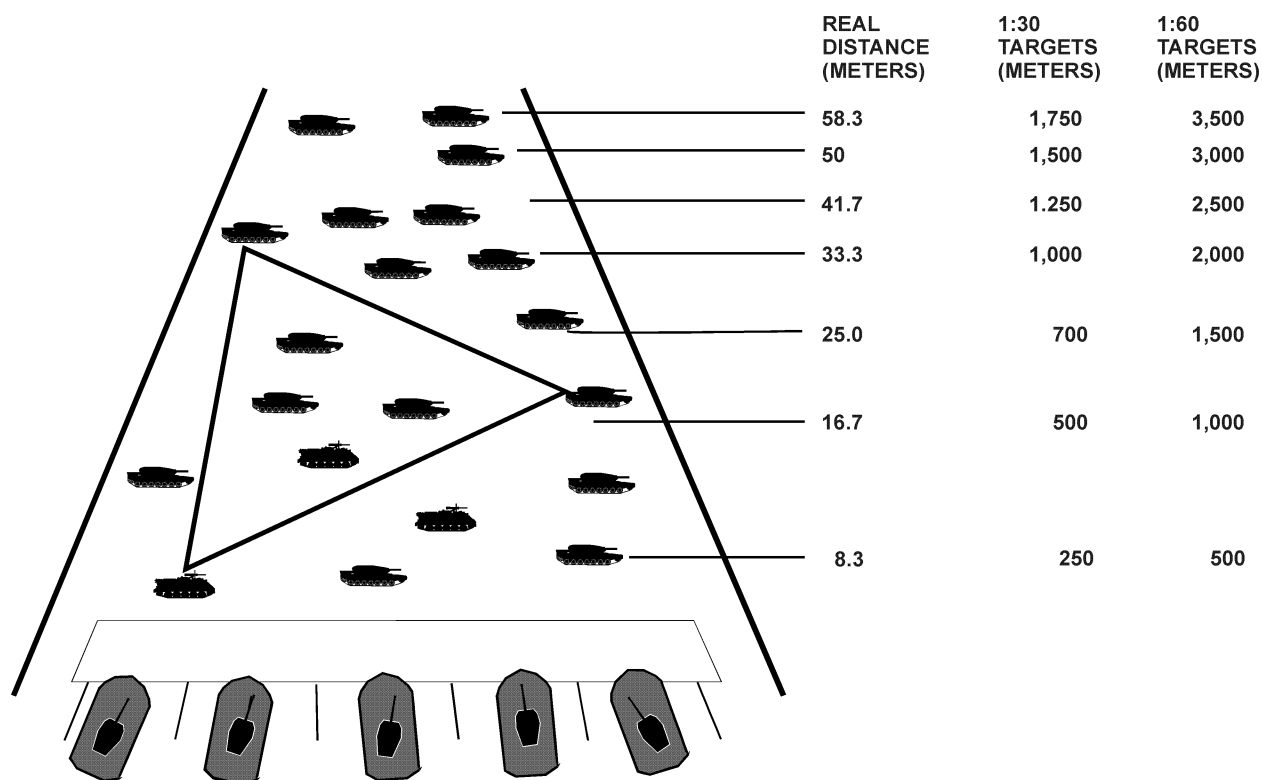


Figure 11-1. Scaled Ranges (1/30 to 1/60).

target area to give the crew practice in distinguishing friend or foe. For overseas units, terrain and target arrays can be set up to resemble the anticipated threat targets and the actual terrain in front of prepared battle positions.

The crew moves down the course, engaging a series of targets. (See fig. 11-2.) Stabilized LAV-25s move at normal speeds during engagements. Although all targets are within battlesight range of the subcaliber device, precision and battlesight gunnery techniques should be practiced on the half-scale range. When using a stadia reticle on half-scale targets, first-round-hit probability may be degraded, thereby placing a heavier emphasis on the adjustment of a subsequent round. The crew should also run the course at night, using available illumination (passive, flare, infrared, or white light).

The three types of LAV-25 scaled ranges are small-scale, stationary; small-scale, moving ; and half-scale, stationary or moving.

11002. Small-Scale (1/60 or 1/30, Stationary LAV-25)

This type range is used for stationary single squad, section, and platoon firing exercises. The scale chosen (1/60 or 1/30) depends on the area available. Ideally, these ranges are basically large sand tables and, as such, offer the best possibility for deployed units to set up target arrays that resemble those expected in actual battle positions. Until sand-tablelike ranges can be constructed, any surface can be used if berms are available for safety.

The size of the range depends on the area available and the caliber of the device used. The size of the required impact area can be reduced by adding berms.

Impact targets, with appropriate mechanisms of the desired scale (targets), are emplaced on the scaled range to present challenging engagement exercises. Targets representing friendly equipment may be placed in the target area to give the crew practice in target identification. See the combat range versus scaled ranges chart (table 11-1) for

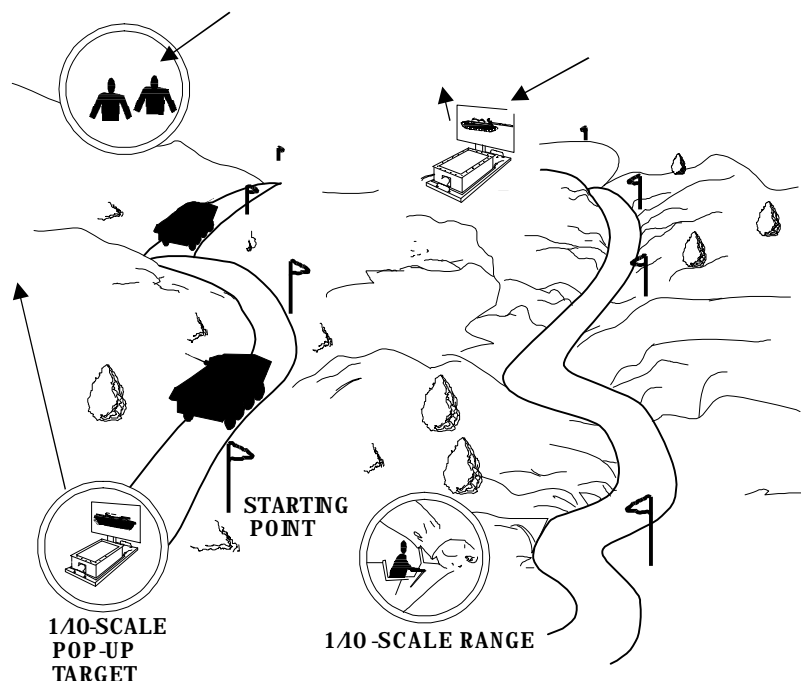


Figure 11-2. 1/10-Scale (Dry Fire) Range.

proper target emplacement distances. Appropriate scaled objects (roads, buildings, vegetation, and terrain features) add realism to the target area.

Table 11-1. Combat Range Versus Scaled Ranges Chart.

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	65	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
1000	500	660	100	165	110	94	55
1100	550	724	110	181	120	103	60
1200	600	792	120	198	131	113	66
1300	650	856	130	214	142	122	71
1400	700	924	140	231	154	132	77
1500	750	990	150	247	164	141	82
1600	800	1060	160	264	176	150	88
1700	850	1120	170	280	186	160	93
1800	900	1192	180	297	198	169	99
1900	950	1256	190	313	208	179	104
2000	1000	1320	200	330	220	188	110
2100	1050	1388	210	346	230	198	115
2200	1100	1450	220	363	242	207	121
2300	1150	1520	230	379	250	216	126
2400	1200	1588	240	396	264	226	132
2500	1250	1650	250	412	274	235	137
2600	1300	1720	260	429	286	245	143
2700	1350	1780	270	445	296	254	148
2800	1400	1850	280	462	308	264	154
2900	1450	1915	290	478	318	273	159
3000	1500	1980	300	495	330	282	165

11003. Small-Scale (1/10), Moving LAV-25

A moving LAV-25 range requires a larger area than a stationary LAV-25 range. The 1/30-scale range can be used for stationary gunnery. However, the scale is so small that the terrain changes too quickly for a moving LAV-25 to adequately use proper adjustment techniques. For example, in a course run simulating 1,200 meters on a 1/30-scale range, a moving LAV-25 traverses only 113 feet. An LAV-25 moving at 3 miles per hour travels this distance in 27 seconds. Therefore, the suggested scale is 1/10. The exact configuration of the 1/10-scale range varies depending on range area and type of terrain. Master gunners must be adept at configuring the scaled ranges by taking into account all factors, i.e., vehicle speed, size of maneuver boxes, target exposure time, and depth of range, as they relate to the scale.

Determining range size depends on the type of subcaliber device used and whether machine gun engagements are incorporated into the training.

This range can be easily constructed on an existing small-arms or machine gun range. Direction of LAV-25 movement can be parallel to the firing line or through the impact area, depending on the size and shape of the existing range.

Simulated 25mm gun impact targets with appropriate target mechanisms are emplaced within the distance constraints of the scaled ranges. Space permitting, coax machine gun targets can be emplaced among simulated 25mm gun-scaled targets. Markers indicate the simulated 25mm gun engagement positions along the route the LAV-25 will travel. These are necessary so that the desired scaled target range is retained when firing.

From marked firing locations, the LAV-25 moving along a designated route engages a series of activated main gun targets (and machine gun targets, if incorporated). Stabilized LAV-25s keep moving during engagements; however, their speed is considerably slower than normal because of the short distances between targets. Crew duties for battlesight engagements should be practiced.

Night firing and battlefield obscuration can be accomplished as in the stationary scaled course.

Note: Precision engagement skills cannot be evaluated on a small-scale, moving LAV-25 range because of the flat trajectory, at short distances, for subcaliber rounds. However, precision aiming skills can be evaluated if the evaluator uses a variation of the point of aim method. (See chap. 7.)

11004. Half-Scale

Half-scale ranges are used for stationary or moving LAV-25 exercises. More realistic training can be conducted on half-scale ranges than on the smaller scale ranges. Ranging to the target can be practiced using the reticle stadia lines because of extended LAV-25-to-target ranges.

The length of the range depends on the size of the area available, the subcaliber device used, and whether machine gun engagements are to be used. Refer to table 11-2 for length of impact area required based on type of subcaliber device used. (Impact area size may be waived to a lesser distance with the addition of berms. Approval for this reduction may be granted by local range control authority.)

Once a subcaliber device is chosen, the course can be set up to resemble any combat course. Full-size

Table 11-2. Range Size Determination.

CALIBER	DEVICE	IMPACT AREA METERS
.22 cal. long rifle	Rimfire	1400
5.56mm rifle	LAV-25 subcaliber device	3600
7.62mm coax		4800

targets are placed beyond the device firing range to give the crew practice in ranging to long-range targets. Moving targets can also be used. It must be noted that when converting an area into a subcaliber range, an appropriate surface danger area diagram must be prepared and submitted to the local range control officer for approval.

11005. Target Types

The targets and the activating mechanisms to be used on the scaled ranges for subcaliber tables are as follows:

Sample targets for subcaliber scaled ranges can be mounted on an “E” type silhouette. (See fig. 11-3.) Table 3 subcaliber targets can be mounted on a moving panel. (See fig. 11-4.) These targets can be placed on various silhouettes for use with subcaliber devices such as the .22 caliber device.

The scaled impact target is available in scales of 1/60, 1/30, and 1/10. (See fig. 11-5.) The target is mounted in a stationary scaled pop-up target mechanism. The target, a two-dimensional silhouette made from plastic, is easily replaced when destroyed. Targets are available in an assortment of threat vehicle silhouettes as well as some friendly equipment silhouettes, for target identification practice.

11006. Small-Scale Target Mechanisms

The following types of mechanisms are for use with small-scale targets.

Moving Targets and Scaled Molded Rubber Targets

This target mechanism is used on the 1/60- and 1/10-scaled ranges. (See fig. 11-6.) It can be fabricated locally. (See TC 25-8, *Training Ranges*.) Targets for use with this mechanism can be obtained locally.

Stationary Targets

This device is a wire-operated target mechanism for popping up 1/60-, 1/30-, and 1/10-scale impact targets powered by any 24-volt electrical source. (See fig. 11-7.) When the target is struck by an impact weapon, the target falls. The mechanism comes with wire attached to the control box (or for 1/60- and 1/30-scale targets through a junction box). The wire and the target mechanism are buried in sand or in the ground to protect them from projectile impact. When not in use, the

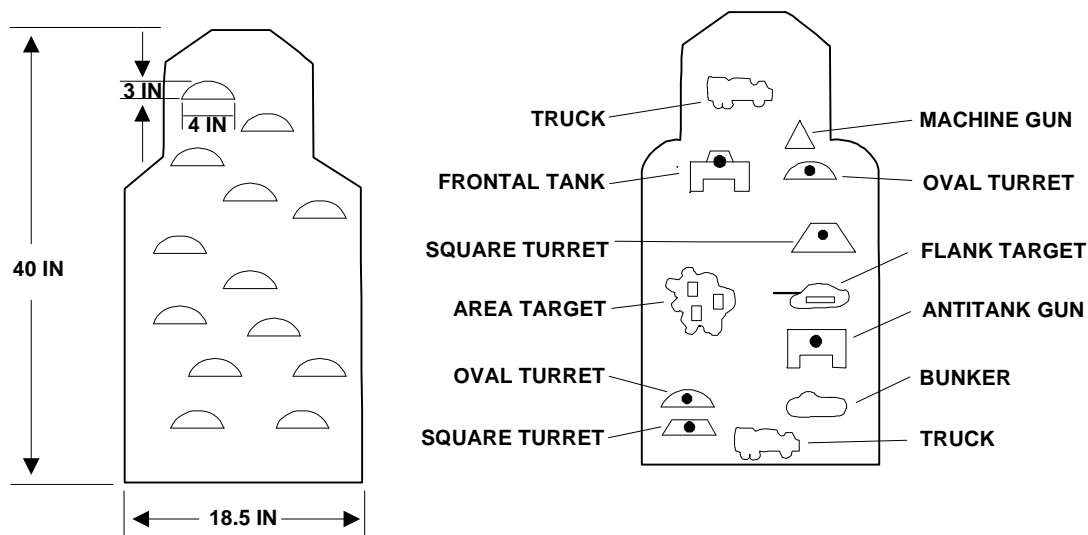


Figure 11-3. Sample Targets on “E” Silhouettes.

mechanism should be removed or covered to protect it from the weather. Quick-connect plugs are used for easy removal. (See TC 25-8.)

M31A1 Target-Holding Mechanism for Stationary Targets

The M31A1 target-holding mechanism is used with popping up impact targets of 1/20 scale. (See fig. 11-7.) This device is normally operated on 110-volt alternating current.

This device is normally used with “E” type silhouette or other similar infantry type targets. It can be modified for use with properly reduced impact targets. The Portable Infantry Target System is radio controlled and has hit sensors that sense ballistic hits on the target. The radio controller can program them for allowable variations to the scaled ranges.

Portable Infantry Target System

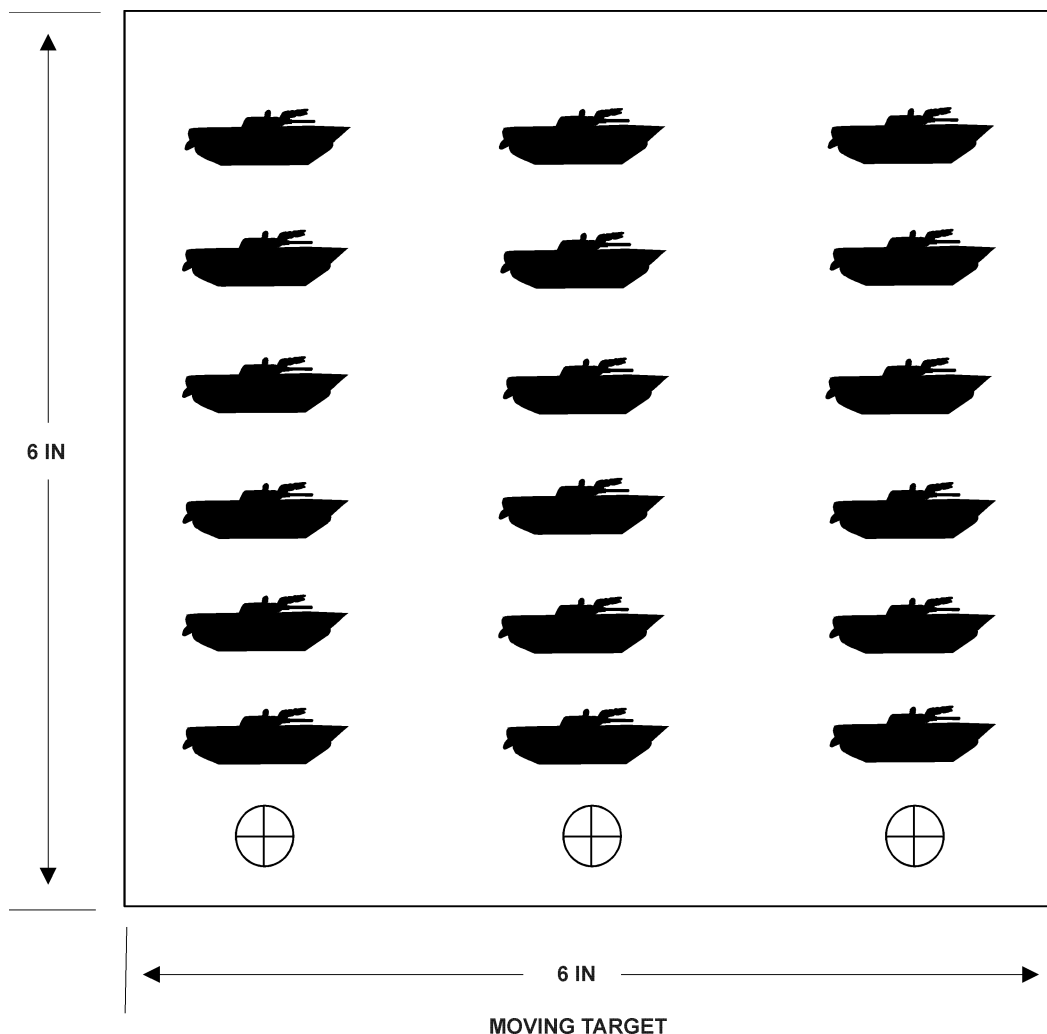


Figure 11-4. Sample Subcaliber Targets for Table 3.

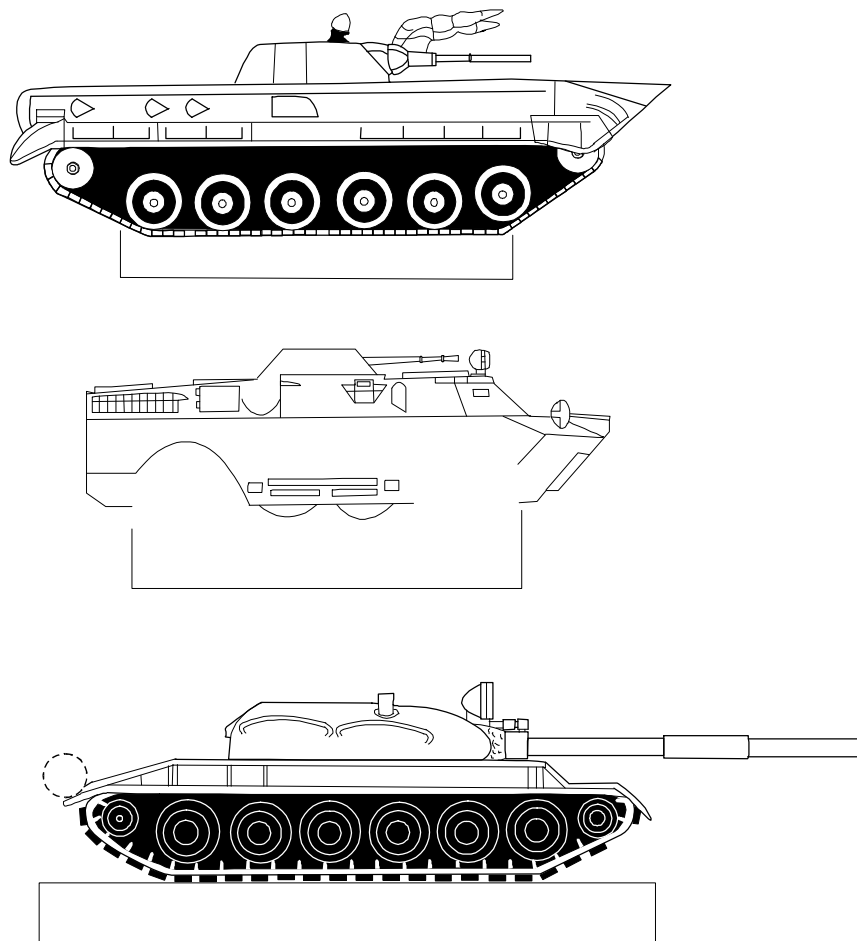


Figure 11-5. Scaled Impact Targets.

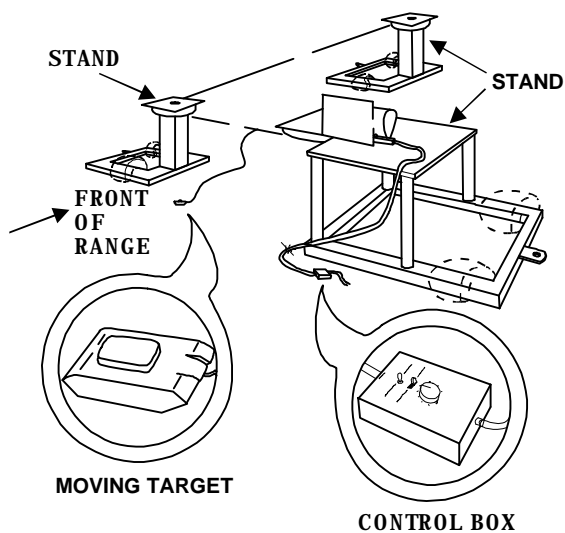
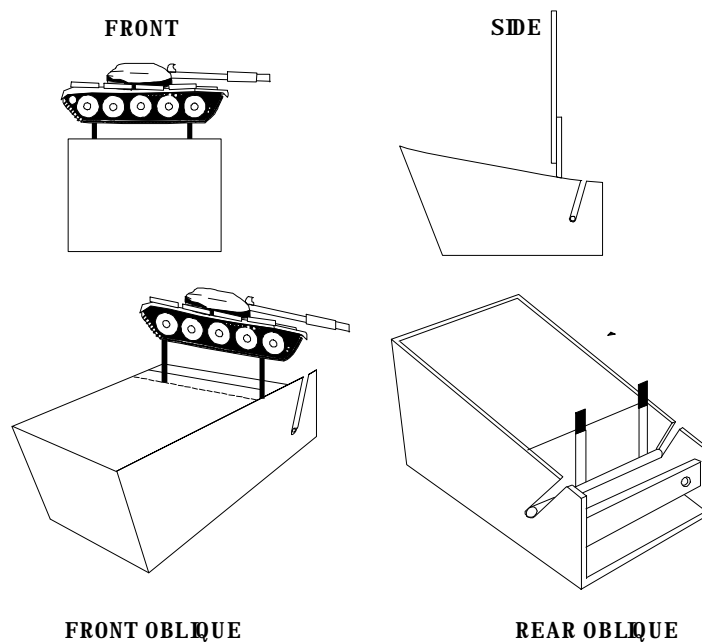
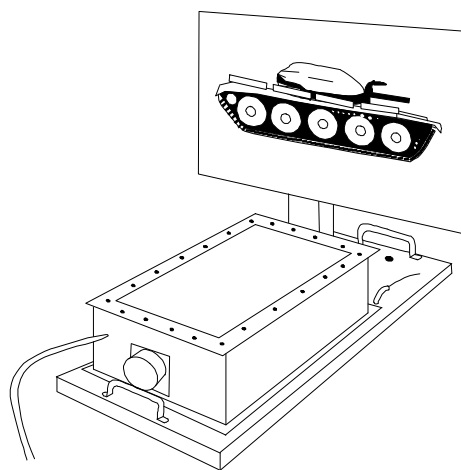


Figure 11-6. Target Mechanism for Moving Targets.



**Figure 11-7. Target Mechanism
for Stationary Targets.**



**Figure 11-8. M31A1 Target-Holding
Mechanism.**

Appendix A

Cleaning, Inspecting, and Storing Ammunition

To maintain the safety, serviceability, and effectiveness of the 25mm and 7.62mm ammunition used on the LAV-25, care must be taken when handling it. The following guidelines can aid crew members in cleaning, inspecting, and storing ammunition. Using proper procedures can prevent problems.

Ammunition Precautions

Do not open ammunition containers until ready to use to avoid corrosion or contamination and to make the process of ammo turn-in easier should firing be shut down for any reason.

Protect ammunition from mud, dirt, and water. If the ammunition gets wet or dirty, wipe it off prior to use. Wipe off light corrosion as it is discovered. Heavily corroded rounds should be replaced.

Use caution during firing to ensure ammunition is kept out of the dirt. Dirt picked up during firing will act as an abrasive in the chamber of the weapon and could cause serious damage.

Do not expose ammunition to direct sunlight. If the powder is hot, excessive pressure may develop when the gun is fired.

Do not oil or grease ammunition. Dust and other abrasives will collect on it and damage the operating parts of the gun.

Do not use defective rounds, including dented rounds or those with loose projectiles. Replace them.

Do not fire any ammunition graded and marked "FOR TRAINING ONLY" over friendly troops.

Cleaning Ammunition

Clean primers only with rags dipped in alcohol or acetone. Store cleaning rags in noncombustible self-closing containers. Waste or used rags shall be disposed of according to local hazardous materials regulations. Areas in which solvents and paints are used must be well-ventilated.

Remove dirt, mud, and other foreign material using rags or brushes. Use rags dampened with alcohol or acetone to remove grease.

Remove flaked, chipped, and blistered or peeling paint using a nonferrous brush. Remove rust using a nonferrous brush or sandpaper.

Clean corrosion from aluminum or copper-based metals by brushing with a nonferrous brush and then removing residue with rags and corrosion-removing compound.

Inspection of Ammunition

Inspection criteria and classification of specific defects (identified as acceptable, repairable, and irreparable) are outlined in tables A-1 and A-2.

Acceptable ammunition will be cleaned and repackaged.

For disposition of irreparable ammunition, contact explosive ordnance disposal (EOD) personnel for guidance.

Small arms cartridges will be given an inspection prior to issue. The cartridges in a minimum of three boxes from each lot will be inspected for physical defects. Lots having more than 5 percent defective cartridges may be subjected to a 100

percent inspection if authorized by higher authority, and visually defective rounds will be pulled out. Ammunition having less than 5 percent visually defective rounds may be issued without further inspection.

During inspection of belted ammunition for use in machine guns, look for the following defects:

- Cartridges improperly aligned in the belts.
- Incendiary and/or tracer ammunition improperly proportioned or spaced with ball ammunition.
- Cartridge links in link belts have broken, cracked, or stretched loops.
- Link belts not packed with double loop on top.
- Cracks or other damage and deterioration.

Table A-1. Inspection Criteria for 25mm Ammunition Projectiles.

Item	Acceptable	Repairable	Irreparable
Markings.	Legible and correct.	Illegible, correct data available for remarking.	Correct data cannot be determined.
Paint.	No scratches, peeling, or blistering.	Scratches, peeling, or blistering in spots.	Scratches, peeling, or blistering requiring complete repaint.
Body.	Free from rust.	Minor rust that can be removed with corrosion-removing compound, sandpaper, or wire brush.	Extensive rust that cannot be removed with corrosion-removing compound, sandpaper, or a wire brush.

Table A-2. Inspection Criteria for 25mm Ammunition Metallic Cartridge Case.

Item	Acceptable	Repairable	Irreparable
Markings.	Legible.	Markings illegible, incorrect, or misleading, but correct data is available for remarking.	Correct data cannot be determined.
Body.	Light corrosion. Minor scratches or dents in casing.	Minor scratches, rust, or corrosion which can be removed with fine sandpaper, steel wool, or corrosion-removing compound.	Severe corrosion, rust, or scratches which cannot be removed with sandpaper or steel wool.
Body and base.	Minor cuts, scratches, and dents.	None.	Severe cuts, tears, and dents where propellant is exposed.

Storage Precautions

Store ammunition in a dry, cool place. Never store in the direct sunlight or where temperatures exceed limits marked on containers.

Select storage sites carefully to avoid exposure to power lines and electric cables.

Ensure that exposure to radio frequency (RF) energies and electromagnetic radiation is kept to a minimum in storage areas.

Do not store ammunition adjacent to reservoirs, water mains, or sewer lines.

Select level, well-drained sites free from flammable materials.

Do not store ammunition under trees or adjacent to towers or other structures that attract lightning.

Provide nonflammable or fire-resistant overhead covers (e.g., tarpaulin) for all ammunition. Main-

tain overhead air space of approximately 18 inches between cover and ammunition. Keep cover at least 6 inches from stack on ends and at sides to permit circulation of air.

Use heavy, well-supported dunnage to prevent stacks from sinking and to keep bottom tier off ground.

Dig suitable trenches to prevent water from flowing under stacks.

Group ammunition by caliber, type, method of packing, and lot number.

Tag or mark ammunition removed from original packing to preserve the ammunition lot or functional lot identification. This will prevent otherwise serviceable ammunition from becoming Condition Code H through loss of identity (ammunition lot number). Small arms ammunition with loss of lot identity is to be reported to the battalion S-4 (ammo tech).

Appendix B

Range Determination

Range determination is the process of determining the distance between two points. The distance is usually measured from the observer to the target, but it may also be from a known or prominent feature to the target, and the observer-target distance is then computed. The ability to accurately determine range is a key skill needed to accomplish the mission. Not only does accurate range determination affect the LAV-25 crewman's combat gunnery proficiency, but it is also necessary in reporting information accurately and adjusting supporting arms effectively. Range determination coupled with knowledge of threat weapons capability aids the vehicle commander in choosing the method of engagement. Two methods are used in the LAV-25 to determine range: immediate and deliberate. The immediate method is used when speed has priority over accuracy. The deliberate method is used when accuracy has priority over speed.

Immediate Method of Range Determination

The two techniques used in the immediate method are the battlesight technique (with the main gun and/or coaxially mounted machine gun or coax) and the recognition technique.

Battlesight Technique

The battlesight technique is accomplished by laying the battlesight circle center mass of the target (6 o'clock for armor piercing [AP] ammunition) and applying a burst. The battlesight circle is a known distance of 470 meters for the coaxially mounted machine gun, 950 meters for high explosive (HE) ammunition, and 1,450 meters for AP. Having fired a burst, the gunner uses the burst-on-target (BOT) method to adjust the sight picture. Then, the gunner engages the target until it

is destroyed or the command **CEASE FIRE** is given. The coax is used in the same manner, but mainly for troops in the open. The main gun battlesight tells if the target is within battlesight range. It gives about a 50 percent probability of a first round hit to a range of approximately 950 meters for HE and 1,450 meters for AP.

Recognition Technique

The recognition technique depends on target visibility and can be used with the unaided eye or with vision aids such as scopes or binoculars. Targets recognizable to the unaided eye or by sighting through vision aids with about 7- or 8- power magnification are normally at the ranges shown in table B-1. For example, if a vehicle can be identified as an armored personnel carrier (BMP) with the naked eye, it is probably within 1,500 meters. If the crew members can be seen on or around the BMP with the naked eye, it is probably within 500 meters. Certain viewing conditions can make a target appear to be closer or farther away than it actually is.

Deliberate Method of Range Determination

The deliberate method is typified by the use of more accurate techniques of range determination such as laser range finder (LRF), stadia technique, the mil-relation formula, or the flash-to-bang technique.

Laser Range Finder

An LRF is normally an individually operated, hand-held or vehicle-mounted, distance-measuring device which uses a reflected laser pulse to provide an accurate range to the target. The LRF increases first round hit probability on targets

through fast and accurate range determination. It may be operated from an internal battery or from an external power source by means of the power cable. Some of its capabilities and features are the following:

- It fires an invisible laser beam at a target, then detects laser energy reflected from the target.
- It has a highly accurate range determination from 200 to 9,900 meters (plus or minus 10 meters).
- It warns operator when the internal battery is getting weak.
- It informs operator if the LRF has been fired at more than one target.
- Its reticle pattern is graduated in mils.

Stadia Technique

The stadia technique, also called the choking technique, provides a rapid and accurate way of measuring distance. The LAV-25 crewman sights on the target and moves the gun in elevation until the appropriate (AP or HE) stadia lines enclose a 6-meter portion of a flank target or a 3-meter portion of a frontal target. In figure B-1, HE ammo is used and the target is approximately 5 meters wide, so the guns are elevated until the target fills five-sixths of the space between the HE stadia lines. If the target and the firing LAV-25 are both stationary, the intersection of the vertical range line and the indicated range on the range scale becomes the sighting point. The gun can then be fired as soon as the target is centered between the stadia lines at the correct elevation. Figure B-1 depicts target ranges of 1,400 meters, 1,700 meters, and 700 meters using the stadia method.

Table B-1. Recognition Technique.

Target	If recognized by the naked eye, range is	If recognized by 7- or 8-power magnification, range is
Tank Crewmember, Troops, Machine Gun, Mortar, Antitank Gun, Antitank Missile Launches	500 meters	2000 meters
Tank, APC, Model of Truck	1000 meters	4000 meters
Tank, Howitzer, APC, Truck	1500 meters	5000 meters
Armored Vehicle, Wheeled Vehicle	2000 meters	6000 meters
Variable Target Conditions		
Target seems closer		Target seems more distant
Bright clear day		Fog, rain, or hazy twilight
Sun in front of the target		Sun behind the target
Higher elevations		Lower elevations
Large targets		Small targets
Contrast		Dark colors
Looking across ravines, hollows, rivers, or depressions		
At sea		

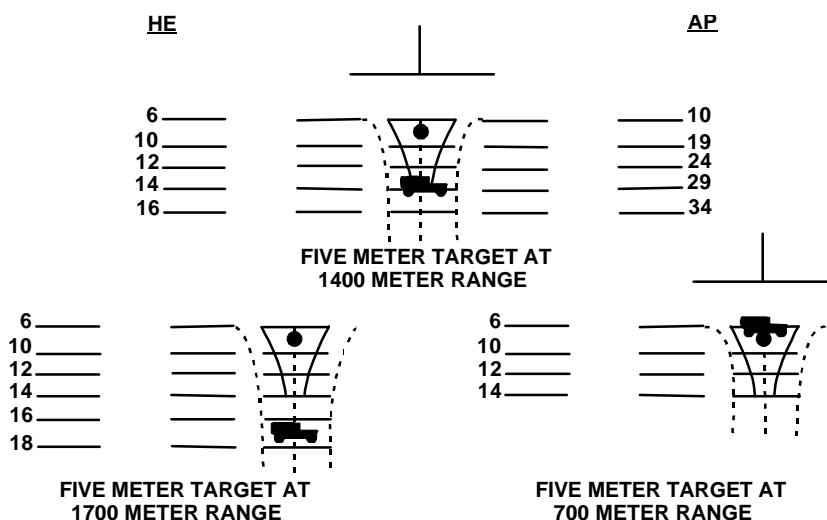


Figure B-1. Stadia Method.

Mil-Relation Formula

The range to a target can be estimated using the mil-relation formula and the vehicle's known dimensions. The mil-relation formula $W = R \times m$, commonly called WORM or WORM rule, is based on the assumption that an angle of 1 mil equals 1 meter in width at a distance of 1,000 meters (actually 0.98175) from the observer. (W = vehicle's width in meters, R = range in thousands of meters [i.e., 2.5 = 2,500 meters], and m = vehicle's width in mils.) To use the mil-relation formula to determine range, simply solve the equation for R ($R = W \div m$). Dimensions of equipment can be obtained from training aids such as armored vehicle recognition cards (GTA 17-2-13) which can be obtained from the battalion S-2, S-3, or supply officer or on the Internet. Dimensions of selected equipment are provided in figure B-2. See FMFM 6-8, *Supporting Arms Observer, Spotter, and Controller*, for details.

Example: A BMP is observed. The width as seen from a side view is measured as 2 mils. Using the formula $R = W \div m$, the range to the target is determined.

$$R = W \div m$$

$$R = 6.8 \text{ meters} \div 2 \text{ mils}$$

$$R = 3.9 \text{ (3,700 meters)}$$

Flash-to-Bang Technique

To determine the range to a target using the flash-to-bang technique, count the number of seconds between the visual signature of the target's weapon firing and the sound of the report. Multiply this figure by the speed of sound (350 meters per second). The result will be the distance from the observer to the target in meters.

Example: An enemy tank is observed firing. The time difference between seeing the weapon's signature and hearing the report of the firing is 10 seconds. Multiply the seconds by 350 = 3,500. The tank is about 3,500 meters away.

Equipment	Dimensions (in meters)	
	Side View	Front View
Tank (T-62)	7.5	3.4
Reconnaissance Vehicle (BRDM-2)	5.7	2.4
Reconnaissance Vehicle (BTR-60)	7.5	2.8
Armored Personnel Carrier (BMP)	6.5	2.9
Air Defense Weapon (ZSU-23-4)	6.3	2.9

Figure B-2. Selected Equipment Dimensions.

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Appendix C

Air Defense

Air defense is all defensive measures designed to destroy attacking enemy aircraft or missiles in the Earth's envelope of atmosphere, or to nullify or reduce the effectiveness of such attack. (Joint Pub 1-02.)

There are two methods of air defense—passive and active. All LAV-25 units must know how to take passive measures to avoid air detection and active measures to combat air attack.

Passive Air Defense Methods

Passive air defense is the most important method of air defense as it may prevent you from being targeted. Passive air defense involves taking those measures necessary to avoid detection and engagement by threat aviators.

Vehicle dispersion must be emphasized to reduce the effectiveness of enemy radar and other detection devices. This also reduces casualties and decreases the enemy's ability to engage more than one target at a time. Attack avoidance depends on the unit's ability to avoid detection; what can be seen, can be destroyed.

Use of cover and concealment must be maximized. If possible, have a friendly aircraft observe the position and correct all vehicles that are visible.

Observing and reporting help the commander to coordinate active air defense measures to engage detected enemy aircraft, to move unprotected elements, and to request additional support. Reports must be accurate and timely to be effective.

Active Air Defense Methods

When passive air defense fails, LAV-25 crews must employ active air defense. Enemy aircraft are engaged to—

Destroy the aircraft.

Force the aircraft away from the friendly position. Force the aircraft to fly higher so that friendly air defense weapons or friendly aircraft can destroy it.

Spoil the aircraft's aim while it is engaging you.

High volume of fire is the key to success in active air defense. Because of the speed and agility of aircraft, the response must be coordinated, practiced, and highly controlled. Active air defense measures should be controlled at section level. Platoon dispersion does not allow for accurate and timely engagement of aircraft. The section has sufficient weapon systems (with a significant amount of ammunition and some degree of control) to engage enemy aircraft.

The technique to obtain volume of fire is simple. All section vehicles engage with either the M242 25mm or M240 coax as designated by the section leader either by fire command or by SOP.

Unit SOPs should provide guidance for integrating dismounted weapons fire in conjunction with supporting LAV-25 weapon systems in active air defense.

Once the engagement begins, all gunners continue to fire until the aircraft crashes, the aircraft catches fire or is smoking, the personnel have evacuated the aircraft, or the aircraft withdraws.

Aerial Engagement Weapons

Proper weapons and ammunition selection for the range and target is important. Table C-1 shows the weapon and ammunition and the type of aerial targets that it can destroy.

The M242 25mm automatic gun is effective against slow-moving, fixed-wing aircraft and helicopters. Target identification is imperative to determining the type of ammunition to use. Use the APDS-T, the APFSDS-T, or the HEI-T round against slow-moving, fixed-wing aircraft and helicopters. The APDS-T and APFSDS-T have 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. Rounds should be fired in 20- to 25-round bursts on high rate to sustain the proper volume of fire.

Use the coaxially and pintle-mounted 7.62mm machine guns against fixed-wing aircraft, un-armored helicopters, and airborne troops. A continuous burst (50 to 100 rounds) at the proper aiming point is required. Use the tracer-on-target technique to bring rounds on target. The 7.62mm machine guns are not effective against heavily armored helicopters such as the HIND-D.

Sighting Systems and
Techniques

Engagement
Techniques

Use the LAV-25 ballistic sight with either the 25mm gun or the 7.62mm coax machine gun when engaging aerial targets.

Engaging Helicopters
If the helicopter is flying a lateral or overhead course, the commander or gunner uses a lead of 50 meters (half the length of a football field).

If the helicopter is flying directly toward the vehicle, aim the fire slightly above the nose of the helicopter.

If the helicopter is hovering, the commander or gunner aims just above the fuselage and fires a burst of 20 to 25 rounds on high rate of fire.

Table C-1. Weapon and Ammunition Selection Against Aerial Targets.

	FIXED-WING		HELICOPTER		PARATROOPER
	SLOW	FAST	ARMORED	UNARMORED	
Coaxially mounted 7.62mm	Yes	Yes	No	Yes	Yes
Pintle-mounted 7.62mm	Yes	Yes	No	Yes	Yes
HEI-T	Yes	Yes*	Yes	Yes	Yes

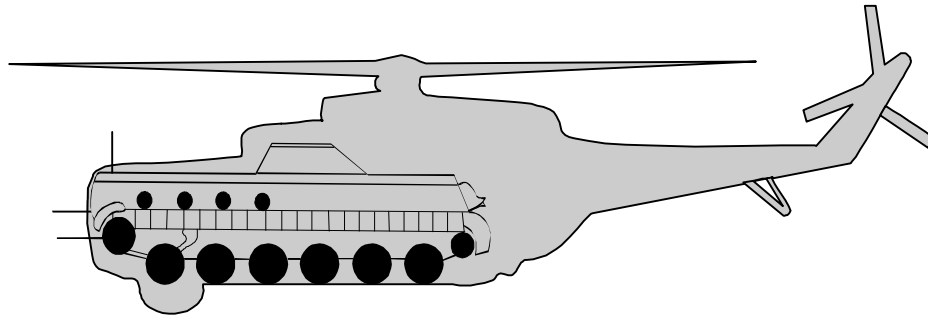


Figure C-1. HIND-D and BMP Height Comparison.

The HIND-D is about the same height as a BMP when measured from the aircraft's bottom to the top of the pilot's canopy. (See fig. C-1.)

Engaging High-Speed Aircraft

The best technique for engaging high-speed aircraft is a controlled burst of coax machine gun and small arms from both the mounted and dismounted elements at a designated TRP. This can be initiated by either the section leader issuing a predetermined command or by a leader initiating fire so that other elements can fire on his tracers. The section leader needs to apply a 200-meter lead (about two football field lengths) on the approaching aircraft. Aim the fire in front of the aircraft so that the aircraft will fly through the

entire section's cone of fire. *Do not* try to track the aircraft if it flies too fast. (See fig. C-2.)

If the aircraft is flying directly toward the vehicle, use a controlled burst (50 to 100 rounds) and select an aiming point slightly above the nose of the aircraft. Thus, the aircraft will fly into the cone of fire.

A third technique to engage high-speed aircraft is to pick a reference point or a series of reference points. (See fig. C-3.) (Example: the platoon leader alerts the platoon and as the aircraft nears a reference point, he orders **ENEMY AIR; REFERENCE POINT TWO; FIRE**. Fire all weapons [of LAV-25s and of dismounted Marines] at a 45-degree angle above the reference

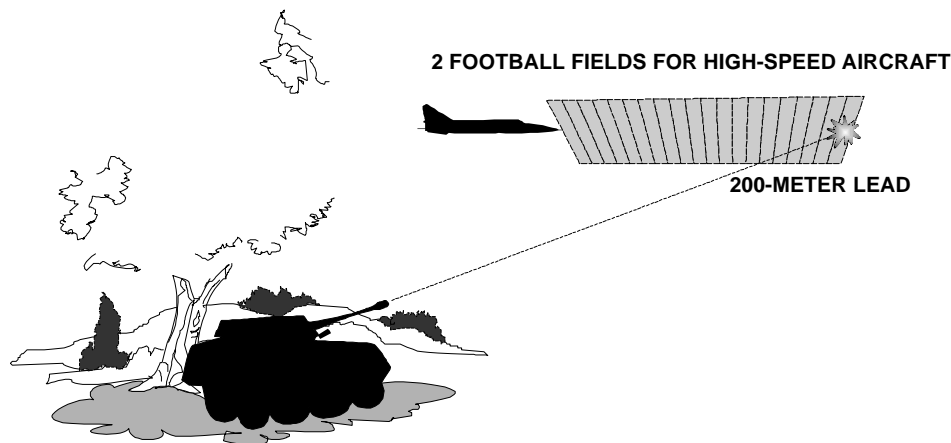


Figure C-2. High-Speed Aircraft Engagement.

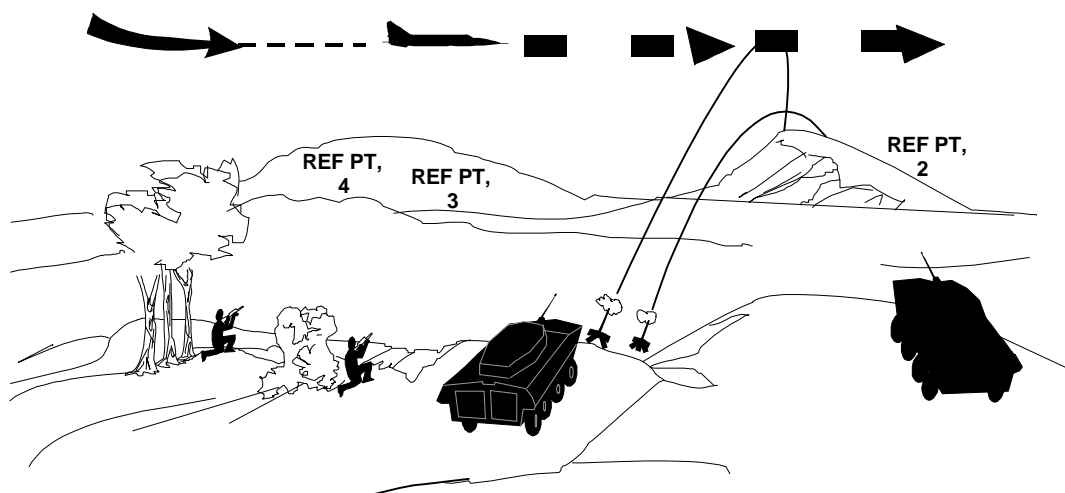


Figure C-3. Reference Point Technique.

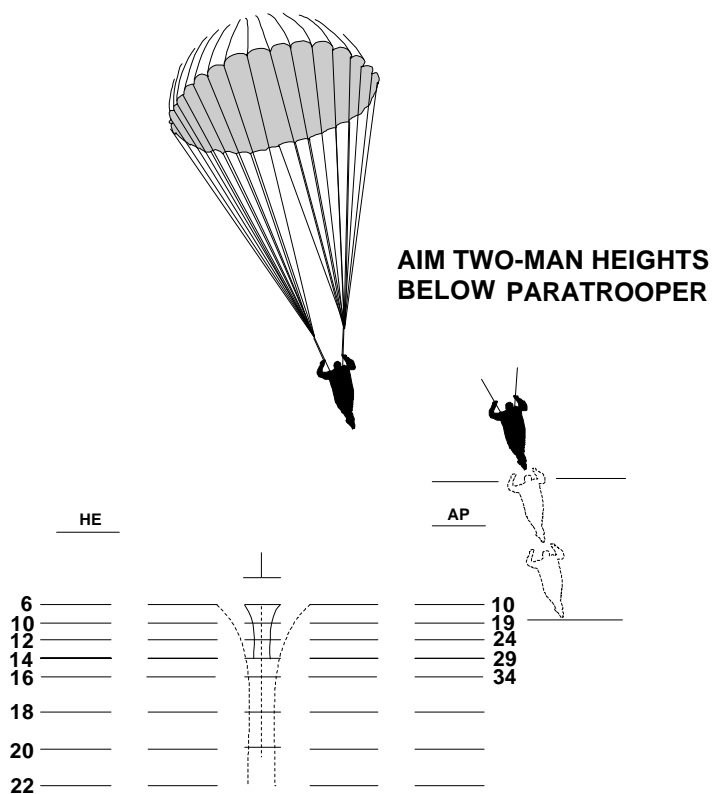


Figure C-4. Engaging Paratroopers.

point.)

Engaging Paratroopers

Paratroopers' rapid rate of fall and oscillation of the parachute makes them difficult to engage.

(See fig. C-4.)

Use the LAV-25 ballistic sight.

Use the coax machine gun at ranges under 900 meters.

Use the 25mm gun with HEI-T at ranges over 900 meters.

Fire a burst (with a lead of two man-heights) beneath the dropping paratrooper.

If troop-carrying helicopters are sighted, engage them—not the parachuting or rappelling troops. Helicopters are better targets.

Note: The Geneva Convention specifically prohibits engaging aircraft crewmembers who are parachuting out of damaged aircraft. They

cease to be a threat when removed from their aircraft. However, the Geneva Convention does not protect paratroopers (from any aircraft) while they are in the air.

Weapons Control Status

Air defense fires are controlled using hostile criteria (determining type of aircraft and whether it is friend or foe) and weapons control status. Once identified, engagement is controlled by the weapons control status. These weapons control categories are—

Weapons free. Crews may fire at aircraft not positively identified as friendly.

Weapons tight. Crews fire only at aircraft positively identified as hostile according to announced hostile criteria.

Weapons hold. Crews do not fire except in self-defense.

Friendly aircraft also operate in hostile air space or environment.

The division G-2 often provides early warning of threat air attack. Normally, the probability of attack is described using one of three conditions:

Red—attack imminent or in progress.

Yellow—attack probable.

White—attack not probable.

Appendix D

LAV-25 Gunnery Skills Test Recommended Performance Checklists

The LAV-25 gunnery skills test (LGST) evaluates each crewmember's ability to perform gunnery

related skills without the aid of technical manuals or publications.

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Test Station 1 - Load the M242 25mm Automatic Gun. (0313.3.9)

1. Task. Load the M242 25mm automatic gun.
2. Conditions. Given an LAV-25, 210 25mm dummy rounds, appropriate tools and technical manuals.
3. Standards. Within 10 minutes, fully load the high explosive (HE) and armor piercing (AP) side of the weapon. The Marine must load the ready boxes and feeder and cycle the ghost round.
4. Evaluation Procedures.

The evaluator logs crew members on a roster. All materials and equipment needed for the task must be present and operational. The evaluator must use the performance checklists to score this task. Only one crewmember at a time is tested.

If the crewmember receives a ***NO GO***, he is told what mistakes he made and actions required to correct them. The crewmember is tested in accordance with local standing operating procedure.

5. Personnel, Equipment, and Material Required:

- Qualified LAV-25 crew evaluator (LCE).
- Operational LAV-25 with SL-3.
- 210 25mm dummy rounds.
- Clipboard and pen.
- Stopwatch.

6. Pretest Preparation:

- Remove 25mm automatic gun and ensure all parts are present and operational.
- Install 25mm automatic gun.
- Ensure master power and turret power switches are off.
- Ensure gas bag is removed.

7. Test Planning Time.

Administrative:	5 minutes
Test:	<u>10 minutes</u>
Total:	15 minutes

Recommended Performance Checklist, Station 1

NAME: _____

GRADE: _____ UNIT: _____ DUTY POSITION: _____

TASK: Load the M242 25mm automatic gun.

PERFORMANCE STEPS	GO	NO GO
1. Ensure that the turret is powered down.	_____	_____
2. Ensure that the M242 is clear.	_____	_____
3. Ensure that the M242 is in <i>SEAR</i> .	_____	_____
4. Ensure that the M242 is on <i>SAFE</i> .	_____	_____
5. Ensure that the feed and link chutes are in place.	_____	_____
6. Load HE ammunition.	_____	_____
a. Load ready box.	_____	_____
b. Route ammunition to feeder.	_____	_____
c. Load feeder.	_____	_____
7. Load AP ammunition.	_____	_____
a. Load the feed chute.	_____	_____
b. Load the ready box.	_____	_____
c. Route ammunition to feeder.	_____	_____
d. Load the feeder.	_____	_____
8. Cycle the ghost round.	_____	_____
9. Complete performance steps within 10 minutes.	_____	_____

EVALUATOR'S NAME: _____

TEST DATE: _____ OVERALL SCORE: GO NO GO

REMARKS: _____

Test Station 2—Clear, Remove, Disassemble, Assemble, and Install the M242 25mm Automatic Gun. (0313.3.1; 0313.3.2; 0313.3.10)

1. Task. Clear, remove, disassemble, assemble, and install the M242 25mm automatic gun.

2. Conditions. Given an LAV-25 with installed M242 loaded with 210 25mm dummy rounds, appropriate tools, technical manuals, and an assistant.

3. Standards. Within 30 minutes, the Marine must—

- Fully unload the HE and AP side of the weapon.
- Unload the ready boxes and feeder, and stow the ammunition properly.
- Disconnect the feed chutes and link chutes, remove the M242 receiver, feeder, and barrel assemblies, and completely disassemble the weapon.
- Completely reassemble the weapon, install the M242 receiver, feeder, and barrel assemblies, connect power to the J1 electrical receptacle, attach feed chutes, and attach link chutes.

4. Evaluation Procedures

The evaluator logs crew members on a roster. All materials and equipment needed for the task must be present and operational. The evaluator must use the performance checklists to score this task. Only one crewmember at a time is tested.

If the crewmember receives a *NO GO*, he is told what mistakes he made and actions required to correct them. The crewmember is tested in accordance with local SOP.

5. Personnel, Equipment, and Material Required:

- Qualified LCE.
- Operational LAV-25 with SL-3.
- Stopwatch.
- Clipboard and pen.
- 210 25mm dummy rounds.

6. Pretest Preparation:

- Remove 25mm automatic gun and ensure all parts are present and operational.
- Install 25mm automatic gun.
- Ensure that the M242 is completely loaded and the ghost round is cycled.
- Ensure master power and turret power switches are off.
- Inform assistant crewmember that he is only to assist with the barrel and receiver assemblies.

7. Test Planning Time

Administrative:	5 minutes
Test:	<u>30 minutes</u>
Total:	35 minutes

Recommended Performance Checklist, Station 2

NAME: _____

GRADE: _____ UNIT: _____ DUTY POSITION: _____

TASK: Clear, remove, disassemble, assemble, and install an M242 25mm automatic gun.

PERFORMANCE STEPS	GO	NO GO
1. Unload the 25mm automatic gun.	_____	_____
a. Ensure that the turret is powered down.	_____	_____
b. Ensure that the M242 is on <i>SAFE</i> .	_____	_____
c. Ensure that the turret is locked.	_____	_____
d. Remove link chutes.	_____	_____
e. Unload AP ammunition.	_____	_____
(1) Unload feeder.	_____	_____
(2) Unload ready box.	_____	_____
(3) Stow ammunition.	_____	_____
f. Unload HE ammunition.	_____	_____
(1) Unload feeder.	_____	_____
(2) Unload ready box.	_____	_____
(3) Stow ammunition.	_____	_____
g. Remove and clear the feeder. (Ensure the feed select solenoid remains in AP while removing feeder.)	_____	_____
(1) Remove the feed chutes from the feeder assembly.	_____	_____
(2) Unlock the feeder handle.	_____	_____
(3) Release the drive shaft.	_____	_____
(4) Slide the feeder assembly back on the receiver assembly rails.	_____	_____
(5) Lock the feeder handle down.	_____	_____
(6) Lift the feeder assembly off the receiver assembly and place on clean, flat surface. (Assistant helps.)	_____	_____
(7) Push in drive shaft on receiver.	_____	_____
h. Clear the receiver.	_____	_____
2. Remove the M242 25mm automatic gun.	_____	_____
a. Remove the barrel assembly. (Assistant helps.)	_____	_____
(1) Unlock the barrel assembly from the receiver assembly.	_____	_____
(2) Withdraw the barrel assembly from the receiver assembly.	_____	_____
b. Remove the receiver assembly.	_____	_____
(1) Disconnect the electrical harness from the J1 receptacle.	_____	_____
(2) Unlock the anti-rotation latch handle.	_____	_____
(3) Remove the receiver assembly from the locking ring. (Assistant helps.)	_____	_____
3. Disassemble the M242 automatic gun.	_____	_____

PERFORMANCE STEPS		NO GO
a. Remove the bolt and track assembly from the receiver.	_____	_____
(1) Pull out drive shaft.	_____	_____
(2) Cycle bolt out of <i>SEAR</i> .	_____	_____
(3) Unlock track latch.	_____	_____
(4) Remove bolt and track assembly.	_____	_____
(5) Push in drive shaft on receiver.	_____	_____
b. Disassemble bolt and track assembly.	_____	_____
(1) Remove bolt carrier from track assembly.	_____	_____
(2) Unlock bolt from forward locking position.	_____	_____
(3) Remove firing pin sleeve keeper.	_____	_____
(4) Remove firing pin and sleeve from bolt and separate the pin and sleeve.	_____	_____
(5) Remove cam pin.	_____	_____
(6) Remove bolt from bolt carrier.	_____	_____
(7) Remove idler sprocket shafts.	_____	_____
(8) Remove idler sprockets.	_____	_____
(9) Remove drive sprocket retainer.	_____	_____
(10) Remove drive sprocket.	_____	_____
(11) Remove chain from track assembly.	_____	_____
4. Assemble and install the 25mm gun.	_____	_____
a. Assemble bolt and track assembly.	_____	_____
(1) Place chain on track assembly.	_____	_____
(2) Insert drive sprocket.	_____	_____
(3) Insert drive sprocket retainer.	_____	_____
(4) Insert idler sprockets.	_____	_____
(5) Insert idler sprocket shafts.	_____	_____
(6) Slide bolt into bolt carrier.	_____	_____
(7) Insert cam pin.	_____	_____
(8) Insert firing pin and sleeve into bolt.	_____	_____
(9) Insert firing pin keeper.	_____	_____
(10) Lock bolt in forward position.	_____	_____
(11) Place bolt and carrier on track assembly.	_____	_____
b. Install bolt and track assembly.	_____	_____
(1) Lower drive shaft handle.	_____	_____
(2) Insert bolt and track assembly into receiver.	_____	_____
(3) Lock track latch handle.	_____	_____
(4) Cycle bolt to <i>SEAR</i> .	_____	_____
(5) Raise drive shaft handle.	_____	_____
c. Install receiver.	_____	_____
(1) Pull anti-rotation latch handle out.	_____	_____
(2) Install receiver into trunion and lock anti-rotation handle into place. (Assistant helps.)	_____	_____
(3) Connect electrical harness to J1 receptacle.	_____	_____
d. Install barrel.	_____	_____
(1) Install barrel into barrel support. (Assistant helps.)	_____	_____
(2) Lock into place.	_____	_____
e. Install feeder.	_____	_____
(1) Verify feeder assembly is in <i>SEAR</i> and <i>AP</i> .	_____	_____

PERFORMANCE STEPS	GO	NO GO
(2) Lower drive shaft handle.	_____	_____
(3) Raise feeder handle.	_____	_____
(4) Position feeder on receiver.	_____	_____
(5) Raise drive shaft handle.	_____	_____
(6) Lower feeder handle.	_____	_____
(7) Install feed chutes.	_____	_____
(8) Install link chutes.	_____	_____
5. Completed performance steps within 30 minutes.	_____	_____

EVALUATOR'S NAME: _____

TEST DATE: _____ **OVERALL SCORE:** **GO** **NO GO**

REMARKS: _____

Test Station 3 - Load The M240 7.62mm Coaxially Mounted Machine Gun (0313.3.11)

1. Task. Load the M240 7.62mm coaxially mounted machine gun.
2. Conditions. Given an LAV-25 with installed 7.62mm coaxially mounted machine gun, 400 7.62mm dummy rounds, appropriate tools, and technical manuals.
3. Standards. The Marine must fully load the ready box and the coaxially mounted machine gun within 5 minutes.
4. Evaluation Procedures.

The evaluator logs crew members on a roster. All materials and equipment needed for the task must be present and operational. The evaluator must use the performance checklists to score this task. Only one crewmember at a time will be tested.

If the crewmember receives a **NO GO**, he is told what mistakes he made and actions required to correct them. The crewmember is tested in accordance with local SOP.

5. Personnel, Equipment, and Material Required:

- Qualified LCE.
- Operational LAV-25 with SL-3.

- Operational M240 coax machine gun, installed.
- Four hundred rounds of 7.62mm, dummy ammunition.
- Stopwatch.
- Clipboard and pen.

6. Pretest Preparation:

- Remove 7.62mm coaxially mounted machine gun and ensure all parts are present and operational.
- Install 7.62mm coaxially mounted machine gun.
- Ensure all power is off.

7. Test Planning Time

Administrative:	5 minutes
Test:	<u>5 minutes</u>
Total:	10 minutes

Recommended Performance Checklist, Station 3

NAME: _____

GRADE: _____ UNIT: _____ DUTY POSITION: _____

TASK: Load the M240 7.62mm coaxially mounted machine gun.

PERFORMANCE STEPS	GO	NO GO
1. Ensure that the turret is powered down.	_____	_____
2. Ensure that the turret is locked.	_____	_____
3. Ensure that the M240 is clear.	_____	_____
a. Charge M240 machine gun.	_____	_____
b. Set manual safe on M240 to <i>SAFE</i> .	_____	_____
c. Open cover assembly and feed tray.	_____	_____
d. Look in chamber to ensure no rounds in chamber.	_____	_____
e. Close feed tray.	_____	_____
f. Close cover assembly.	_____	_____
g. Place on fire and ride bolt forward.	_____	_____
4. Ensure that the feed chute is connected.	_____	_____
5. Load the ready box.	_____	_____
6. Route the ammunition to the M240.	_____	_____
7. Place the ammunition in the M240.	_____	_____
a. Charge M240 machine gun.	_____	_____
b. Set manual safe on M240 to <i>SAFE</i> .	_____	_____
c. Open cover assembly.	_____	_____
d. Install ammunition belt on feed tray.	_____	_____
e. Close cover assembly.	_____	_____
8. Completed performance steps within 5 minutes.	_____	_____

EVALUATOR'S NAME: _____

TEST DATE: _____ OVERALL SCORE: GO NO GO

REMARKS: _____

Test Station 4 - Clear, Remove, Disassemble, Assemble, and Install the M240 7.62mm Coaxially Mounted Machine Gun (0313.3.3; 0313.3.4; 0313.3.12)

1. Task. Clear, remove, disassemble, assemble, and install the M240 7.62mm coaxially mounted machine gun.

2. Conditions. Given an LAV-25 with installed M240 7.62mm coaxially mounted machine gun loaded with 400 7.62mm dummy rounds, appropriate tools, and technical manuals.

c. Standards. Within 15 minutes the Marine must—

- Clear and fully unload the M240 7.62mm coaxially mounted machinegun, unload the ammunition from the feed chute and ready box; and stow the ammunition in the ammunition cans.
- Remove the M240 7.62mm coaxially mounted machine gun and completely disassemble the weapon.
- Assemble, perform a function check on the M240 7.62mm coaxially mounted machine gun, and install the weapon.

4. Evaluation Procedures.

The evaluator logs crew members on a roster. All materials and equipment needed for the task must be present and operational. The evaluator must use the performance checklists to score this task. Only one crewmember at a time is tested.

If the crewmember receives a **NO GO**, he is told what mistakes he made and actions required to correct them. The crewmember is tested in accordance with local SOP.

5. Personnel, Equipment, and Material Required:

- Qualified LCE.
- Operational LAV-25 with SL-3.
- Operational, installed, fully loaded M240 7.62mm coaxially mounted machinegun.
- Four hundred rounds 7.62mm dummy ammunition.
- Stopwatch.
- Clipboard and pen.

6. Pretest Preparation:

- Remove 7.62mm machine gun and ensure all parts are present and operational.
- Ensure the 7.62mm machine gun mounts properly.
- Install 7.62mm machine gun.
- Ensure that the 7.62mm machine gun is completely loaded.
- Ensure master power and turret power switches are off.
- Ensure cradle is clear of any obstructions.
- Ensure the cradle securing pin is present.

7. Test Planning Time.

Administrative:	5 minutes
Test:	<u>15 minutes</u>
Total:	20 minutes

Recommended Performance Checklist, Station 4

NAME: _____

GRADE: _____ UNIT: _____ DUTY POSITION: _____

TASK: Clear, remove, disassemble, assemble, and install the M240 7.62mm coaxially mounted machine gun.

PERFORMANCE STEPS	GO	NO GO
1. Unload the M240 coax machine gun.	_____	_____
a. Ensure that the turret is powered down.	_____	_____
b. Pull the charger cable to lock the bolt to rear.	_____	_____
c. Place manual safety to <i>SAFE</i> position.	_____	_____
d. Open cover assembly.	_____	_____
e. Remove any ammunition from feed tray.	_____	_____
f. Raise feed tray.	_____	_____
g. Look in chamber to ensure no rounds in chamber.	_____	_____
h. Close cover assembly.	_____	_____
i. Place manual safety to <i>FIRE</i> position.	_____	_____
j. Pull manual fire lever, ride bolt forward.	_____	_____
k. Perform steps a through j in sequence.	_____	_____
2. Download 7.62mm ammunition.	_____	_____
a. Remove ammunition from feed chute and ready box.	_____	_____
b. Place ammunition into ammo cans.	_____	_____
3. Remove M240 coax machine gun.	_____	_____
a. Unlock and remove gun cradle securing pin.	_____	_____
b. Pull and hold cradle release lever.	_____	_____
c. Lift rear of coax gun and pull it away from rotor.	_____	_____
d. Release cradle release lever.	_____	_____
e. Remove coax gun from cradle.	_____	_____
4. Disassemble M240 machine gun.	_____	_____
a. Depress barrel locking latch and hold.	_____	_____
b. Turn barrel release to upright position.	_____	_____
c. Remove barrel.	_____	_____
d. Depress trigger pin spring and remove pin.	_____	_____
e. Pull trigger housing assembly down and back.	_____	_____
f. Pull charger handle through cable guide.	_____	_____
g. Pull back plate latch and lift buffer straight up.	_____	_____
h. Press driving spring in, then up, and pull out.	_____	_____
i. Depress cover latches and raise cover assembly.	_____	_____
j. Pull charger handle back, pull out the bolt and operating rod assembly.	_____	_____
k. Close cover, push out spring pin, and remove.	_____	_____
l. Press latches and remove cover assembly and feed tray.	_____	_____
5. Assemble the M240 coax machine gun.	_____	_____
a. Position feed tray and cover assembly, push cover assembly forward, close cover, and insert spring pin.	_____	_____
b. Insert spring pin from right side.	_____	_____

PERFORMANCE STEPS	GO	NO GO
c. Open cover assembly.	_____	_____
d. Set bolt and operating rod assembly on top of receiver rails.	_____	_____
e. Extend bolt to unlocked position, then push assembly all the way in.	_____	_____
f. Close and lock cover.	_____	_____
g. Insert driving spring in the operating rod, push in fully, and lower it to seat the stud in the hole of the receiver.	_____	_____
h. Install buffer and make sure it latches.	_____	_____
i. Slide charger handle through cable guide and position trigger housing assembly in place.	_____	_____
j. Insert pin.	_____	_____
k. Insert barrel fully into socket, push barrel release to the right as far as it will go (not less than two, or more than seven clicks).	_____	_____
6. Perform function check on M240 machine gun.	_____	_____
a. Ensure safety is to <i>FIRE</i> position.	_____	_____
b. Charge the weapon.	_____	_____
c. Place safety to <i>SAFE</i> position.	_____	_____
d. Attempt to fire the weapon. (The weapon should not fire.)	_____	_____
e. Place safety to <i>FIRE</i> position and ease recoiling parts forward.	_____	_____
f. Perform steps a through e in sequence.	_____	_____
7. Install the M240 coax machine gun.	_____	_____
a. Place M240 coax machine gun in cradle channel guide.	_____	_____
b. Slide M240 coax machine gun forward until rear of machine gun is seated in cradle.	_____	_____
c. Install and lock gun cradle securing pin.	_____	_____
d. Ensure the feed chute is connected.	_____	_____
8. Completed performance steps within 15 minutes.	_____	_____

EVALUATOR'S NAME: _____

TEST DATE: _____ OVERALL SCORE: GO NO GO

REMARKS: _____

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Test Station 5 - Load the M240E1 Pintle-Mounted Machine Gun. (0313.3.13)

1. Task. Load the M240E1 pintle-mounted machine gun.
2. Conditions. Given an LAV-25 with installed M240E1 pintle-mounted machine gun, 200 rounds of 7.62mm dummy ammunition, and appropriate tools and technical manuals.
3. Standards. The Marine must fully load the M240E1 pintle-mounted machine gun within 2 minutes.
4. Evaluation Procedures.

The evaluator logs crew members on a roster. All materials and equipment needed for the task will be present and operational. The evaluator must use the performance checklists to score this task. Only one crewmember at a time is tested.

If the crewmember receives a **NO GO**, he is told what mistakes he made and actions required to correct them. The crewmember is tested in accordance with local SOP.

5. Personnel, Equipment, and Material Required:

- Qualified LCE.
- Operational LAV-25 with SL-3.

- Operational, installed M240E1 pintle-mounted machine gun.
- Two hundred rounds of 7.62mm dummy ammunition in an ammunition can.
- Stopwatch.
- Clipboard and pen.

6. Pretest Preparation:

- Clear the weapon.
- Complete a function check on the weapon.
- Ensure M240E1 machinegun bolt is forward.
- Ensure manual safe is set to *FIRE* position.

7. Test Planning Time

Administrative:	5 minutes
Test:	<u>2 minutes</u>
Total:	7 minutes

Recommended Performance Checklist, Station 5

NAME: _____

GRADE: _____ UNIT: _____ DUTY POSITION: _____

TASK: Load the M240E1 pintle-mounted 7.62mm machine gun.

PERFORMANCE STEPS	GO	NO GO
1. Load the M240E1 pintle-mounted machine gun.	_____	_____
a. Ensure the M240E1 is clear.	_____	_____
(1) Pull the charging handle to lock the bolt to rear.	_____	_____
(2) Place manual safety to <i>SAFE</i> position.	_____	_____
(3) Open cover assembly.	_____	_____
(4) Raise feed tray.	_____	_____
(5) Look into chamber to ensure no rounds are in chamber.	_____	_____
(6) Close cover assembly.	_____	_____
(7) Place manual safety to <i>FIRE</i> position.	_____	_____
(8) Pull trigger, ride bolt forward.	_____	_____
(9) Perform steps 1 through 8 in sequence.	_____	_____
b. Charge M240E1 machine gun.	_____	_____
c. Set manual safe on M240E1 to <i>SAFE</i> .	_____	_____
d. Open cover assembly.	_____	_____
e. Attach 7.62mm ammunition can to the gun cradle.	_____	_____
f. Install ammunition belt on feed tray.	_____	_____
g. Close cover assembly.	_____	_____
2. Completed performance steps within 2 minutes.	_____	_____

EVALUATOR'S NAME: _____

TEST DATE: _____ OVERALL SCORE: GO NO GO

REMARKS: _____

Test Station 6 - Clear, Remove, and Install the M240E1 Pintle-Mounted Machine Gun. (0313.3.5; 0313.3.6; 0313.3.14)

1. Task. Clear, remove, and install the M240E1 pintle-mounted machine gun.

2. Conditions. Given an LAV-25 with installed M240E1 7.62mm pintle-mounted machine gun, loaded with 200 7.62mm dummy rounds, appropriate tools, and technical manuals.

3. Standards. Within 5 minutes, the Marine must—

- Clear and fully unload the M240E1 7.62mm pintle-mounted machine gun, and stow the ammunition in the ammunition cans.
- Remove the M240E1 7.62mm pintle-mounted machine gun from its cradle, and remove the pintle-mount cradle from the LAV-25.
- Install the pintle-mount cradle onto the LAV-25, and install the M240E1 pintle-mounted machine gun into the cradle.

4. Evaluation Procedures.

The evaluator logs crew members on a roster. All materials and equipment needed for the task must be present and operational. The evaluator must use the performance checklists to score this task. Only one crewmember at a time is tested.

If the crewmember receives a **NO GO**, he is told what mistakes he made and actions required to correct them. The crewmember is tested in accordance with local SOP.

5. Personnel, Equipment, and Material Required:

- Qualified LCE.
- Operational LAV-25 with SL-3.
- Operational, installed, fully loaded M240E1 7.62mm pintle-mounted machine gun.
- 200 rounds 7.62mm dummy ammunition.
- Stopwatch.
- Clipboard and pen.

6. Pretest Preparation:

- Remove 7.62mm pintle-mounted machine gun and ensure all parts are present and operational.
- Ensure the pintle-mount gun cradle is installed securely on the LAV-25.
- Ensure the 7.62mm pintle-mounted machinegun mounts properly to the cradle.
- Install 7.62mm pintle-mounted machine gun.
- Ensure that the 7.62mm pintle-mounted machine gun is completely loaded.

7. Test Planning Time

Administrative:	5 minutes
Test:	<u>5 minutes</u>
Total:	10 minutes

Recommended Performance Checklist, Station 6

NAME: _____

GRADE: _____ UNIT: _____ DUTY POSITION: _____

TASK: Clear, remove, and install the M240E1 pintle-mounted 7.62mm machine gun.

PERFORMANCE STEPS	GO	NO GO
1. Unload the M240E1 pintle-mounted machine gun.	_____	_____
a. Pull the charging handle to lock the bolt to rear.	_____	_____
b. Place manual safety to <i>SAFE</i> position.	_____	_____
c. Open cover assembly.	_____	_____
d. Remove any ammunition from feed tray.	_____	_____
e. Raise feed tray.	_____	_____
f. Look in chamber to ensure no rounds are in chamber.	_____	_____
g. Close cover assembly.	_____	_____
h. Place manual safety to <i>FIRE</i> position.	_____	_____
i. Pull trigger, ride bolt forward.	_____	_____
j. Perform steps a through i in sequence.	_____	_____
2. Download 7.62mm ammunition.	_____	_____
a. Place ammunition in ammo cans.	_____	_____
b. Remove the ammunition can from the pintle-mount gun cradle.	_____	_____
c. Stow ammunition.	_____	_____
3. Remove M240E1 pintle-mounted machine gun.	_____	_____
a. Unlock and remove gun cradle securing pin.	_____	_____
b. Remove M240E1 from the pintle-mount gun cradle.	_____	_____
c. Remove the pintle-mount gun cradle from the LAV-25.	_____	_____
4. Install the M240E1 pintle-mounted machine gun.	_____	_____
a. Attach the pintle-mount gun cradle to the LAV-25.	_____	_____
b. Lock the M240E1 to the pintle-mount gun cradle.	_____	_____
e. Insert the gun cradle securing pin.	_____	_____
5. Completed performance steps within 5 minutes.	_____	_____

EVALUATOR'S NAME: _____

TEST DATE: _____ OVERALL SCORE: GO NO GO

REMARKS: _____

Test Station 7 - Boresight LAV-25 Turret Weapon Systems

1. Task. Boresight the LAV-25 turret weapons systems.

2. Conditions. Acting as a gunner, with the aid of one assistant, given an LAV-25 with SL-3; boresight adapter; boresight kit; and an M240 coax machine gun installed.

3. Standards. Within 15 minutes, the Marine boresights the turret weapons systems. (The Marine performs the task as a gunner and a vehicle commander; the assistant acts as the driver.) The Marine must—

- Align the gunner's DIM-36TH and the commander's M36 to show the same sight picture as the borescope.
- Align the installed coax machinegun to the 1000 meter reference point.

4. Evaluation Procedures.

The evaluator logs crew members on a roster. All materials and equipment needed for the task must be present and operational. The evaluator must use the performance checklists to score this task. Only one crewmember at a time is tested.

If the crewmember receives a **NO GO**, he is told what mistakes he made and actions required to correct them. The crewmember is tested in accordance with local SOP.

5. Personnel, Equipment, and Material Required:

- Qualified LCE.
- Operational LAV-25 with SL-3.
- Operational M240 coax machine gun.
- 25mm boresight kit and adapter.
- Stopwatch.
- Clipboard and pen.

6. Pretest Preparation:

- Insert 25mm boresight adapter and boresight telescope.
- Align telescope on a target approximately 1000 meters away.
- Ensure DIM-36TH and M36 are installed and secure, and will boresight.
- Offset the alignment of the sights.
- Instruct the assistant to act only as the driver.
- Ensure that the DIM-36TH is cooled down prior to testing any Marines.

7. Test Planning Time.

Administrative:	5 minutes
Test:	<u>15 minutes</u>
Total:	20 minutes

Recommended Performance Checklist, Station 7

NAME: _____

GRADE: _____ UNIT: _____ DUTY POSITION: _____

TASK: Boresight the LAV-25 turret weapons systems.

PERFORMANCE STEPS	GO	NO GO
1. Turn on the thermal sight.	_____	_____
2. Align the day sights.	_____	_____
a. Clear both the main gun and the coaxially mounted machine gun.	_____	_____
b. Locate aiming point on target at 1000 meters.	_____	_____
c. Set turret drive lock lever to unlock.	_____	_____
d. Ensure sights are properly installed and secure.	_____	_____
e. Manually move turret/gun to place day sight reticle boresight cross on chosen aiming point.	_____	_____
f. Setup the boresight adapter and telescope.	_____	_____
g. Move turret/gun manually to lay boresight telescope reticle on aiming point. (Assistant guides the Marine.)	_____	_____
h. Adjust gunner's day sight to align boresight cross on the aiming point.	_____	_____
i. Set deflection and elevation collars to midscale (4).	_____	_____
j. Repeat steps h and i for the commander's day sight.	_____	_____
3. Align the thermal sight.	_____	_____
a. Ensure that daysight boresight cross is on chosen aiming point.	_____	_____
b. Set System Mode switch to <i>BORESIGHT</i> .	_____	_____
c. Set Field of View to <i>NARROW</i> .	_____	_____
d. Using boresight switch, align thermal boresight cross to same aiming point as daysight.	_____	_____
e. Manually place the thermal sight battlesight circle on the same aiming point.	_____	_____
f. Set Field of View to <i>WIDE</i> .	_____	_____
g. Using the boresight switch, align the dot in the center of the Wide Field of View to the same aiming point.	_____	_____
h. Turn the System Mode switch to <i>NORMAL</i> .	_____	_____
4. Boresight the coax.	_____	_____
a. Manually move the turret/guns to place the day sight reticle boresight cross on the chosen aiming point.	_____	_____
b. Install the boresight telescope and red streamer in the barrel of coaxially mounted gun.	_____	_____
c. Adjust gun elevation and azimuth drives to align the boresight telescope with the aiming point.	_____	_____
d. Remove and store boresight telescope and streamer.	_____	_____
5. Completed performance measures within 15 minutes.	_____	_____

EVALUATOR'S NAME: _____

TEST DATE: _____ **OVERALL SCORE:** **GO** **NO GO**

REMARKS: _____

Score Sheet For The LAV-25 Gunnery Skills Test

MARINE'S NAME: _____

SSN: _____ RANK: _____ UNIT: _____

DUTY POSITION: _____ TEST DATE: _____

STATION	RESULTS	
	GO	NO GO
1. Load the M242 25mm automatic gun.		
2. Clear, remove, disassemble, assemble, and install the M242 25mm automatic gun.		
3. Load the M240 7.62mm coaxially mounted machine gun.		
4. Clear, remove, disassemble, assemble, and install the M240 7.62mm coaxially mounted machine gun.		
5. Load the M240E1 pintle-mounted machine gun.		
6. Clear, remove, and install the M240E1 pintle-mounted machine gun.		
7. Boresight LAV-25 turret weapon systems.		

Appendix E

Basic Gunnery Tables

Basic gunnery tables train crewmembers in the engagement of targets using battlesight and precision gunnery, and fire adjustment techniques. Basic gunnery includes the firing of subcaliber tables 1 through 3. Tables are fired using day and

night, or limited visibility conditions. The thermal or the passive sight may be used at night; units are encouraged to use both throughout training.

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Table 1. Precision Gunnery Manipulation

Table 1 is a precision gunnery manipulation exercise designed to evaluate each crewmember's ability, acting as a gunner, to properly range and aim at frontal and flank targets at varied ranges. Table 1 reinforces precision gunnery ranging skills, and drills the crewmembers in precision gunnery aiming procedures.

Table 1 is divided into three phases that should be run successively. Table 1 is a scaled laser range that uses the visual aiming device (VAD) with the manipulation board (see fig. E-1). The manipulation board is placed 23 meters in front of the firing vehicle, and the targets are sized according to figure E-1. Crewmembers must achieve a **GO** on all three phases to receive a **GO** on table 1.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Engage five targets per phase.

Conditions. Given one shot per target, with the VAD.

Standards. Hit 4 of 5 targets within 15 seconds per phase.

Conduct

Evaluator aligns and zeros the laser by aiming at each target, and placing a 1/2-inch marker on stout board in front of the vehicle prior to evaluating any crewmembers. Evaluator should check zero of the day and night sights.

Manipulation board is placed 23 meters in front of the firing vehicle.

Target markers on stout board are no greater than 1/2-inch in diameter.

Each crewmember is evaluated from the gunner's station.

Evaluator numbers each target per phase at random prior to conducting table 1.

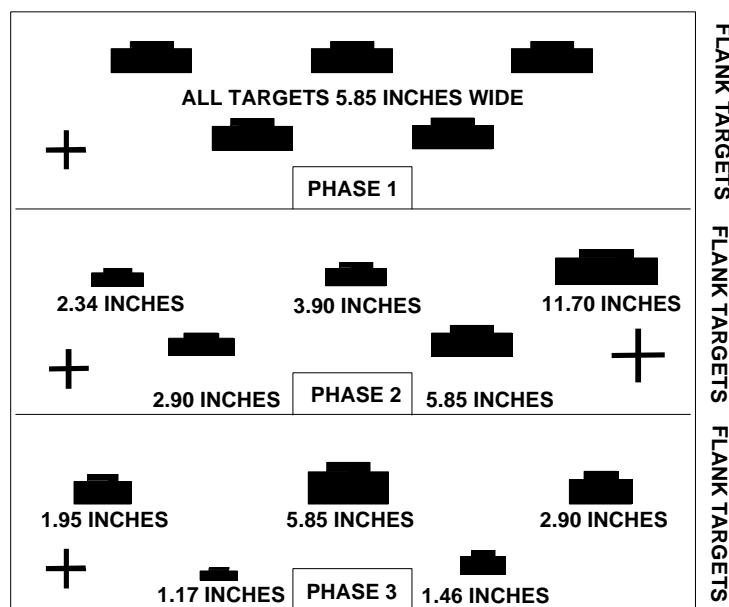


Figure E-1. Manipulation Board.

Firing Tasks

Phase I, flank manipulation, evaluates the gunner's ability to shift rapidly from target to target at a constant range. Crewmember starts at the start cross, and engages targets in numerical order, one shot per target.

Phase II, progressive flank manipulation, evaluates the gunner's ability to rapidly shift from multiple targets at progressively decreasing ranges. Crewmember starts at the start cross, and engages targets in numerical order, one shot per target.

Phase III, non-progressive frontal manipulation, evaluates the gunner's ability to rapidly shift from multiple frontal targets at varied nonprogressive ranges. Crewmember starts at the start cross, and engages targets in numerical order, one shot per target.

Crewmember repeats all phases during reduced visibility using the thermal night sight.

Note: The passive sight cannot be used for training in this table.

Scoring Procedures

Time starts for each phase when the gunner fires at the start cross, and ends when the gunner fires at the last target.

Score each target as a hit or a miss. If 50 percent of the laser strike is outside the 1/2-inch target on the stout board, it is a miss.

Allowable Variations

Reduced visibility tasks may be fired during the day with the thermal night sight as long as targets on manipulation board are properly thermalized.

Table 2.

Battlesight Gunnery Manipulation

Table 2 is a battlesight gunnery manipulation exercise designed to evaluate the crewmember's ability, acting as gunner, to properly aim at frontal targets representing "most dangerous" threats to the crew. The focus of the table is evaluating the crewmember's ability to consistently use the proper battlesight aiming point based on the target and selected ammunition.

Table 2 uses the VAD and a scaled target panel (fig. E-2) that is manufactured locally. The scaled target panel is placed 23 meters in front of the firing vehicle, and the targets are sized in accordance with figure E-2. Crewmembers must hit four of five high explosive (HE) targets within the center mass circle and four of five armor piercing (AP) targets within the 6 o'clock circle.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Engage ten targets.

Conditions. Given one shot per target with the VAD, engage targets in numerical order starting from the zero circle.

Standards. Hit 4 of 5 HE targets within the center mass circle and four of five AP targets within the 6 o'clock circle within 30 seconds in order to receive a **GO** on table 2.

Conduct

Evaluator zeros VAD, day sight, and night sight prior to evaluating any crewmember. Laser is zeroed to the battlesight circle on day sight and thermal sight reticles and to the center cross on the passive night sight reticle.

Crewmember's first shot will be at the zero circle (unevaluated) to initiate table start.

Crewmember fires the table from the gunner's station for day fires and thermal night fires and fires from the commanders station for reduced visibility fires with the passive night sight.

Evaluator numbers each target at random prior to conducting table 2.

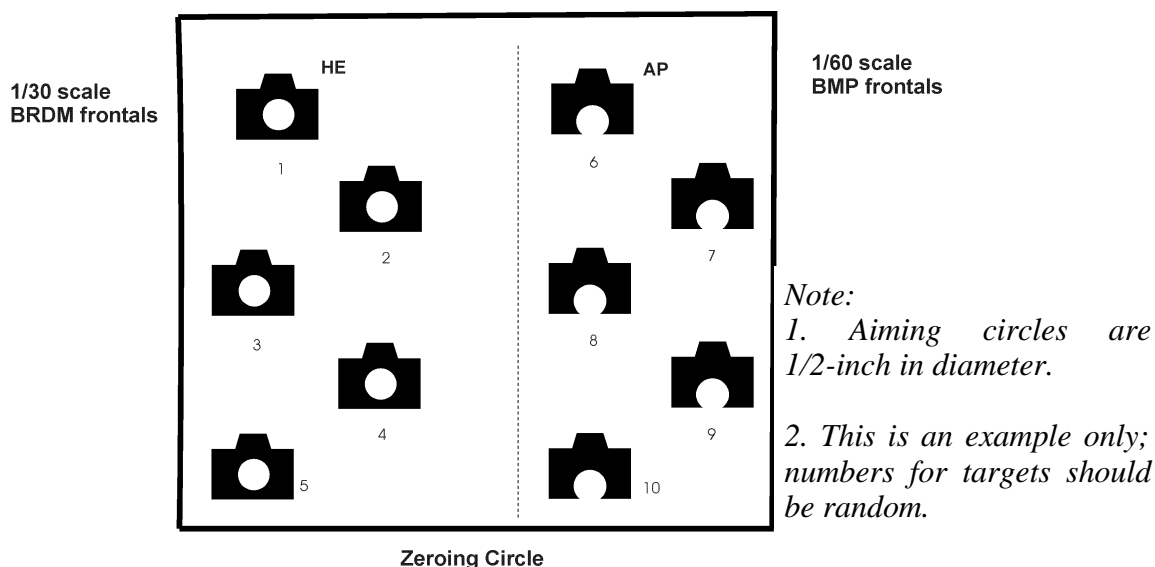


Figure E-2. Scaled Target Panel.

Firing Tasks

Starting at the zero circle, crewmember engages targets in numerical order given one shot per target.

The firing task is repeated during reduced visibility using the thermal night sight.

The firing task is repeated during reduced visibility using the passive night sight.

Scoring Procedures

Time starts when the crewmember engages the zero circle and ends when the crewmember engages target 10.

Laser strikes more than 50 percent outside the center, and 6 o'clock circles will be evaluated as misses.

Allowable Variations

Reduced-visibility thermal engagements may be fired during the day from the thermal sight.

Table 3.**Adjustment of Fire on Stationary and Moving Targets**

Table 3 is used to train the commander and the gunner in the fundamentals of direct fire adjustments. Table 3 requires them to use methods of adjustment because error is induced into the sighting system. They use battlesight gunnery aiming techniques when engaging targets on table 3. The commander and the gunner are evaluated on the proper use of fire commands to conduct the exercise. The crew duties are critiqued, but they have no effect on the overall rating.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Employ direct fire adjustment techniques against stationary and moving targets.

Conditions. Using the M16A2 or M240 as the subcaliber device, adjust fire from a first round miss. Tasks are fired from a stationary LAV-25 against stationary and moving targets using tracer ammunition.

Standards. Crewmembers use correct adjustment techniques, and hit the target with the second round to meet the minimum standards. Crewmembers must receive a **GO** on each task to receive a **GO** on table 3.

Conduct

Master gunner or LAV-25 crew evaluator (LCE) induces error into the fire control sighting system prior to evaluating any crewmembers on table 3.

- M16A2 (5.56mm), 1/20 scale, 100 meters.
- M16A2 (.22 cal), 1/60 or 1/35 scale, 60 meters.
- M240 (7.62mm), 1/5 scale, 400 meters.

Note: If zeroing the subcaliber device is not accurate, reduce range scale and range as appropriate.

Firing Tasks

Task 1. The commander issues a battlesight fire command while laying the gun for direction. The gunner identifies and, on command, engages the target. Since error was induced into the fire control system, the initial round will be off target requiring the gunner to use proper adjustment techniques to hit the target with the second round. Five targets are engaged in this manner, two rounds per target using the day sight.

Task 2. The commander repeats task 1 from the gunner's position.

Task 3. Gunner repeats task 1 against five moving targets.

Task 4. The commander repeats task 3 from the gunner's position.

All tasks are repeated during reduced visibility using the passive and thermal night sight. The gunner uses the thermal sight for tasks 1 and 3; the commander uses the passive sight for tasks 2 and 4.

The appropriate scaled range size and range depth for the recommended subcaliber devices are—

Scoring Procedures

Table 3, Adjustment of Fire on Stationary and Moving Targets.

TASK	TARGET CONDITION	AMMUNITION	HIT	TIME	CREW DUTIES	RATING
Apply direct fire adjustment using the gunner's controls.	5 stationary targets	10 rounds	3 of 5 in 0-2	30 30+	Sat Unsat	GO NO GO
Apply direct fire adjustment using the commander's controls.	5 stationary targets	10 rounds	3 of 5 in 0-2	30 30+	Sat Unsat	GO NO GO
Apply direct fire adjustment using the gunner's controls.	5 stationary targets	10 rounds	3 of 5 in 0-2	30 30+	Sat Unsat	GO NO GO
Apply direct fire adjustment using the commander's	5 stationary targets	10 rounds	3 of 5 in 0-2	30 30+	Sat Unsat	GO NO GO

For all tasks, time starts when the commander or gunner issues the alert element of the fire command, and time stops when the commander issues **CEASE FIRE** on the fifth target.

Crew duties are critiqued but have no effect on the overall rating on table 3.

Allowable Variations

Reduced-visibility firing for the gunner may be accomplished during the day as long as the night sight is used.

The commander's reduced-visibility firing is in darkness due to the nature of the commander's night sight.

If moving targets are not available, they may be substituted with stationary frontal targets.

Appendix F

Sustainment Gunnery Tables

Tables 4 through 8 are sustainment gunnery tables. Sustainment tables are designed to reinforce, evaluate, and drill precision and battlesight skills demonstrated during crew qualification and ensure these skills do not perish. Sustainment gunnery enables commanders to meet existing training requirements, i.e., nuclear, biological, and chemical (NBC) gunnery, and allows commanders and master gunners to mold training to correct deficiencies identified during gunnery density analysis.

Sustainment gunnery takes crews that successfully complete basic gunnery and equips them with the skills necessary to fire full caliber ammunition and complete crew qualification. A unit should not implement sustainment gunnery prior to conducting gunnery density analysis and identifying strengths and weaknesses.

Sustainment tables can and should be modified to suit unit's training needs as identified in gunnery density analysis. Any modification done should maintain the intent of the table. If the intent of the table would be changed, then modification should be avoided. An alternative would be alternate training to provide the training needed.

Evaluation Procedures and Standards

Sustainment gunnery tables include crewmember and crew evaluation. Each table specifies who is

evaluated, and lists the standards necessary to complete the table successfully. All crews/crewmembers are evaluated in accordance with the listed standards, and crews/crew members are critiqued after each evolution to discuss performance. Qualified LAV-25 crew evaluators (LCEs) should conduct tables, and the same LCE should conduct the critiques and remediation, if required.

The LCE must time each table in accordance with the outlined procedures. The LCE evaluates the tables in accordance with the standards outlined in the table.

Each table is evaluated as a **GO** or a **NO GO**. The criteria to receive a **GO** varies, but is outlined in the table.

Ammunition. Most of sustainment gunnery is conducted using the visual aiming device (VAD) as the subcaliber device, allowing the evaluator to judge whether the gunner is using proper procedures. It is highly critical that the evaluator properly zero the VAD prior to evaluation. (See chap. 7 for zeroing procedures). On table 7, the M16A2 firing 5.56mm tracer is used as the subcaliber device. Using the M16 on any table other than table 7 will destroy the validity of that table due to the nature of the sighting system. The flat trajectory of the 5.56mm makes it impossible to accurately evaluate aiming techniques other than battlesight on scaled (reduced) ranges.

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Table 4.
Range Determination Exercise

Table 4 begins the sustainment phase of the gunnery training program. Table 4 is a range determination exercise designed to evaluate the crewmember's ability to determine range to targets at various distances and under various conditions with the aided and unaided eye. The focus of the table is to evaluate the crewmember's ability to determine—

- If lightly armored targets are within battlesight range.
- If rocket propelled grenade (RPG) teams are within effective range.
- Range accurately in a timely manner.

Table 4 is divided into three phases that should be conducted concurrently. There is no requirement for a multipurpose range complex (MPRC); table 4 can be operated in any area with the available range to place targets at the tasks' prescribed ranges. Crewmembers must achieve a **GO** on all 3 phases to receive a **GO** on table 4.

Phase I

Phase I evaluates each crewmember's ability to determine, with the unaided eye, whether a lightly armored target is within battlesight range and whether an RPG-7 team is within its' effective range. This phase aids the crew members in determining which engagement method to use and reinforces target priority in multiple personnel carrier (PC)/RPG engagements.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Select an engagement method by determining if a lightly armored target is within battlesight range, and determine if an RPG team is within effective range.

Conditions. With the unaided eye, given an ammunition, using full-scale threat targets presented at various ranges in accordance with the chart below, accomplish each of the table's tasks.

AMMUNITION

APDS-T

HEI-T

BATTLESIGHT RANGE

0-1400 meters

0-950 meters

RPG-7 effective range: 300-500 meters

Standards. Each task must be accomplished within 5 seconds of receiving the appropriate ammunition/weapon by the evaluator in order to receive a **GO** for that task. Each crewmember must receive a **GO** on 8 of the 10 tasks to receive a **GO** on phase I.

Tasks

1 through 5: Given one lightly armored target per task, determine within 5 seconds each if the target is within battlesight range for the selected ammunition.

6 through 10: Given one RPG team per task, determine within 5 seconds each if the target is within its effective range.

Conduct

Evaluator will inform the crewmember which ammunition or weapon he is to base his decisions on prior to each task.

Targets will be full-scale targets placed at actual range. Number of targets within battlesight range for tasks 1 through 5 is at the discretion of the commander. At least two of the tasks will be used for each ammunition's respective battlesight range.

Scoring Procedures

Phase I time begins when the evaluator gives the crewmember the weapon/ammunition used, and time ends when the crewmember announces which engagement method is used (i.e., battlesight or precision) or whether the RPG team is within its effective range.

Phase II evaluates the crewmember's ability to determine range to various targets with the aid of binoculars using the mil-relation rule. This phase reinforces skills required by the vehicle commander when determining range.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Determine the range to various targets.

Conditions. Given half- and full-scale threat targets, using binoculars from a stationary vehicle, determine range to targets.

Standards. Determine range within 200 meters and within 10 seconds to receive a **GO** on each task. Crewmember must receive a **GO** on 8 of the 10 tasks in order to receive a go on phase II.

Tasks

1 through 5. Given one lightly armored target per task, determine range within 200 meters and 10 seconds for each target.

6 through 10. Given one infantry target per task, determine range within 200 meters and 10 seconds for each target.

Conduct

All targets will be placed in a manner so that target reference points (TRPs) can be designated adjacent to the targets. Evaluator will direct crewmember to determine range to target adjacent to selected TRP.

Lightly armored targets may be half-scale and placed at ranges from 400-1000 meters (actual range) to simulate a range from 800-2,000 meters.

Infantry targets will be full-scale and placed at actual range from 300-800 meters.

Scoring Procedures

Phase II time starts when the evaluator informs the crewmember of the TRP adjacent to the target, and time ends when the crewmember announces the range.

Phase III evaluates the crewmember's ability, acting as gunner, to determine range to various targets using the reticle of the M36 day and thermal sight.

Note: Targets will require thermalization in accordance with FM 25-7.

This phase reinforces skills required by the gunner when ranging targets for precision gunnery.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Determine range to various targets.

Conditions. On a half-scale range, using the M36 sight from a stationary and moving vehicle, determine the range to targets.

Standards. Determine range to each target within 100 meters within 10 seconds to receive a **GO** on each task. Crew must achieve a **GO** on 4 of the 5 tasks to receive a **GO** for phase III.

Tasks

Determine range to a BMP 700-1,000 meters from a stationary vehicle.

Determine range to a BMP 1400-1,600 meters from a stationary vehicle.

Determine range to a BRDM 600-800 meters from a moving vehicle.

Determine range to a BTR 1,000-1,200 meters from a stationary vehicle.

Determine range to a truck 1,000-1,200 meters from a moving vehicle.

Repeat all tasks during reduced visibility with the thermal night sight.

Conduct

Phase III may be conducted on a half-scale range.

All targets are presented individually.

The evaluator, acting as vehicle commander, may lay the gun on target, and issue a fire command.

Scoring Procedures

Phase III time starts when the vehicle commander (evaluator) lays the gunner on target and gives the

fire command, and time ends when the gunner announces the range.

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Table 5.

Target Acquisition Exercise

Table 5 is a target acquisition exercise designed to evaluate the crew's ability to acquire and identify single and multiple vehicles and infantry threat targets from both a stationary and a moving vehicle. Table 5 reinforces acquisition skills required by the crewmembers, and drills the crewmembers in target search techniques.

General Instructions to Crewmembers Task, Conditions, and Standards

Task. Acquire and identify single and multiple vehicles and infantry targets.

Conditions. From a stationary and moving vehicle, using available optics and search techniques.

Standards. Each task must be accomplished within 10 seconds of full target exposure. In order to receive a **GO** on each task, the crew must acquire and identify all targets in the task within the time limit. The crew must receive a **GO** on 8 of the 10 tasks to receive a **GO** on table 5.

Conduct

Table 5 can be conducted on a 1/2-scale range at the commander's discretion.

All targets must be accurate in scale and appearance.

Frontal or flank targets may be used at the commander's discretion.

Table 5 can be modified to suit unit training needs identified in training analysis.

Tasks

See table diagram.

Table is repeated during reduced visibility.

Scoring Procedures

Time starts for all tasks when the target(s) are fully exposed, and time ends when the vehicle commander/gunner completes the fire command.

Table 5 Target Acquisition Exercise.

TASK/LAV-25 CONDITION	TARGET CONDITION	TIME	GO	NO GO
Acquire single target from a stationary LAV-25.	Stationary BMP, 1400-1700 meters	10 seconds		
Acquire multiple targets from a stationary LAV-25.	Stationary BTR, 600-800 meters RPG team, 300-500 meters	10 seconds		
Acquire single target from a moving LAV-25.	Stationary BTR, 600-1000 meters	10 seconds		
Acquire multiple targets from a moving LAV-25.	2 stationary BTRs, 1000-1400 meters	10 seconds		
Acquire multiple targets from a stationary LAV-25.	Dismounted troops, 500-700 meters RPG team, 300-500 meters	10 seconds		
Acquire single target from a moving LAV-25.	Stationary truck, 500-700 meters	10 seconds		
Acquire multiple targets from a stationary LAV-25.	2 stationary BMPs, 1400-1700 meters	10 seconds		
Acquire single target from a moving LAV-25.	RPG team, 500-700 meters	10 seconds		
Acquire multiple targets from a moving LAV-25.	Stationary BTR, 800-1000 meters Stationary BMP, 800-1000 meters	10 seconds		
Acquire single target from a stationary LAV-25.	Dismounted troops, 700-1000 meters	10 seconds		

Table 6.

Precision Gunnery—Scaled Range

Table 6 is a scaled, precision gunnery range designed to evaluate the crew's ability to function as a unit, and the gunner's ability to use precision aiming procedures on threat targets at various ranges. Crew duties are evaluated on table 6 as satisfactory or unsatisfactory.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Engage single and multiple vehicle targets.

Conditions. Given one shot per target with a visual aiming device (VAD), from a stationary vehicle, using precision gunnery techniques.

Standards. To achieve a *GO* on a task, the crew must hit all targets in that task and receive a "SAT" on crew duties within the established time. To receive a "SAT," the vehicle commander must properly lay the gunner on target and issue an appropriate fire command. To achieve a *GO* on table 6, the crew must receive a *GO* on 8 of the 10 tasks.

Conduct

Table 6 will be conducted on a scaled range with appropriately scaled targets.

Evaluators will zero each target to the stout board with 1/2-inch markers prior to evaluating any crews.

If lifters are not used to present the targets, the evaluator must ensure that placards are placed adjacent to each engagement and the evaluation must also identify the engagement to the crew by placard number. If the engagement includes a moving target, the evaluator will tell the crew

which target is simulated to be moving. The crew will not receive any training in tracking; they will be drilled on the proper lead angle used when firing at moving targets.

Moving targets will be represented on the stout board by the evaluator placing the mark 5 mils ahead of the target for armor piercing (AP) and 10 mils ahead of the target for high explosive (HE). This will evaluate the crew's ability to use the standard leads for the appropriate ammunition since it is impossible to zero a moving target to the stout board.

Evaluator must ensure that any targets within battlesight range are presented as dangerous or least dangerous targets (i.e., presented as flank or rear targets).

Tasks

Repeat table under reduced visibility and limited visibility conditions using thermal night sight.

Scoring Procedures

Time starts for all tasks when either the target(s) is fully exposed or the evaluator identifies the engagement to the crew by stating the placard number. Time ends when the vehicle commander announces *CEASE FIRE*.

Markers placed on the stout board should be no greater than 1/2-inch in diameter, and laser strikes where 50 percent of the laser is outside the marker are evaluated as misses.

Allowable Variations

Reduced visibility firing of the table can be accomplished during the day as long as the night sight is used.

If moving targets are not available, stationary frontal targets may be substituted.

**Table 6 Precision
Gunnery—Scaled Range.**

TASK	TARGET CONDITION	AMMUNITION	TIME	CREW DUTIES	
				SAT	UNSAT
Engage Multiple Targets	2 Stationary BMPs, 1400 meters	2 RDS lasers	20 seconds		
Engage Single Target	1 Moving BRDM, 1100 meters	1 RDS laser	15 seconds		
Engage Multiple Targets	1 Moving BMP, 1200 meters 1 Stationary BTR, 1000 meters	2 RDS lasers	20 seconds		
Engage Single Target	1 Stationary BTRs, 1500 meters	1 RDS laser	15 seconds		
Engage Multiple Targets	2 Stationary BRDMs, 1300 meters	2 RDS lasers	20 seconds		
Engage Single Target	1 Moving BMP, 1500 meters	1 RDS laser	15 seconds		
Engage Multiple Targets	1 Stationary BMP, 1600 meters 1 Stationary BTR, 1600 meters	2 RDS lasers	20 seconds		
Engage Multiple Targets	1 Stationary BRDM, 1000 meters 1 Stationary BMP, 1200 meters	2 RDS lasers	20 seconds		
Engage Multiple Targets	2 Moving BMPs, 1400 meters	2 RDS lasers	20 seconds		
Engage Single Target	1 Stationary BMP, 1700 meters	1 RDS laser	15 seconds		

Table 7.

Battlesight Gunnery—Scaled Range

Table 7 is a battlesight gunnery exercise fired on a scaled range designed to evaluate the crew's ability to function as a unit and the gunner's ability to use battlesight gunnery aiming and adjusting techniques on threat targets within battlesight range. The M16A2, firing 5.56mm tracer, is the subcaliber device recommended for firing table 7. Crew duties are evaluated on table 7 as satisfactory or unsatisfactory.

General Instructions to Crewmembers on Task, Conditions, Standards

Task. Engage single and multiple vehicle targets.

Conditions. Exercising proper crew duties, given one round sensing and one round to adjust with the M16A2 for each target, from a stationary vehicle and using battlesight gunnery techniques.

Standards. To receive a *GO* on each task, the crew must hit all targets in that task and receive a "SAT" on crew duties within the established task time. To receive a "SAT," the vehicle commander must properly lay the gunner on target and issue an appropriate fire command. To achieve a *GO* on table 7, the crew must achieve a *GO* on 8 of the 10 tasks.

Conduct

Table 7 will be conducted on a 1/30- or 1/60-scaled range with appropriately scaled targets.

Scoring is conducted by moving down range after table and verifying/pasting shot holes.

Evaluator will zero subcaliber device to battlesight circle prior to evaluating any crews.

If target lifters are not used, placards will be placed near each engagement for the crews to use as guides, and the evaluator will identify the engagement to the crew by placard number.

Two 16 round magazines will be prepared for the crew and changed for the crew after task 5.

Tasks

All tasks will be repeated during reduced visibility using the thermal sight, and the passive night sight.

Scoring Procedures

Time starts for each engagement when the targets are fully exposed or the evaluator instructs the crew on the engagement by giving them a placard number. Time stops when the vehicle commander announces *CEASE FIRE*.

Targets are scored by visually inspecting them for shot holes. One hit is required to get credit for that engagement.

Allowable Variations

Reduced visibility firing can be accomplished during the day as long as the thermal night sight is used.

If moving targets are not available, a stationary frontal target may be substituted.

Table 7 Battlesight Gunnery—Scaled Range.

TASK	TARGET CONDITION	AMMUNITION	TIME	CREW DUTIES	
				SAT	UNSAT
Engage Multiple Targets	2 stationary BMPs, 1400 meters	4 RDS 5.56T	20 seconds		
Engage Single Target	1 stationary BMP, 1100 meters	2 RDS 5.56T	10 seconds		
Engage Multiple Targets	2 stationary BMPs, 900 meters	4 RDS 5.56T	20 seconds		
Engage Single Target	1 stationary BMP, 1000 meters	2 RDS 5.56T	10 seconds		
Engage Multiple Targets	2 stationary BMPs, 1300 meters	4 RDS 5.56T	20 seconds		
Engage Single Target	1 stationary BMP, 800 meters	2 RDS 5.56T	10 seconds		
Engage Multiple Targets	2 stationary BMPs, 1000 meters	4 RDS 5.56T	20 seconds		
Engage Multiple Targets	2 stationary BMPs, 1200 meters	4 RDS 5.56T	20 seconds		
Engage Multiple Targets	2 stationary BMPs, 1100 meters	4 RDS 5.56T	20 seconds		
Engage Single Target	1 stationary BMP, 1000 meters	2 RDS 5.56T	10 seconds		

Table 8.

NBC Gunnery

Table 8 is an NBC gunnery exercise fired with full caliber ammunition, designed to evaluate the crew's ability to function in an NBC environment. The table is fired in mission-oriented protective posture (MOPP) condition 4 with all vehicle hatches buttoned. Crew duties are not evaluated on table 8; however, crew duties are critiqued at the conclusion of the table.

General Instructions to Crewmembers on Task, Conditions, Standards

Task. Engage single and multiple vehicle and infantry targets.

Conditions. In MOPP-4, with all hatches buttoned, from both a stationary and a moving vehicle, against targets in battlesight range.

Standards. To receive a *GO* on table 8, the crew must achieve 70 points or more on 5 of the 8 tasks.

Conduct

Table 8 is fired on a full-scale range with full caliber ammunition. Units design table 8 to meet unit NBC requirements using the following guidelines:

- Eight firing tasks including targets in battlesight range.
- Four offensive and 4 defensive tasks.
- An even distribution of single and multiple PC and infantry engagements.
- A simultaneous engagement.

Scoring Procedures

All tasks are scored using matrices H-3 and H-4.

The time starts for each engagement when the vehicle commander issues the alert element of the fire command, and the time stops when the vehicle commander announces *CEASE FIRE* for the final time in the engagement.

Appendix G

Intermediate Gunnery Tables

Tables 9 through 12 are intermediate gunnery tables. Intermediate tables begin single vehicle, crew, full caliber ammunition firing. Skills drilled during sustainment gunnery are applied when firing full caliber ammunition. The culmination of the intermediate tables is crew qualification, table 12. The crew is evaluated on its ability to engage single and multiple, moving and stationary, vehicle and infantry targets, using battlesight and precision gunnery techniques from a moving and stationary LAV-25.

Crew qualification enables crews to naturally progress to advanced gunnery, having mastered the individual and crew skills necessary to operate as a crew within an LAV-25 section. Successful intermediate gunnery depends heavily on a strong foundation of sustainment gunnery and a thorough follow up by commanders and master gunners to ensure the objectives and intents of the tables are met before progressing.

Evaluation Procedures and Standards

Intermediate gunnery tables evaluate the crew as a unit. Performance of crew duties is noted and critiqued, but does not always affect a crew's overall rating on all tables. The LAV-25 crew evaluator (LCE) responsible for evaluating the crew is solely responsible for debriefing the crew and providing any necessary corrective action. The intermediate tables are structured to allow progressive evaluation of crew duties. This is accomplished by critiquing crew duties on tables 9 and 10 without weighing the crew's performance against the crew's overall table results. Beginning at table 11, crew duties are integrated into the table results allowing crews to naturally progress from firing

subcaliber on scaled ranges to firing full caliber on a multipurpose range complex (MPRC).

Timing Procedures

Acquisition Time. Acquisition time is the time the crew uses on each precision gunnery engagement to acquire the target. Acquisition time starts when the target(s) are fully exposed. The time ends when 10 seconds elapses, or the gunner announces **IDENTIFIED**. If the crew acquires the target(s) within the 10 seconds, they receive a **GO** on acquisition. If they do not acquire the target(s), they receive a **NO GO** on acquisition. This notation is not intended to penalize the crew; but is designed for the evaluator to recognize trends, and to identify areas of strength and weakness within each crew during the conduct of fire.

Exposure Time. Exposure time is defined as the time the firing vehicle is exposed to the threat (target[s]). Exposure time always starts when the target(s) is fully exposed and always ends when the target(s) are destroyed. Exposure time must be recorded for each task that is fired, and for each target that is presented. Exposure time may be recorded by the LCE or the tower operator when using computerized targeting. The determination of which method to use to record exposure time will be made after consideration of a number of factors. These factors include, but are not limited to: type of engagement; ability of tower operators; visibility; target array; and availability of assets (personnel/equipment). Regardless of method used, it must be consistent throughout the firing evolution. Often, the decision is based on consistency alone. The ability of numerous LCEs to maintain consistent recording is sometimes limited.

Target Exposure Time. Target exposure time is the time the target is programmed to be exposed to the firing vehicle. This time will always be sufficient for the crew to acquire the target and destroy it while meeting the minimum engagement criteria. Exposure time will vary from target to target depending on the matrix used for scoring. Master gunners must remember to add target lift time into target exposure time.

Precision and Battlesight Engagements. Exposure time for all engagements starts when the targets are fully exposed. When this condition is met, the firing vehicle is considered exposed to the threat, and the timing for the engagement (exposure time) starts. Time for the engagement stops when all targets are killed or target exposure time has expired.

Offensive/Defensive Engagements. Since all engagements start from either the hull-down (partially exposed) or the exposed position, there are no special rules concerning timing for offensive or defensive engagements.

Multiple Engagements. Multiple engagements are engagements with more than one target, and they are to be engaged either sequentially or with the same weapon. The timer must maintain a stop (kill) time for each target. The timer notes exposure (kill) time for each target and this time is used for scoring. It is important to note that exposure time for both targets starts when both the targets are fully exposed. When the firing vehicle is engaging the first target, time is running on the second target. The only exception is during a multiple battlesight engagement. In this case, the time for the second target starts when the first target is destroyed.

Simultaneous Engagements. Simultaneous engagements (e.g., M242 and M240E1) are engagements with more than one target, and the targets are to be engaged at the same time with different weapons. Simultaneous engagements are scored with point calculation worksheets (PCW's). Timing procedures for simultaneous engagements are the same as multiple precision engagements. When the crew is engaging the first target, time is running on the second target.

Standards

Coaxial Machine Gun/Pintle-Mounted Machine Gun Engagements.

Area Engagements. Full credit is given when the crew has suppressed the target area in accordance with the area target engagement technique. The LCE will announce *SUPPRESSION* to the crew when the conditions of the engagement have been met.

Point Engagements. Full credit is given when a target hit is achieved on 1 of 2 or 1 of 3 infantry remoted target system (IRETS).

25mm Engagements. Full credit is given, regardless of ammunition or method of engagement, when target receives three hits.

Scoring Procedures

Scoring matrices and PCWs are used to determine the level of proficiency during intermediate gunnery. Scoring matrices are used to evaluate precision gunnery and PCWs are used to evaluate battlesight gunnery. The scoring matrices incorporate target threat at varying ranges in relation to exposure time. The PCWs incorporate target threat based capabilities at specific ranges in relation to the exposure time and conditions affecting the threat gunner. Each task lists the appropriate scoring method to use. The timer records times, and figures the crew's score per task in accordance with the following procedures:

Scoring Matrices (Single Engagements)

The timer—

- Records exposure (kill) time.
- Reads across the column from the exposure time and notes the score.
- Subtracts crew cuts assessed during the task.
- Circles *GO* for acquisition unless the crew failed to acquire the target within 10 seconds of target exposure.

The result is the crew's final score for the task.

Scoring Matrices (Multiple Target Engagements)

The timer—

- Record the exposure time for each target in the engagement.
- Uses second exposure (kill) time and reads across to the “kill two” column and notes the score, if both targets were killed. Then, the timer uses the first exposure time, and reads across to the “kill one” target column and, notes the score. Uses the higher score (the crew is given the benefit of the doubt).
- Uses the exposure time for the target and reads across to the “kill one” target column, noting score, if one target is killed.
- Uses either score from (b) or (c) (whichever is appropriate) and subtracts crew cuts assessed during the task.
- Circles **GO** for acquisition unless the crew failed to acquire the target within 10 seconds of target exposure.

The result is the crew’s final score for the task.

PCWs (Single Target Engagements)

The timer—

- Notes exposure (kill) time, target type, target range, and conditions effecting the threat gunner.
- Uses the appropriate worksheet, based on the factors above, and reads across for the score for the exposure time.
- Subtracts crew cuts assessed during the task.

The result is the crew’s final score for the task.

PCWs (Multiple Engagements)

The timer—

- Notes exposure (kill) times for target types, target ranges, and conditions affecting the threat gunners.

- Uses the appropriate worksheets, based on the factors above, to determine score for each target as in single target engagements.
- Records the average by adding the two scores and dividing by two.
- Subtracts crew cuts assessed during the task.

The result is the crew’s final score for the task.

PCWs (Simultaneous Engagements)

The timer—

- Notes the exposure (kill) time when both targets were killed, the target types, target ranges, and conditions effecting the threat gunners.
- Uses the appropriate worksheets, based on the above factors, to determine the score for each target. Note that the same exposure time will be used for both targets.
- Adds the two scores together and obtains an average by dividing by two.
- Subtracts crew cuts assessed during the task.

The result is the crew’s final score for the task.

Ammunition. For the conduct of intermediate gunnery—

- APDS-T/TPDS-T ammunition is used against BMP targets.
- HEI-T/TP-T ammunition is used against all other vehicle targets.
- 7.62mm ammunition is used against all infantry type targets.

Commander’s Engagement. The commander will fire one engagement per Intermediate gunnery table (day or night) based on the training analysis.

Allowable Variations. Each table specifies the variations specifically allowed for that table. However, for tables 9 through 11, altering tables for training requirements or range deficiencies is always acceptable but the intent of the tables should never be altered.

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Table 9.

Full Caliber Battlesight

Table 9 is a full caliber battlesight table, fired on a full scale range, designed to reinforce battlesight engagement techniques. Battlesight aiming procedures drilled during sustainment gunnery, Table 7, are combined with direct fire adjustment techniques in preparation for crew qualification. Crew duties are evaluated and critiqued after each firing evolution.

General Instruction to Crewmembers on Task, Conditions, and Standards

Task. Engage single and multiple vehicle type targets.

Conditions. From a stationary and moving vehicle, given “most dangerous” threat targets, engage using proper battlesight techniques.

Standards. Using the appropriate PCW to score tasks, crews must successfully complete 8 of the 10 tasks with 70 points or more to achieve a **GO** on table 9. Crew duties are evaluated and critiqued but they do not affect the crew’s overall rating.

Conduct

Targets should represent accurate frontal threat most dangerous targets.

All defensive engagements should be fired from an exposed position to reinforce task condition.

Tasks

Table 9 consists of 10 tasks, the first 5 of which should be fired during the day and the remaining 5 fired at night.

Scoring Procedures

Use specified PCW per task. Refer to appendix M for use of PCWs.

Allowable Variations

If ammunition constraints do not allow firing the table as specified, use available ammunition and change target type and range to conform to ammunition used.

If range facilities do not permit firing the table as specified, modify as necessary.

Table 9 Full Caliber Battlesight.

TASK/ENGAGEMENT CONDITIONS	TARGET CONDITIONS	AMMUNITION	PCW
Employ battlesight gunnery against a single target, moving LAV-25.	Stationary BMP, 1000M-1200M	9 rounds TPDS-T	One condition
Employ battlesight gunnery against a single target, stationary LAV-25.	Stationary BTR, 800M-1200M	9 rounds TP-T	Normal
Employ battlesight gunnery against multiple targets, moving LAV-25.	2 stationary BMPs, 1200M-1400M	18 rounds TPDS-T	Normal
Employ battlesight gunnery against simultaneous targets, stationary LAV-25.	RPG team, 300M-500M Stationary BTR, 700M-900M	50 rounds 7.62 9 rounds TP-T	Normal
Employ battlesight gunnery against multiple targets, moving LAV-25.	Stationary BTR, 700M-900M Stationary BMP, 1000M-1300M	9 rounds TP-T 9 rounds TPDS-T	One condition
Employ battlesight gunnery against a single target, stationary LAV-25.	Stationary BTR, 600M-800M	9 rounds TP-T	Normal
Employ battlesight gunnery against a single target, moving LAV-25.	Stationary BMP, 1200M-1400M	9 rounds tpds-t	One condition
Employ battlesight gunnery against multiple targets, stationary LAV-25.	2 Stationary BTRs, 800M-1000M	18 rounds TP-T	Normal
Employ battlesight gunnery against multiple targets, moving LAV-25.	Stationary BTR, 700M-900M Stationary BMP, 800M-1100M	9 rounds TP-T 9 rounds TPDS-T	One condition
Employ battlesight gunnery against multiple targets, stationary LAV-25.	2 Stationary BMPs, 1100M-1300M	18 rounds TPDS-T	Normal
Ammunition requirements: 76* rounds TPDS-T; 67* rounds TP-T; 50 rounds 7.62mm or 135 rounds of any 25mm; 50 rounds 7.62mm. * Denotes rounds included for lost rounds due to changing feeds.			

Table 10. Full Caliber Precision

Table 10 is a full caliber precision gunnery table, fired on a full scale range, and it evaluates the crew's ability to use precision gunnery techniques. Precision gunnery aiming procedures drilled during sustainment gunnery, table 6, are combined with direct fire adjustment techniques to prepare for crew qualification. Crew duties are evaluated and critiqued but they do not affect the crew's overall rating.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Engage single and multiple vehicle and infantry targets.

Conditions. From a stationary and moving vehicle, given stationary and moving targets outside of battlesight range, engage using proper precision gunnery techniques.

Note: Precision engagements are allotted six rounds. The only exception is when either the target or the firing vehicle is moving, in which case nine rounds are allotted.

Standards. Using the appropriate matrix to score tasks, crews must successfully complete 8

of the 10 tasks with 70 points or more to achieve a **GO** on table 10. Crew duties are evaluated and critiqued, but they do not affect the crew's overall rating.

Conduct

Targets should represent accurate threat targets.

All Defensive engagements are fired from an exposed position.

Tasks

Table 10 consists of 10 tasks, the first 5 should be fired during the day and the remaining 5 at night.

Scoring Procedures

Use the specified matrix per task.

Allowable Variations

If ammunition constraints do not allow firing the table as specified, use available ammunition and change target type and range to conform to ammunition used (ensuring targets remain outside the ammunition's battlesight range).

If range facilities do not allow firing the table as specified, modify scenario as necessary.

Table 10 Full Caliber Precision.

TASK/ENGAGEMENT CONDITIONS	TARGET CONDITIONS	AMMUNITION	ACQUISITION GO NO GO	MATRIX
Employ precision gunnery against a single target, moving LAV-25.	Stationary BMP, 1500M-1700M	9 rounds TPDS-T	GO NO GO	9-1
Employ precision gunnery against a single target, stationary LAV-25.	Moving BTR, 1100M-1300M	9 rounds TP-T	GO NO GO	9-1
Employ precision gunnery against multiple targets, moving LAV-25.	Stationary jeep, 1300m-1500m Dismounted troops, 500M-700M	9 rounds TP-T 100 rounds 7.62	GO NO GO	9-2
Employ precision gunnery against multiple targets, stationary LAV-25.	Moving BMP, 1400M-1600M Dismounted troops, 700M-900M	9 rounds TPDS-T 100 rounds 7.62	GO NO GO	9-2
Employ precision gunnery against multiple targets, moving LAV-25.	Moving jeep, 900M-1100M Stationary BMP, 1500M-1700M	9 rounds TP-T 9 rounds TPDS-T	GO NO GO	9-2
Employ precision gunnery against a single target, stationary LAV-25.	Moving BTR, 1000M-1200M	9 rounds TP-T	GO NO GO	9-1
Employ precision gunnery against multiple targets, moving LAV-25.	Stationary BTR, 900M-1000M Moving BMP, 1400M-1600M	9 rounds TP-T 9 rounds TPDS-T	GO NO GO	9-2
Employ precision gunnery against multiple targets, stationary LAV-25.	Stationary BMP, 1500M-1700M Dismounted troops, 500M-700M	9 rounds TPDS-T 100 rounds 7.62	GO NO GO	9-2
Employ precision gunnery against multiple targets, moving LAV-25.	Stationary BTR, 1100M-1300M Stationary BMP, 1400M-1600M	9 rounds TP-T 9 rounds TPDS-T	GO NO GO	9-2
Employ precision gunnery against multiple targets, stationary LAV-25.	2 stationary BTRS, 1300M-1500M	18 rounds TP-T	GO NO GO	9-2
Ammunition requirements: 59* rounds TPDS-T; 76* rounds TP-T; 300 rounds 7.62mm or 126 rounds of any 25mm; 300 rounds 7.62mm. * Denotes rounds included for lost rounds due to changing feeds.				

Table 11.

Full Caliber Combined— Prequalification

Table 11 is a full caliber combined precision/battlesight gunnery table, fired on a full scale range, that serves as the 25mm prequalification table. Table 11 evaluates the crew's ability to engage targets placed in a realistic threat array using battlesight and precision methods of engagement. Tables 9 and 10 are combined in this table for prequalification in preparation for crew qualification. Crew duties are evaluated and critiqued but they do not affect the crew's overall rating.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Engage single and multiple vehicle and infantry targets.

Conditions. From a stationary and moving vehicle, given stationary and moving vehicle and infantry targets, engage using proper battlesight and precision techniques.

Standards. Using the appropriate matrix and PCW to score tasks, crews must successfully complete 7 of the 10 tasks with 70 points or more to achieve a **GO** on table 11. Crew cuts are assessed on table 11.

Conduct

Targets should represent accurate threat targets.

All engagements should be fired from an exposed position. Defensive engagements should not start from full defilade.

Tasks

Table 11 consists of 10 tasks, the first 5 should be fired during the day, and the remaining 5 fired at night.

Scoring

Use specified matrix or PCW per task.

Refer to appendix M for use of PCWs and matrices.

Allowable Variations

If ammunition constraints do not allow firing the table as specified, use the available ammunition and modify the target type and range to correspond with available ammunition and method of engagement used.

If range facilities do not allow firing the table as specified, modify tasks as necessary.

Table 11 Full Caliber Combined—Prequalification.

TASK/ENGAGEMENT CONDITIONS	TARGET CONDITIONS	AMMUNITION	ACQUISITION GO NO GO	MATRIX
Employ precision gunnery against single target, moving LAV-25.	Stationary BMP, 1500M-1700M	6 rounds TPDS-T	GO NO GO	9-1
Employ battlesight gunnery against multiple targets, stationary LAV-25.	Stationary BTR, 700M-900M Stationary BMP, 1200M-1400M	9 rounds TP-T 9 rounds TPDS-T	NA NA	PCW normal
Employ precision gunnery against multiple targets, moving LAV-25.	Moving BTR, 900M-1000M Stationary BMP, 1500M-1700M	9 rounds TP-T 6 rounds TPDS-T	GO NO GO	9-2
Employ battlesight gunnery against simultaneous targets, stationary LAV-25.	Stationary BMP, 1200M-1400M RPG team, 300M-500M	9 rounds TPDS-T 50 rounds 7.62	NA NA	PCW one condition
Employ precision gunnery against multiple targets, moving LAV-25.	Moving Jeep, 1300M-1500M Dismounted troops, 500M-700M	9 rounds TP-T 100 rounds 7.62	GO NO GO	9-2
Employ battlesight gunnery against a single target, stationary LAV-25.	Stationary BTR, 600M-800M	9 rounds TP-T	NA NA	PCW normal
Employ precision gunnery against multiple targets, moving LAV-25.	Moving BMP, 1400M-1600M Dismounted Troops, 500M-700M	9 rounds TPDS-T 100 rounds 7.62	GO NO GO	9-2
Employ battlesight gunnery against multiple targets, stationary LAV-25.	2 stationary BMPs, 1000M-1300M	18 rounds TPDS-T	NA NA	PCW normal
Employ precision gunnery against a single target, stationary LAV-25.	Stationary BTR, 1000M-1200M	6 rounds TP-T	GO NO GO	9-1
Employ battlesight gunnery against multiple targets, moving LAV-25.	Stationary BMP, 700M-1000M Stationary BTR, 800M-1000M	9 rounds TPDS-T 9 rounds TP-T	NA NA	PCW one condition
Ammunition requirements: 71* rounds TPDS-T; 55* rounds TP-T; 250 rounds 7.62mm or 127 rounds of any 25mm; 250 rounds 7.62mm. * Denotes rounds included for lost rounds due to changing feeds.				

Table 12.

Crew Qualification

Table 12 is a marksmanship based, single vehicle, crew qualification table. Table 12 evaluates the crew's ability to engage single and multiple, stationary and moving, vehicle and infantry targets placed in a realistic threat array, using the proper method of engagement.

Prerequisite

Each member of the crew must have passed the LGST within 3 months of firing table 12.

Each crew must have fired table 11 before firing table 12.

Each crew must have fired table 8, NBC gunnery, within 6 months of firing table 12.

Requirement

The crew must fire all tasks, day and night, to obtain an overall qualified rating.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Engage single and multiple vehicle and infantry targets.

Conditions. From a stationary and moving vehicle, given stationary and moving vehicle and infantry targets, engage using proper battlesight and precision engagement techniques.

Standards. Using the appropriate matrix or PCW to score tasks, crews must successfully complete 7 of the 10 tasks with 70 points or more to obtain an overall qualified rating on table 12. Crew duties are evaluated and scored in accordance with paragraph 8103. Crew cuts are assessed on table 12. Crew ratings are determined using the following standards:

- **Distinguished**—7 of 10 tasks with at least 70 points and a combined score of at least 900 points.

- **Superior**—7 of 10 tasks with at least 70 points and a combined score between 800 and 899 points.
- **Qualified**—7 of 10 tasks with at least 70 points and a combined score between 700 and 799 points.
- **Unqualified**—4 of 10 tasks with less than 70 points, or less than 700 points combined.

Conduct

Targets should accurately represent threat targets.

All engagements should be fired from an exposed position. Battlesight engagements should be fired from an exposed position. Defensive engagements should not start from full defilade.

Tasks

Table 12 consists of 10 tasks, the first 5 should be fired during the day and the remaining 5 at night.

Scoring

Use specified matrix or PCW per task.

Refer to appendix M for use of PCWs and matrices.

Refer to paragraph 8401 for timing procedures.

Allowable Variations

Ammunition availability will dictate which qualification table to use. Use the TP-T/TPDS-T mix table whenever possible.

If moving targets are not available, substitute a full scale frontal target within the same range band, and require the firing vehicle to move during the engagement.

No tasks may be shifted from night to day, or day to night with only one exception. In areas where night firing time is limited due to range constraints, i.e., the range closes at 2,200, up to 2 night tasks may be moved to the day portion as long as they are conducted using the thermal sight.

Refires for Qualification

Crews refire only those tasks that they failed to score at least 70 points.

Commanders may authorize the refiring of only the tasks necessary for a qualified rating.

700 points is the maximum a refiring crew can achieve, regardless of score after initial attempt at qualification.

Alibis

All alibi engagements will be refired. Unit commanders may authorize an alibi for the following conditions:

- Target or range malfunction.
- Unsafe conditions not related to the firing crew.
- Weapon malfunction not attributed to crew error. This determination is based on the crew's ability to complete prefire checks in accordance with TM 08594A 10/1B, and observations by the firing vehicles LCE.

Ammunition

Master gunners must add rounds to accommodate crew's changing ammunition when using dual ammunitions, depending on the order of the tasks within the table.

Table 12 TP-T/TPDS Mix.

TASK/ENGAGEMENT CONDITIONS	TARGET CONDITIONS	AMMUNITION	ACQUISITION GO NO GO	MATRIX
Employ precision gunnery against single target, stationary LAV-25.	Stationary BMP, 1500M-1700M	6 rounds TPDS-T	GO NO GO	9-1
Employ precision gunnery against multiple targets, moving LAV-25.	Moving BRDM, 1200M-1400M RPG team, 500M-700M	9 rounds TP-T 50 rounds TPDS-T	NA NA	9-2I
Employ battlesight gunnery against multiple targets, stationary LAV-25.	Stationary BTR, 700M-1000M Stationary BMP, 700M-100M	9 rounds TP-T 9 rounds TPDS-T	GO NO GO	PCW normal
Employ battlesight gunnery against simultaneous targets, moving LAV-25.	Stationary BMP, 1000M-1300M RPG team, 300M-500M	9 rounds TPDS-T 50 rounds 7.62	NA NA	PCW one condition
Employ battlesight gunnery against multiple targets, moving LAV-25.	Stationary BMP, 1000M-1300M Stationary BTR, 700M-1000M	9 rounds TPDS-T 9 rounds TP-T	GO NO GO	PCW one condition
Employ precision gunnery against a single target, stationary LAV-25.	Stationary jeep, 1300M-1500M	6 rounds TP-T	NA NA	9-1
Employ precision gunnery against multiple targets, stationary LAV-25.	Moving BMP, 1500M-1700M Dismounted troops, 700M-900M	9 rounds TPDS-T 100 rounds 7.62	GO NO GO	9-2
Employ precision gunnery against multiple targets, moving LAV-25.	Moving BMPs, 1500M-1700M Stationary BMP, 1400-1600	18 rounds TPDS-T	NA NA	9-2
Employ battlesight gunnery against simultaneous targets, moving LAV-25.	Stationary BRDM, 500M-700M RPG team, 300M-500M	9 rounds TP-T 50 rounds 7.62	GO NO GO	PCW one condition
Employ battlesight gunnery against multiple targets, stationary LAV-25.	Stationary BMP, 1000M-1300M Stationary BTR, 700M-1000M	9 rounds TPDS-T 9 rounds TP-T	NA NA	PCW normal
Ammunition requirements: 71* rounds TPDS-T; 55* rounds TP-T; 250 rounds 7.62mm or 127 rounds of any 25mm; 250 rounds 7.62mm. * Denotes rounds included for lost rounds due to changing feeds.				

Table 12 TP-T Only.

TASK/ENGAGEMENT CONDITIONS	TARGET CONDITIONS	AMMUNITION	ACQUISITION GO NO GO	MATRIX
Employ precision gunnery against single target, stationary LAV-25.	Stationary BMP, 1500M-1700M	6 rounds TPDS-T	GO NO GO	9-1
Employ precision gunnery against multiple targets, moving LAV-25.	Moving BRDM, 1200M-1400M RPG team, 500M-700M	9 rounds TP-T 50 rounds TPDS-T	NA NA	9-2I
Employ battlesight gunnery against multiple targets, stationary LAV-25.	Stationary BTR, 700M-1000M Stationary BMP, 700M-100M	18 rounds TP-T	GO NO GO	PCW normal
Employ battlesight gunnery against simultaneous targets, moving LAV-25.	Stationary BMP, 700M-1000M RPG team, 300M-500M	9 rounds TPDS-T 50 rounds 7.62	NA NA	PCW one condition
Employ battlesight gunnery against multiple targets, moving LAV-25.	2 stationary BRDMs 700M-1000M	18 rounds TP-T	GO NO GO	PCW one condition
Employ precision gunnery against a single target, stationary LAV-25.	Stationary jeep, 1300M-1500M	6 rounds TP-T	NA NA	9-1
Employ precision gunnery against multiple targets, stationary LAV-25.	Moving BMP, 1300M-1500M Dismounted troops, 700M-900M	9 rounds TP-T 100 rounds 7.62	GO NO GO	9-2
Employ precision gunnery against multiple targets, moving LAV-25.	Moving jeep, 1000M-1200M Stationary BTR, 1300-1500	18 rounds TP-T	NA NA	9-2
Employ battlesight gunnery against simultaneous targets, moving LAV-25.	Stationary BRDM, 500M-700M RPG team, 300M-500M	9 rounds TP-T 50 rounds 7.62	GO NO GO	PCW one condition
Employ battlesight gunnery against multiple targets, stationary LAV-25.	Stationary BTR, 600M-900M Stationary BTR, 700M-1000M	18 rounds TP-T	NA NA	PCW normal
Ammunition requirements: 120 rounds TP-T; 250 rounds 7.62mm.				

TABLE 12 TPDS-T Only.

TASK/ENGAGEMENT CONDITIONS	TARGET CONDITIONS	AMMUNITION	ACQUISITION GO NO GO	MATRIX
Employ precision gunnery against single target, stationary LAV-25.	Stationary BMP, 1500M-1700M	6 rounds TPDS-T	GO NO GO	9-1
Employ precision gunnery against multiple targets, moving LAV-25.	Moving BMP, 1500M-1700M RPG team, 500M-700M	9 rounds TP-T 50 rounds TPDS-T	NA NA	9-2I
Employ battlesight gunnery against multiple targets, stationary LAV-25.	2 stationary BMPs, 1100M-1400M	18 rounds TP-T	GO NO GO	PCW normal
Employ battlesight gunnery against simultaneous targets, moving LAV-25.	Stationary BMP, 700M-1000M RPG team, 300M-500M	9 rounds TPDS-T 50 rounds 7.62	NA NA	PCW one condition
Employ battlesight gunnery against multiple targets, moving LAV-25.	2 stationary BMPs 1100M-1400M	18 rounds TP-T	GO NO GO	PCW one condition
Employ precision gunnery against a single target, stationary LAV-25.	Stationary BMP, 1400M-1600M	6 rounds TP-T	NA NA	9-1
Employ precision gunnery against multiple targets, stationary LAV-25.	Moving BMP, 1400M-1700M Dismounted troops, 700M-900M	9 rounds TP-T 100 rounds 7.62	GO NO GO	9-2
Employ precision gunnery against multiple targets, moving LAV-25.	Moving BMP, 1500M-1700M Stationary BMP, 1500-1700	18 rounds TP-T	NA NA	9-2
Employ battlesight gunnery against simultaneous targets, moving LAV-25.	Stationary BMP, 1000M-1300M RPG team, 300M-500M	9 rounds TP-T 50 rounds 7.62	GO NO GO	PCW one condition
Employ battlesight gunnery against multiple targets, stationary LAV-25.	2 stationary BMPs, 1000M-1300M	18 rounds TP-T	NA NA	PCW normal
Ammunition requirements: 120 rounds TPDS-T; 250 rounds 7.62mm.				

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Appendix H

Advanced Gunnery Tables

The scout section gunnery tables (13 and 14) are used to train and evaluate LAV-25 equipped scout sections. These gunnery tables test the scout section's ability to conduct reconnaissance and security missions, and evaluate the section leader's ability to control scout section fires while engaging stationary and moving targets presented in realistic tactical arrays. The evaluation should focus on the scout section's primary mission of information collection and reporting procedures. The scout section's ability to use combat resources, direct and indirect fire, while remaining undetected, should also be evaluated.

Using the information in this appendix as a guide, the commander designs his own gunnery tables, based on the resources available and the unit's training requirements; the individual and collective tasks required. Providing flexibility to the commanders ensures that each unit receives the training required to effectively train the scout sections. The tables are divided into tactical and gunnery portions that may or may not be conducted together.

Individual and Collective Requirements

When designing the tactical portion of the tables, the commander selects a number of combat critical tasks, i.e., tactical tasks, from the individual training standards (ITS) list and the collective task list from the Marine Corps Combat Readiness Evaluation System (MCCRES). These tasks are arranged in a mission type format where the section is assigned the tasks as part of a scout platoon. Performance of these tactical tasks constitute fifty percent of the scout section's overall score.

A standard list of fire control tasks is required to ensure that the scout section leader is satisfying the ITSs for gunnery, and that the dismounted element leader satisfies the same standards for controlling dismounted element fires.

At a minimum, the scout section must perform all ITS fire control tasks, mounted and dismounted. Use separate checklists for each firing task programmed into the scenario. Each task is evaluated. The gunnery tasks constitute thirty percent of the scout section's total overall score. The remaining twenty percent of the section's score is gunnery hit rate which is evaluated with the target destruction matrix, table H-2.

Mounted Tasks

At a minimum, the following tasks will be evaluated in the mounted portion of the tables:

- 0313.3.7—Load the M257 Smoke Grenade Launcher.
- 0313.3.8—Unload the M257 Smoke Grenade Launcher.
- 0313.3.24—Fire the M257 Smoke Grenade Launcher.
- 0313.3.26—Establish Firing Positions for the LAV-25.
- 0369.5.8—Control LAV Weapons Fires.
- 0369.5.9—Establish Battle Positions.
- 0300.1.4—Adjust Indirect Fire.

The checklists for these tasks can be found in appendix L. Others are found in applicable ITS orders.

Procedures

Scout sections must perform the firing tasks within the allotted engagement times in accordance with table H-1.

Engagement time starts when the first section vehicle is exposed to the threat, however, target exposure times should allow the section to report, determine the best course of action, and develop the situation. Master gunners should program scenarios, depending on gunnery task, to account for these actions.

Engagement stop times are determined by the following conditions:

- The section leader announces **“CEASE FIRE”**.
- All targets are destroyed.
- All section vehicles return to defilade for the final time.

Table 12 addresses alibi criteria. No other alibi criteria is used.

Scoring Procedures

Each table uses a 1000 point system for the three areas of tactics and gunnery. The breakdown of scoring is explained as follows.

Tactics are worth 50 percent or a total of 500 points. Evaluators use the unit-generated performance checklists for evaluation. Tasks may be of equal weight, or commanders may assign different values to each task based on unit requirements.

Gunnery tasks are worth 30 percent or a total of 300 points. Evaluators use the performance checklists provided in appendix L for mounted tasks, and unit-generated checklists for dismounted tasks. The number of checklists will vary depending on how many firing tasks are programmed.

Use the formula in figure H-1 for determining total tactical and gunnery points, or, at the commander's option, point values can be assigned for

each individual task based on mission essential task list importance.

Gunnery hit rate is worth 20 percent or a total of 200 points. To determine the number of gunnery points awarded, use the target destruction matrix, table H-2.

Ratings

Sections are rated by the following standards.

- **Distinguished.** Combined score of 900 points or higher, which includes at least 350 tactical, 210 gunnery task and 140 gunnery hit points at a minimum.

Example: The section was assigned 11 gunnery tasks, mounted and dismounted. The section passed nine tasks. The section was presented 25 targets overall, mounted and dismounted, they destroyed 22. The section was assigned 12 tactics tasks, they passed 10.

1. Divide the total number of tasks passed by the total number of tasks.

$$9/11 = 0.82$$

2. Multiply the result by 300 (total possible gunnery points) to get the section's **gunnery score**.

$$0.82 \times 300 = 246 \text{ points}$$

3. Use table H-4 to get the **gunnery hit rate score**.

$$22 \text{ of } 25 \text{ targets} = 176 \text{ points}$$

4. Follow steps 1 and 2 in the same manner to arrive at the **tactics** task score.

$$10/12 = 0.83 \quad 0.83 \times 500 = 415 \text{ points}$$

5. Add the gunnery score, the gunnery hit rate score, and the tactics task score to get the sections overall score.

$$246 + 176 + 415 = 837 \text{ points}$$

Figure H-1. Evaluation Scoring Formula.

- **Superior.** Combined score between 800-899 points, which includes 350 tactical, 210 gunnery task and 140 gunnery hit points at a minimum.
- **Qualified.** Combined score between 700-799 points, which includes 350 tactical, 210 gunnery task and 140 gunnery hit points at a minimum.
- **Unqualified.** Combined score less than 700 points, or less than 350 tactical, 210 gunnery task or 140 gunnery hit points.

Targets

Target arrays should be consistent with the type of threat forces that a section normally encounters. FM 17-98 describes these forces in detail for

reconnaissance and security missions. Master gunners should program target scenarios in accordance with the required firing task and FM 17-98 to ensure realistic arrays are presented to the section. There is no minimum or maximum number of targets allowed, however, there must be sufficient targets to allow the crews sufficient ammunition to upload the weapons systems, and to perform all the required mounted gunnery tasks. There must be enough targets to allow the dismounted element to complete their assigned tasks.

Target signature devices should be used when appropriate to the gunnery task.

Table 13.

Scout Section Training Course

The scout section training course is used to train and evaluate scout section tactical and gunnery skills in preparation for table 14. Table 13 gunnery portion may be conducted using subcaliber or full caliber ammunition at the commander's discretion. The gunnery portion must evaluate the gunnery tasks outlined in appendix L. The tactical portion must be designed to evaluate the commander selected tasks. It is not required to combine the tactical and gunnery tasks when designing the scenario. Perform the gunnery tasks with the tactical tasks if it's possible to do so without degrading the tactical task.

Prerequisite to Firing Table 13

Each crew in the section must have successfully qualified on table 12 within 6 months of firing table 13. Due to personnel turnover considerations, it is acceptable that three of the four vehicle commanders and gunners meet this requirement.

Each individual in the scout section must have passed the LAV-25 gunnery skills test (LGST) within 6 months of firing table 13.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Conduct a reconnaissance and/or security mission, and acquire, report, and employ accurate direct and indirect fire to engage targets in a tactical array.

Conditions. As part of a platoon, the section uses reconnaissance, and engagement techniques against threat targets.

Standards. Engagement time standards are listed table H-3 and hit rate is evaluated with table H-4. Evaluation of tactical and gunnery tasks is accomplished with checklists.

Conduct of the Range

Depending on the availability of resources, maneuver areas and range time, the commander may

decide to fire the gunnery portion of table 13 using subcaliber munitions. The tactical phase of table 13 should precede the gunnery phase of table 13, and should be conducted in a realistic environment for the scenario. Table 13 must have a day (13A) and night (13B) phase of fire. The commanders decide which tactical and gunnery tasks to evaluate during the hours of darkness; however, when planning the night gunnery phase, the section must be presented enough targets to allow sufficient ammunition to upload the weapons systems.

The section always acts as part of a platoon, whether other sections are present. A platoon commander/evaluator should be appointed to receive reports, and provide the guidance that will drive the scenario. The platoon commander/evaluator ensures that the section follows the designed scenario by guiding the section through the tactical and the gunnery phases as the section reports.

Tactical Phase. The commander/evaluator must present the section a mission type order that will require the section to accomplish the commander-selected tactical tasks and employ the dismounted element effectively. Evaluators should be located with both the mounted and dismounted elements and should have the performance checklists on hand for evaluation.

Gunnery Phase. The commander/evaluator must present the section a mission type order that will require the section to maintain a tactical posture throughout this phase. The scenario for fire must be designed to allow the section to accomplish the required gunnery tasks, mounted and dismounted. The master gunner must plan target presentation to correspond with the scenario so that the section leader is aware of which gunnery task he is to perform.

An after action review for the entire section is required after each phase of the table. All evaluators should be present so that all aspects of the sections performance are debriefed.

Although the scout section will be performing tactical tasks during the conduct of the gunnery

phase, only the specific gunnery tasks are evaluated. Tactical tasks are evaluated during the tactical phase of the table, however, the tactical tasks will be reviewed and critiqued during the gunnery phase of the table.

The key to successful conduct of table 13 is the platoon commander/evaluator who must have the ability to lead the scout section through the scenario without confusion so the evaluators with the section can grade the section.

Table 14.

Scout Section Qualification

The scout section qualification is used to evaluate the scout section's tactical and gunnery proficiency in a realistic tactical and live fire scenario.

Prerequisite to Firing Table 14

Each scout section must have achieved a passing score on table 13 within 3 months of firing table 14.

Each crewmember must have successfully completed the LGST within 3 months of firing table 14.

General Instructions to Crewmembers on Task, Conditions, and Standards

Task. Conduct a reconnaissance and/or security mission, and acquire, report, and employ accurate direct and indirect fire to engage targets in a tactical array.

Conditions. As part of a platoon, the scout section uses reconnaissance, and engagement techniques against threat targets.

Standards. Engagement time standards are listed table H-3 and hit rate is evaluated with table H-4. Evaluation of tactical and gunnery tasks is accomplished with checklists.

Conduct of the Range

Table 14 is similar to table 13. The gunnery portion of table 14 is fired using full caliber munitions. The tactical phase of table 14 should precede the gunnery phase of table 14, and should be conducted in a realistic environment for the scenario. Table 14 must have a day (14A) and night (14B) phase of fire. The commander opts which tactical and gunnery tasks to evaluate during the hours of darkness, however, when planning the night gunnery phase, the section must be presented enough targets to allow sufficient ammunition to upload the weapons systems.

The section always acts as part of a platoon, whether other sections are present or not. A platoon commander/evaluator should be appointed to receive reports, and provide the guidance that will drive the scenario. The platoon commander/evaluator will ensure that the section follows the designed scenario by guiding the section through the tactical and gunnery phases as the section reports.

The tactical and gunnery phases of table 14 are conducted and evaluated in the same manner as table 13. The only differences between tables 13 and 14 should be the actual scenario used, and table 14 is always fired with full caliber ammunition.

Targets Presented

[illegible]

Scoring Matrix H-3

TIME	COLUMN A		COLUMN B		COLUMN C	
15	100	NBC		NBC		NBC
16	94					
17	88					
18	82					
19	76					
20	70	100	100			
21	64	94	94			
22	58	88	88			
23	52	82	82			
24	46	76	76			
25	40	70	70	100	100	
26	34	64	64	94	94	
27	28	58	58	88	88	
28	22	52	52	82	82	
29	16	46	46	76	76	
30	10	40	40	70	70	100
31	4	34	34	64	64	94
32	0	28	28	58	58	88
33		22	22	52	52	82
34		16	16	46	46	76
35		10	10	40	40	70
36		4	4	34	34	64
37		0	0	28	28	58
38				22	22	52
39				16	16	46
40				10	10	40
41				4	4	34
42				0	0	28
43						22
44						16
45						10
46						4
47						0

Scoring Matrix H-4

TIME SECONDS	KILL 1 TARGET	KILL 2 TARGETS	KILL 1 NBC TARGETS	KILL 2 NBC TARGETS
25	50	100		
26	47	94		
27	44	88		
28	41	82		
29	38	76		
30	35	70	50	100
31	32	64	47	94
32	29	58	44	88
33	26	52	41	82
34	23	46	38	76
35	20	40	35	70
36	17	34	32	64
37	14	28	29	58
38	11	22	26	52
39	8	16	23	46
40	5	10	20	40
41	2	4	17	34
42	0	0	14	28
43			11	22
44			8	16
45			5	10
46			2	4
47			0	0

Appendix I

Ammunition Forecasting and Allocating

Ammunition is a valuable training resource that requires detailed planning and coordination to ensure the sound management of a finite asset. Ammunition planning involves forecasting requirements and allocating sufficient ammunition to meet those requirements.

Unit ammunition allocations may change for many reasons. The type and amount of ammunition available is especially critical to maintaining LAV-25 gunnery proficiency levels. Units must be flexible enough to plan around fluctuating unit ammunition allocations to accomplish training objectives.

Forecasting

The first step in ammunition forecasting is determining what ammunition is available for training. Normally, the unit S-3 officer controls ammunition allocation available for training. The S-4 is responsible for managing the ammunition accounts. The number of rounds available for each type of ammunition can be obtained from the S-4 ammunition chief.

In the second step, the available ammunition is compared to the amount required for the training plan and reconciled. The frequency of gunnery training varies from unit to unit based on training cycles and available training facilities. Regardless, ammunition is allotted periodically to meet the needs of the training plan.

After forecasting requirements, ammunition is then allocated toward specific training evolutions.

Allocating

Ammunition should be allocated first toward crew qualification. Consideration must be made for extra ammunition for personnel who fail to meet minimum requirements on their gunnery tables. Advanced tables may be modified later to provide ammunition for the critical training events. Allocate available TPDS-T to the crew qualification table first. Although the crew qualification table can be fired with any ammunition, if mixed-type ammunition is available, it should be used.

After ammunition for firing the crew qualification table has been set aside, allocation can be made for the remaining full caliber tables. Use table I-1 as a guideline.

Planning Considerations

Critical Training Events

Example: If NBC gunnery is designated a critical training event in a particular table, then ammunition should be allocated to firing that table first.

Unit Strengths and Weaknesses

If previous gunnery training has revealed that the unit is strong on battlesight gunnery but weak on precision gunnery, then ammunition should probably be dedicated to firing the precision tables first.

Advanced Gunnery

Advanced gunnery training can be accomplished in a number of ways. The small amounts of 25mm ammunition required allow this table to be considered last. Units can also roll back unexpended ammunition for use in advanced gunnery.

Other Training Events

After allocating ammunition for advanced gunnery, the unit can allocate ammunition for additional training events, such as live fire exercises and cross-training.

Allocation of Other Ammunition

Usually, distributing smaller caliber ammunition is easier than distributing 25mm ammunition. Use table I-1 to determine ammunition allocation for

the remaining training events. Ammunition allocation is based on the criticality of training.

Use Available Ammunition Wisely

If ammunition is available for use, use it. Prioritize your order of distribution. Expending all available ammunition during training will ensure complete and effective use of this scarce asset. However, do not allow training units to frivolously expend remaining ammunition at the conclusion of a firing. If ammunition is efficiently used and recycled, the unit can more effectively plan for contingencies.

Plan for Contingencies

The unit's ammunition supply may fluctuate due to situations beyond their control. Training must still be accomplished. Planning for contingencies includes the ability to adjust ammunition allocations based on criticality of the task and to effectively use rolled-back ammunition. Units that do this can accomplish all training goals. The unit must keep its ammunition plan flexible and fluid.

Table I-1. Ammunition Requirements.

TABLE	AMMUNITION	NUMBER OF ROUNDS	CHANGE OVER*	ZERO	TOTAL**
1	Laser	N/A	N/A	N/A	N/A
2	Laser	N/A	N/A	N/A	N/A
3	5.56 tracer or 22 tracer	120	N/A	20	140
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	Laser	N/A	N/A	N/A	N/A
7	5.56 tracer or 22 tracer	64	N/A	20	84
8	25mm (any) 7.62mm	72 250	N/A N/A	10 100	82 350
9	25mm (any) -or mix of- 25mm (TP-T) 25mm (TPDS-T) 7.62mm	135 63 72 50	N/A 4 4 N/A	10 0 10 50	145 67 86 100
10	25mm (any) -or mix of- 25mm (TP-T) 25mm (TPDS-T) 7.62mm	126 72 54 300	N/A 4 5 N/A	10 0 10 50	136 76 69 350
11	25mm (any) -or mix of- 25mm (TP-T) 25mm (TPDS-T) 7.62mm	127 51 66 250	N/A 4 5 N/A	10 0 10 50	137 55 81 300
12	25mm (any) -or mix of- 25mm (TP-T) 25mm (TPDS-T) 7.62mm	120 51 69 250	N/A 3 4 N/A	10 0 10 50	130 54 83 300
13	7.62mm	400	N/A	50	450
14	25mm (any) 7.62mm	100 250	N/A N/A	10 50	110 300

*Number of rounds added to table ammunition to reflect lost rounds from ammunition change. Also, change over values will fluctuate based on order of tasks in table.

**All totals are based on one iteration for one firing vehicle. All totals include firing day and night portion of table.

(reverse blank)

Appendix J

Immediate and Remedial Actions

Immediate and remedial actions provide crew members with routine ways to return a misfired or jammed weapon to a firing status as soon as possible. Immediate action procedures are based on existing procedures used to return a jammed or misfired weapon to a firing status. Remedial action procedures are based on data collected from the weapon manufacturer and provide general guidance on returning a malfunctioning weapon to a firing status. Immediate action procedures are designed to be implemented as the routine for crew members, whereas remedial action procedures augment immediate procedures in malfunction clearing.

Immediate Action

Immediate action is the routine action taken by the gunner to quickly bring a stopped weapon back to a firing status. Though a standard procedure exists, the crew may be instinctively aware of why there is a stoppage. For example, if a low ammunition condition already exists, the crew would know that the gun would be interrupted when ammunition selection changed, and hence, know to reset the low ammunition override when stoppage occurred. In other cases, the gunner may hear the bolt going into *MISFIRE*, automatically reset the misfire, and cycle the bolt to *SEAR*. If the crew can determine the cause of the stoppage instinctively, they should correct the problem and continue the mission. When a crew is involved in an engagement and doesn't know the cause of the stoppage, they have a routine action they can execute to minimize confusion. Figure J-1 shows immediate action in flowchart form.

After a weapon stops firing, announce *MISFIRE* and look at the bolt position indicator (BPI) and the control display assembly (CDA).

If BPI or CDA indicates a jam, the gunner should announce **JAM** and proceed to remedial action.

Note: In a powered-up and normally functioning weapon, the CDA indicates a jam in the following manner: SEAR light is off, and the MISFIRE indicator is not flashing.

If BPI or CDA do not indicate *JAM*, check the—

- Low ammunition indicator—if lit, activate low ammunition override switch, and attempt to fire.
- Misfire indicator—if flashing, depress *MISFIRE* reset button, select *SINGLE S HOT* rate of fire, cycle back to *SEAR*, and attempt to fire.
- Weapon's power indicator—if flashing, tell driver to check hatch, or if oriented over the rear of the vehicle, tell scout leader to secure overhead troop hatches. When the light glows solid green again, attempt to fire.
- Weapon arm switch—if set in *SAFE* position, move it to *ARM* position, and attempt to fire.

Remedial Action

Remedial action is the action taken by the crew—beyond immediate actions—to clear a stoppage in the weapons system. Clearing procedures vary with the stoppage, but the rule of thumb is to do whatever it takes to bring the weapon back to a firing status without injuring personnel or equipment. Remedial action procedures help establish a systematic approach to clearing the M242.

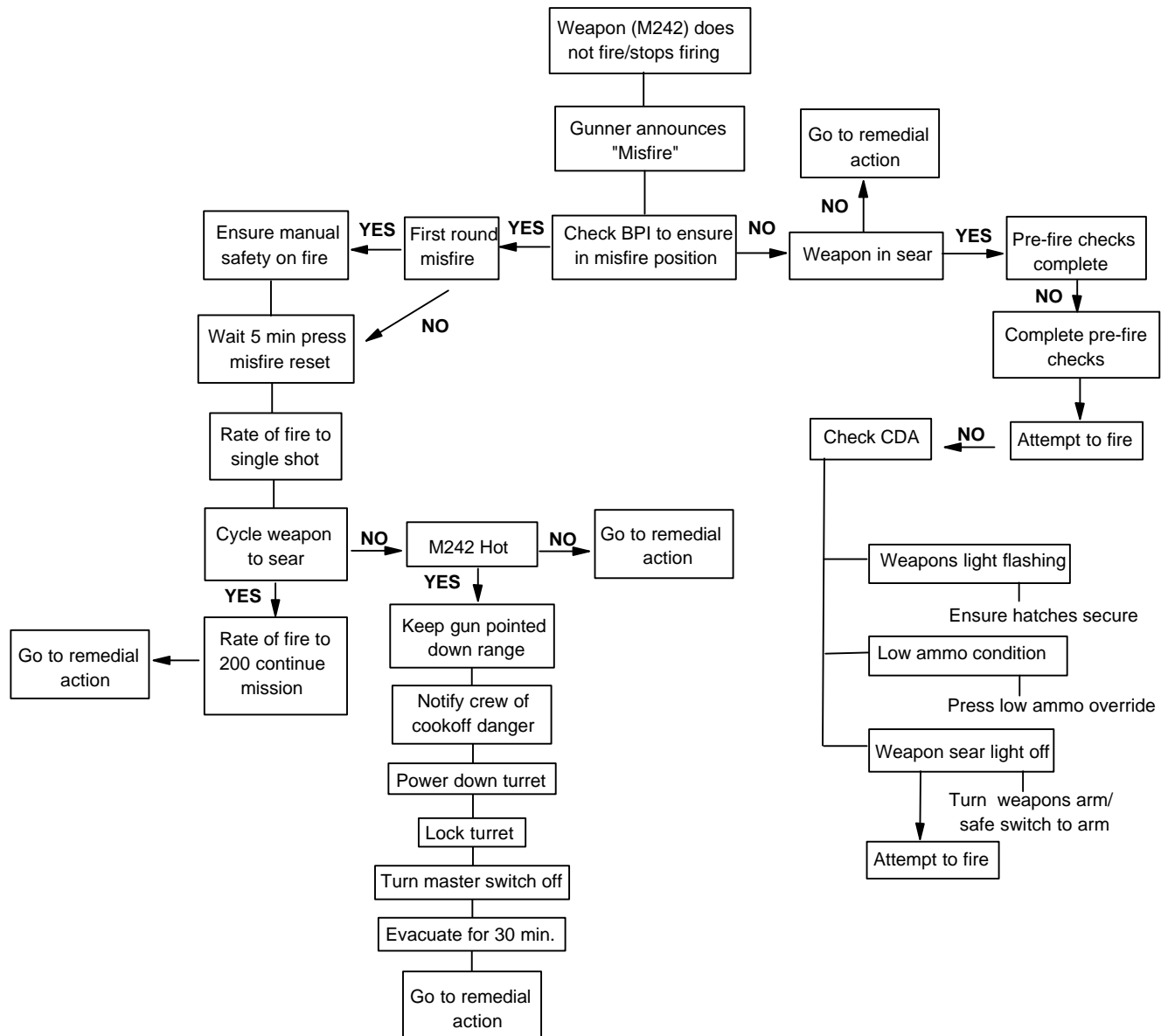


Figure J-1. Immediate Action.

Remedial action procedures cover four different types of stoppages, but weapons can stop functioning an unlimited number of ways. These four procedures group stoppages based on commonly encountered problems.

Remedial action procedures include the following:

- Ensure that all safeties are exercised and the system is powered down.

- Identify the problem area. Check to see if the—
 - Bolt position indicator is in *FEED*.
 - Bolt position indicator is in *RAM* or *EXTRACT*.
 - Bolt position indicator is in *MISFIRE*.
 - Round(s) are cross-indexed.
- Clear the stoppage using the procedures for that problem.

Bolt Position Indicator is in *FEED*

When the bolt position indicator indicates that the weapon has stopped in the partially fed position, a feed jam exists. The characteristics of a feed jam are: Weapon is between *SEAR* and *RAM*; feeder cannot be removed; ammunition selected cannot be downloaded; bolt is fully to the rear; one casing is in front of the bolt; and one live round is in the rotor.

The objective in clearing this type of jam is to position the weapon to enable work on the feeder. Ideally, get the weapon back to *SEAR*. If it can't be moved to *SEAR*, move it to *RAM*. Then, remove, clear, and inspect the feeder for damage.

To return to a firing status—

1. Attempt to manually cycle the weapon to *SEAR*. When mechanical problems exist, there is no physical jam, and the weapon can be cycled manually to *SEAR*, download normally, and inspect in accordance with TM 08672A-20&P/1, *Gun, Automatic: 25-MM, M242*.

2. Download the deselected ammunition because the feed select solenoid is already in the appropriate position for downloading this ammunition.

3. Download the selected ammunition. Pull both feed stop knobs out and change feeds on the feed select solenoid.

4. Disconnect the vertical drive shaft from the feeder. This removes the receiver from the equation. The bolt is fully to the rear, so no clearing action is necessary for the receiver. With the feeder isolated, cycle the feeder and receiver to *SEAR*.

5. Remove the feeder, perform manual cycle check, and check feeder for damage.

Download ammunition only if necessary. Only perform steps necessary to clear the weapon.

Bolt Position Indicator is in *RAM* or *EXTRACT*

When the bolt position indicator is in *RAM* or *EXTRACT*, the feeder has already fed the ammunition to the bolt, and the rotor is centered over the bolt, having completed its movement for the cycle. The characteristics of this type of jam are: Rotor is centered over the bolt; the bolt is midway of its cycle (forward or back); and the feeder can be removed. The objective is to remove the feeder, clear the jam, and perform an inspection in accordance with TM 08672A-20&P/1. Attempting to manually cycle the weapon will usually increase the severity of the jam. If enough friction is exerted by the jam to engage the receiver clutch assembly, then manual cycling usually will not be effective.

To return to a firing status—

1. Download the deselected ammunition because the feed select solenoid is already in the appropriate position for downloading this ammunition.

2. Download the selected ammunition. Pull both feed stop knobs out and change feeds on the feed select solenoid.

3. Disconnect the vertical drive shaft from the feeder. This removes the receiver from the process. The bolt is fully to the rear, so no clearing action is necessary for the receiver. With the feeder isolated, cycle the feeder and receiver to *SEAR*.

4. Remove the feeder, perform manual cycle check, and check feeder for damage.

Bolt Position Indicator is in *MISFIRE*

When the bolt position indicator is in *MISFIRE*, the weapon usually stops due to a mechanical/electrical problem vice a jam. If power is interrupted or the microswitch sensor harness assembly in the bolt position indicator is unserviceable, the weapon can stop in *MISFIRE*. If the power is

interrupted, the logic of the weapon does not recognize that the weapon is in *MISFIRE*, and will not return the weapon to *SEAR* under power. If the harness assembly is bad and the *MISFIRE* light is flashing, the weapon should be cycled to *SEAR* using normal procedures. If a round was fired and the weapon cannot be cycled under power, there may not be enough force from the manual hand crank to remove the bolt from the breech. The characteristics of this type of malfunction are: The *MISFIRE* reset button is not flashing; no physical jam exists; bolt and track are forward, locked in the breech; and the feeder can be removed.

To return to a firing status—

1. Attempt to cycle manually forward to *SEAR*.
2. Download the deselected ammunition because the feed select solenoid is already in the appropriate position for downloading this ammunition.
3. Download selected ammunition. Pull both feed stop knobs out and change feeds on the feed select solenoid.
4. Disconnect the vertical drive shaft from the feeder. This removes the receiver from the process. The bolt is already fully to the rear, so no clearing action is necessary for the receiver. With the feeder isolated, cycle the feeder to *SEAR*.
5. Remove the feeder.
6. Ensure the pushrod extension is protruding into the receiver well.
7. Rotate the bolt clockwise while cycling the receiver to *SEAR*, using a crescent wrench on the flat surfaces of the bolt.

Cross-Indexed Round(s)

When a round is cross-indexed, one end of the round has been grabbed by a different tooth of the feed sprocket than the other end. This happens

because one end of the link catches on the link stripper, causing one end of the round to skew when entering the feeder. When this type of jam is identified, and there was no attempt to manually cycle the feeder, the jam is easily cleared.

To return to a firing status—

1. Download the deselected ammunition.
2. Remove link chute and separate expended links.
3. Remove the feed chute and separate linked ammunition as close to the feeder as possible.
4. Remove the feeder if it is not in *FEED*, because this jam is easier to clear with the feeder removed.
5. Disconnect the vertical drive shaft if the feeder cannot be removed.
6. Elevate the weapon and clear as many links as possible with a screwdriver. Most links should be removable.
7. Insert screwdriver ahead of the round in the feeder, and pry backwards until the base of the round clears the link stripper.
8. Pull the round straight back out of the feeder, using a pair of channel lock pliers.
9. Clear the remaining rounds from the feeder.

It should be noted that there are other methods as well to clear cross-indexed rounds.

Common Malfunctions and Corrective Actions

Many common malfunctions may be encountered when operating the weapons system during immediate or remedial actions. In either case, take the corrective action and continue the mission.

Failure to Feed Select

Feed selection can take place only when the weapon is in *SEAR* and both feed shaft stops are fully seated. A failure to feed select is usually caused by a mechanical misalignment of the feeder gears. Misalignment is indicated when one or both of the feed shaft stops are not fully seated.

To correct, seat the raised feed shaft stop using the 14mm ratchet on appropriate feed sprocket extension, turning it until the stop seats.

Weapon Continually Stops Past SEAR in FEED

If the sear retractor is engaged while the weapon is firing, the weapon will not stop in *SEAR*, but instead, stop past *SEAR* in *FEED*. This happens because the final motion of the chain is stopped by the sear itself, and with the retractor engaged, the

sear is moved from the path of the chain, and will not catch the master link.

To correct, disengage the sear retractor (flush with the weapon) and manually cycle weapon to *SEAR*.

Weapon Cycles but BPI Does Not Cycle

If the vertical drive shaft is not engaged when the weapon is fired, the receiver will cycle, but the feeder will remain in *SEAR*. No damage is done to the weapon but rounds are not fed to the bolt.

To correct, put the feeder and receiver in *SEAR* and insert the vertical drive shaft.

Appendix K

Weapons Conditions

All weapons in the Marine Corps inventory employ weapons conditions to show the state of fire readiness and safety. Weapons handling procedures provide a consistent and standardized way for a Marine to handle, operate, and employ the weapon safely. A weapon's readiness/safety status is described by one of four conditions. The steps in the loading and unloading process take the weapon through four specific conditions of readiness for live fire.

M242 25mm Main Gun

Condition 1 - (Battle Carry)

Battle Carry AP. AP ammunition is selected on the 25mm gun feeder, the ghost round has been cycled in AP, the manual safety is on *FIRE*, and the electric safety is engaged.

Battle Carry HE. HE ammunition is selected on the 25mm gun feeder, the ghost round has been cycled in HE, the manual safety is on *FIRE*, and the electric safety is engaged.

Condition 2

Rounds are loaded into the 25mm gun feeder, the ghost round is cycled, and the electric and manual safeties are engaged.

Condition 3

Rounds are loaded into the 25mm gun feeder, the ghost round has not been cycled, and the electric and manual safeties are engaged.

Condition 4

Rounds are loaded into both ready boxes just past their respective forwarders.

M240C 7.62mm Coax Machine Gun

Condition 1 - (Battle Carry)

Rounds are loaded onto the feed tray, the cover assembly is closed, the bolt is to the rear, the manual safety is on *FIRE*, and the electric safety is engaged.

Condition 2

Does not apply to the M240 series machine gun.

Condition 3

Rounds are loaded onto the feed tray, the cover assembly is closed, the bolt is forward, the manual safety is on *FIRE*, and the electric safety is engaged.

Condition 4

Rounds are loaded into the ready box and feed chute. The weapon is clear; the bolt is forward, and the manual safety is on *FIRE*.

M240E1 7.62mm Pintle-Mounted

Condition 1 - (Battle Carry)

Rounds are loaded onto the feed tray, the cover assembly is closed, the bolt is to the rear, and the safety is on *SAFE*.

Condition 2

Does not apply to the M240 series machine gun.

Condition 3

Rounds are loaded onto the feed tray, the cover assembly is closed, the bolt is forward, and the safety is on *FIRE*.

Condition 4

The ammo box is attached to the flex mount. The weapon is clear; the bolt is forward, and the safety is on *FIRE*.

Appendix L

Advanced Gunnery Recommended Performance Checklists

Element: Scout Section

Task: Load the M257 Smoke Grenade Launcher (0313.3.7).

Conditions: Given an LAV-25, 8 L8A1/A3 Smoke Grenades, and technical manuals.

Standard: The Marine must properly load all 8 L8A1/A3 Smoke Grenades and exercise proper safety precautions.

Performance Steps:

1. Turn all vehicle and turret power off.
2. Lock the turret.
3. Turn grenade launcher switches off.
4. Insert grenades into M257 grenade launcher.

GO

NO GO

Element: Scout Section

Task: Unload the M257 Smoke Grenade Launcher (0313.3.8).

Conditions: Given an LAV-25, 8 L8A1/A3 Smoke Grenades and technical manuals.

Standard: The Marine must properly unload all 8 L8A1/A3 Smoke Grenades and exercise proper safety precautions.

Performance Steps:

1. Turn all vehicle and turret power off.
2. Lock the turret.
3. Turn grenade launcher switches off.
4. Remove grenades from M257.
5. Stow grenades.

GO

NO GO

Element: Scout Section

Task: Fire the M257 Smoke Grenade Launcher (0313.3.24).

Conditions: Given an LAV-25 loaded with 8 L8A1/A3 Smoke Grenades, technical manuals, a target threat area, and a fire command.

Standard: The Marine must fire the M257 Smoke Grenades in accordance with TM 08594A-10/1B.

Performance Steps:

1. Orient the turret in the direction where the smoke is needed.
2. Announce ***GRENADA LAUNCHER***.
3. Secure hatches.
4. Turn weapon power circuit breaker on.
5. Turn grenade launcher switch(es) on.
6. Announce ***FIRE***.
7. Fire the grenade launcher(s).
8. Announce ***GRENADA LAUNCHED***.
9. Perform misfire procedures (as required).

GO

NO GO

Element: Scout Section

Task: Establish Firing Positions for the LAV-25 (0313.3.26).

Conditions: Given an LAV-25 and crew in a tactical environment.

Standard: The Marine must establish and improve firing positions. Each vehicle in the section must prepare a range card within 15 minutes from the time the vehicle moves into position. The range card must be explicit enough so that another LAV-25 crew could use it to effectively engage targets from that position. The section leader must prepare a section sketch.

Performance Steps:

1. Select primary firing position.
2. Select alternate firing position.
3. Select supplementary firing position.
4. Supervise establishment of positions.
5. Prepare a range card (and duplicate).
6. Prepare a section sketch (and duplicate).

GO

NO GO

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Element: Scout Section

Task: Control LAV-25 Weapon Fires (0369.5.8).

Conditions: As an LAV-25 section leader, given an LAV-25 section and a situation in which a target(s) must be engaged using platoon fire.

Standard: The Marine must direct and control the fires of the section using established target reference points (TRPs), sectors of fire, engagement areas, or phase lines. He must issue verbal fire commands or establish temporary TRPs to orient section vehicles on targets, and ensure timely and accurate delivery of fires to the targets.

Performance Steps:

1. Assess the situation.
2. Determine fire patterns.
3. Select technique of fire.
4. Issue clear and concise fire commands.
5. Terminate engagement.

GO

NO GO

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Element: Scout Section

Task: Establish Battle Positions (0369.5.9).

Conditions: As an LAV-25 section leader, given an LAV-25 section, an area of operation, and an enemy situation.

Standard: The Marine must establish battle positions, incorporating local security, positioning vehicles and weapons to meet potential avenues of approach and coordination with adjacent units as required.

Performance Steps:

	GO	NO GO
1. Determine the avenues of approach to the position.	_____	_____
2. Ensure local security is positioned.	_____	_____
3. Direct positioning of vehicles and weapons.	_____	_____
4. Camouflage positions completely.	_____	_____
5. Ensure alternate covered positions are prepared for all weapons.	_____	_____
6. Reconnoiter supplementary battle positions and covered or concealed routes to the positions.	_____	_____
7. Coordinate with adjacent units.	_____	_____
8. Establish wire communications, if situation permits.	_____	_____
9. Set up chemical alarms.	_____	_____
10. Consolidate range cards or sector sketches.	_____	_____
11. Forward a prepared fire plan to the unit commander.	_____	_____
12. Emplace obstacles.	_____	_____
13. Prepare a plan for a rapid withdrawal from the positions.	_____	_____
14. Rehearse withdrawal and movement to alternate battle positions, if time permits.	_____	_____

Element: Scout Section

Task: Adjust Indirect Fire (0300.1.14).

Conditions: Given a target or targets, binoculars, radio, call signs, map compass, coordinate scale, an fire direction center (FDC), and an indirect fire weapon prepared to fire in response to the call for fire.

Standard: The Marine must transmit the initial call for fire within 1 minute after the target is identified. He must transmit subsequent corrections to the FDC within 20 seconds after impact of adjusting rounds. He must be able to fire for effect within four rounds.

Performance Steps:

	GO	NO GO
1. Locate target.	_____	_____
2. Determine magnetic direction to target.	_____	_____
3. Prepare and transmit call for fire.	_____	_____
4. Adjust rounds onto target.	_____	_____
5. Assess target damage and report to FDC.	_____	_____
6. Terminate mission.	_____	_____

Appendix M

Point Calculation Worksheets

METERS	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800
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POINTS

[illegible]

[illegible]

METERS	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800
--------	-----	-----	------	------	------	------	------	------	------	------	------

[illegible]

BTR-70, NORMAL

METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

**TIME
(seconds)**

POINTS

10	100	100	100	100	100	100	100	100	100	100	100	100	100
11	93	93	93	94	95	96	96	96	97	97	98	98	98
12	85	85	85	88	90	92	92	93	94	94	95	95	96
13	78	78	78	82	85	87	89	90	91	92	93	93	94
14	70	70	70	76	80	83	85	87	as	89	90	91	92
15	68	68	68	70	75	79	81	83	85	86	88	88	90
16	66	66	66	68	70	74	77	50	82	84	85	86	88
17	64	64	64	66	68	70	74	77	79	81	83	84	86
18	62	62	62	64	66	68	70	73	76	78	80	82	84
19	60	60	60	62	64	66	68	70	73	75	78	79	82
20	58	58	58	60	62	64	66	68	70	73	75	77	80
21	56	56	56	58	60	62	64	66	68	70	73	75	78
22	54	54	54	56	58	60	62	64	66	68	70	72	76
23	52	52	52	54	56	58	60	62	64	66	68	70	74
24	50	50	50	52	54	56	58	60	62	64	66	68	72
25	48	48	48	50	52	54	56	58	60	62	64	66	70
26	46	46	46	48	50	52	54	56	58	60	62	64	68
27	44	44	44	46	48	50	52	54	56	58	60	62	66
28	42	42	42	44	46	48	50	52	54	56	58	60	64
29	40	40	40	42	44	46	48	50	52	54	56	58	62
30	38	38	38	40	42	44	46	48	50	52	54	56	60
31	36	36	36	38	40	42	44	46	48	50	52	54	58
32	34	34	34	36	38	40	42	44	46	48	50	52	56
33	32	32	32	34	36	38	40	42	44	46	48	50	54
34	30	30	30	32	34	36	38	40	42	44	46	48	52
35	28	28	28	30	32	34	36	38	40	42	44	46	50
36	26	26	26	28	30	32	34	36	38	40	42	44	48
37	24	24	24	26	28	30	32	34	36	38	40	42	46
38	22	22	22	24	26	28	30	32	34	36	38	40	44
39	20	20	20	22	24	26	28	30	32	34	36	38	42
40	18	18	18	20	22	24	26	28	30	32	34	36	40
41	16	16	16	18	20	22	24	26	28	30	32	34	38
42	14	14	14	16	18	20	22	24	26	28	30	32	36
43	12	12	12	14	16	18	20	22	24	26	28	30	34
44	10	10	10	12	14	16	18	20	22	24	26	28	32
45	8	8	8	10	12	14	16	18	20	22	24	26	30
46	6	6	6	8	10	12	14	16	18	20	22	24	28
47	4	4	4	6	8	10	12	14	16	18	20	22	26
48	2	2	2	4	6	8	10	12	14	16	18	20	24

METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

[illegible]

BTR-70, ONE CONDITION

METERS	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800
TIME (seconds)	POINTS												
10	100	100	100	100	100	100	100	100	100	100	100	100	100
11	95	96	96	96	96	97	97	98	100	100	100	100	100
12	90	92	92	92	93	94	94	95	100	100	100	100	100
13	85	87	87	89	90	91	92	93	98	100	100	100	100
14	80	83	83	85	87	88	89	90	95	98	100	100	100
15	75	79	79	81	83	85	86	88	93	95	98	100	100
16	70	74	74	77	80	82	84	85	90	93	95	98	100
17	68	70	70	74	77	79	81	83	88	90	93	95	100
18	66	68	68	70	73	76	78	80	85	88	90	93	98
19	64	66	66	68	70	73	75	78	83	85	88	90	95
20	62	64	64	66	68	70	73	75	80	83	85	88	93
21	60	62	62	64	66	68	70	73	78	80	83	85	90
22	58	60	60	62	64	66	68	70	75	78	80	83	88
23	56	58	58	60	62	64	66	68	73	75	78	80	85
24	54	56	56	58	60	62	64	66	70	73	75	78	83
25	52	54	54	56	58	60	62	64	68	70	73	75	80
26	50	52	52	54	56	58	60	62	66	68	70	73	78
27	48	50	50	52	54	56	58	60	64	66	68	70	75
28	46	48	48	50	52	54	56	58	62	64	66	68	73
29	44	46	46	48	50	52	54	56	60	62	64	66	70
30	42	44	44	46	48	50	52	54	58	60	62	64	68
31	40	42	42	44	46	48	50	52	56	58	60	62	66
32	38	40	40	42	44	46	48	50	54	56	58	60	64
33	36	38	38	40	42	44	46	48	52	54	56	58	62
34	34	36	36	38	40	42	44	46	50	52	54	56	60
35	32	34	34	36	38	40	42	44	48	50	52	54	58
36	30	32	32	34	36	38	40	42	46	48	50	52	56
37	28	30	30	32	34	36	38	40	44	46	48	50	54
38	26	28	28	30	32	34	36	38	42	44	46	48	52
39	24	26	26	28	30	32	34	36	40	42	44	46	50
40	22	24	24	26	28	30	32	34	38	40	42	44	48
	20	22	22	24	26	28	30	32	36	38	40	42	46
42	18	20	20	22	24	26	28	30	34	36	38	40	44
43	16	18	18	20	22	24	26	28	32	34	36	38	42
44	14	16	16	18	20	22	24	26	30	32	34	36	40
45	12	14	14	16	18	20	22	24	28	30	32	34	38
46	10	12	12	14	16	18	20	22	26	28	30	32	36
47	8	10	10	12	14	16	18	20	24	26	28	30	34
48	6	8	8	10	12	14	16	18	22	24	26	28	32

METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

[illegible]

BTR-70, TWO CONDITIONS

METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

**TIME
(seconds)**

POINTS

10	100	100	100	100	100	100	100	100	100	100	100	100	100
11	96	97	97	97	98	100	100	100	100	100	100	100	100
12	93	94	94	94	95	100	100	100	100	100	100	100	100
13	90	91	91	92	93	98	100	100	100	100	100	100	100
14	87	88	88	89	90	95	98	100	100	100	100	100	100
15	83	85	85	86	88	93	95	98	100	100	100	100	100
16	80	82	82	84	85	90	93	95	100	100	100	100	100
17	77	79	79	81	83	88	90	93	98	100	100	100	100
18	73	76	76	78	80	85	88	90	95	98	100	100	100
19	70	73	73	75	78	83	85	88	93	95	98	100	100
20	68	70	70	73	75	80	83	85	90	93	95	100	100
21	66	68	68	70	73	78	80	83	88	90	93	98	100
22	64	66	66	68	70	75	78	80	85	88	90	95	98
23	62	64	64	66	68	73	75	78	83	85	88	93	95
24	60	62	62	64	66	70	73	75	80	83	85	90	93
25	58	60	60	62	64	68	70	73	78	50	83	88	90
26	56	58	58	60	62	66	68	70	75	78	80	85	88
27	54	56	56	58	60	64	66	68	73	75	78	83	85
28	52	54	54	56	58	62	64	66	70	73	75	80	83
29	50	52	52	54	56	60	62	64	68	70	73	78	80
30	48	50	50	52	54	58	60	62	66	68	70	75	78
31	46	48	48	50	52	56	58	60	64	66	50	73	75
32	44	46	46	48	50	54	56	58	62	64	66	70	73
33	42	44	44	46	48	52	54	56	60	62	64	68	70
34	40	42	42	44	46	50	52	54	58	60	62	66	68
35	38	40	40	42	44	48	50	52	56	58	60	64	66
36	36	38	38	40	42	46	48	50	54	56	58	62	64
37	34	36	36	38	40	44	46	48	52	54	56	60	62
38	32	34	34	36	38	42	44	46	50	52	54	58	60
39	30	32	32	34	36	40	42	44	48	50	52	56	58
40	28	30	30	32	34	38	40	42	46	48	50	54	56
41	26	28	28	30	32	36	38	40	44	46	48	52	54
42	24	26	26	28	30	34	36	38	42	44	46	50	52
43	22	24	24	26	28	32	34	36	40	42	44	48	50
44	20	22	22	24	26	30	32	34	38	40	42	46	48
45	18	20	20	22	24	28	30	32	36	38	40	44	46
46	16	18	18	20	22	26	28	30	34	36	38	47	44
47	14	16	16	18	20	24	26	28	32	34	36	40	42

48 12 14 14 16 18 22 24 26 30 32 34 38 40

METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

[illegible]

BRDM, NORMAL**METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800****TIME
(seconds)****POINTS**

9	100	100	100	100	100	100	100	100	100	100	100	100	100
10	94	94	94	95	96	96	96	97	97	98	98	100	100
11	88	88	88	90	92	92	93	94	94	95	95	98	100
12	82	82	82	85	87	89	90	91	92	93	93	95	100
13	76	76	76	80	83	85	87	88	89	90	91	93	98
14	70	70	70	75	79	81	83	85	86	88	88	91	95
15	68	68	68	70	74	77	80	82	84	85	86	88	93
16	66	66	66	68	70	74	77	79	81	83	84	86	91
17	64	64	64	66	68	70	73	76	78	80	82	84	88
18	62	62	62	64	66	68	70	73	75	78	79	82	86
19	60	60	60	62	64	66	68	70	73	75	77	79	84
20	55	55	58	60	62	64	66	68	70	73	75	77	82
21	56	56	56	58	60	62	64	66	68	70	72	75	79
22	54	54	54	56	58	60	62	64	66	68	70	72	77
23	52	52	52	54	56	58	60	62	64	66	68	70	75
24	50	50	50	52		56	58	60	62	64	66	68	72
25	48	48	48	50	52	54	56	58	60	62	64	66	70
26	46	46	46	48	50	52	54	56	58	60	62	64	68
27	44	44	44	46	48	50	52	54	56	58	60	62	66
28	42	42	42	44	46	48	50	52	54	56	58	60	64
29	40	40	40	42	44	46	48	50	52	54	56	58	62
30	38	38	38	40	42	44	46	48	50	52	54	56	60
31	36	36	36	38	40	42	44	46	48	50	52	54	55
32	34	34	34	36	38	40	42	44	46	48	50	52	56
33	32	32	32	34	36	38	40	42	44	46	48	50	54
34	30	30	30	32	34	36	38	40	42	44	46	48	52
35	28	28	28	30	32	34	36	38	40	42	44	46	50
36	26	26	26	28	30	32	34	36	38	40	42	44	48
37	24	24	24	26	28	30	32	34	36	38	40	42	46
38	22	22	22	24	26	28	30	32	34	36	38	40	44
39	20	20	20	22	24	26	28	30	32	34	36	38	42
40	15	18	15	20	22	24	26	28	30	32	34	36	40
41	16	16	16	18	20	22	24	26	28	30	32	34	38
42	14	14	14	16	18	20	22	24	26	28	30	32	36
43	12	12	12	14	16	18	20	22	24	26	28	30	34
44	10	10	10	12	14	16	18	20	22	24	26	28	32
45	8	8	8	10	12	14	16	15	20	22	24	26	30
46	6	6	6	8	10	12	14	16	15	20	22	24	28

BRDM, NORMAL (continued)

TIME
(seconds)

POINTS

[illegible]

BRDM, ONE CONDITION

METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

TIME
(seconds)

POINTS

9	100	100	100	100	100	100	100	100	100	100	100	100	100
10	96	96	96	96	97	97	98	98	98	99	99	99	99
11	92	92	92	93	94	94	95	95	96	97	97	97	97
12	87	89	89	90	91	92	93	93	94	95	95	96	96
13	83	85	85	87	88	89	90	91	92	93	93	94	94
14	79	81	81	83	85	86	88	68	90	91	92	92	93
15	74	77	77	80	82	84	85	86	88	89	90	90	91
16	70	74	74	77	79	81	83	84	86	87	88	89	90
17	68	70	70	73	76	78	80	82	84	85	86	87	88
18	66	68	68	70	73	75	78	79	82	83	84	85	87
19	64	66	66	68	70	73	75	77	80	81	83	84	85
20	62	64	64	66	68	70	73	75	78	80	81	82	84
21	60	62	62	64	66	68	70	72	76	78	79	80	82
22	58	60	60	62	64	66	68	70	74	76	77	79	81
23	56	58	58	60	62	64	66	68	72	74	75	77	79
24	54	56	56	58	60	62	64	66	70	72	74	75	78
25	52	54	54	56	58	60	62	64	68	70	72	73	76
26	50	52	52	54	56	58	60	62	66	68	70	72	75
27	48	50	50	52	54	56	58	60	64	66	68	70	73
28	46	48	48	50	52	54	56	58	62	64	66	68	72
29	44	46	46	48	50	52	54	56	60	62	64	66	70
30	42	44	44	46	48	50	52	54	58	40	62	64	68
31	40	42	42	44	46	48	50	52	56	58	60	62	66
32	38	40	40	42	44	46	48	50	54	56	58	60	64
33	36	38	38	40	42	44	46	48	52	54	56	50	62
34	34	36	36	38	40	42	44	46	50	52	54	56	60
35	32	34	34	36	38	40	42	44	48	50	52	54	58
36	30	32	36	38	40	42	46	52	56	32	34	48	50
37	28	30	30	32	34	36	38	40	44	46	48	50	54
38	26	28	28	30	32	34	36	38	42	44	46	48	52
39	24	26	26	28	30	32	34	36	40	42	44	46	50
40	22	24	24	26	28	30	32	34	38	40	42	44	48
41	20	22	22	24	26	28	30	32	36	38	40	42	46
42	18	20	20	22	24	26	28	30	34	36	38	40	44
43	16	18	18	20	22	24	26	28	32	34	36	38	42
44	14	15	16	15	20	22	24	26	30	32	34	36	40
45	12	14	14	16	18	20	22	24	28	30	32	34	38
46	10	12	12	14	16	18	20	22	26	28	30	32	36
47	8	10	10	12	14	16	18	20	24	26	28	30	34

METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

[illegible]

BRDM, TWO CONDITIONS

METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

TIME

(seconds)

POINTS

9	100	100	100	100	100	100	100	100	100	100	100	100	100
10	97	97	97	98	98	98	99	99	99	99	100	100	100
11	94	94	94	95	95	96	97	97	97	97	99	100	100
12	91	92	92	93	93	94	95	95	96	96	97	100	100
13	88	89	89	90	91	92	93	93	94	94	96	99	100
14	85	86	86	88	88	90	91	92	92	93	94	97	99
15	82	84	84	85	86	88	89	90	91	91	93	96	97
16	79	81	81	83	84	86	87	88	89	90	91	94	96
17	76	78	78	80	82	84	85	86	88	88	90	93	94
18	73	75	75	78	79	82	83	84	86	87	88	91	93
19	70	73	73	75	77	80	81	83	84	85	87	90	91
20	68	70	70	73	75	78	80	81	83	84	85	88	90
21	66	68	68	70	72	76	78	79	81	82	84	87	88
22	64	66	66	68	70	74	76	77	80	81	82	85	87
23	62	64	64	66	68	72	74	75	78	79	81	84	85
24	60	62	62	64	66	70	72	74	76	78	79	82	84
25	58	60	60	62	64	68	70	72	75	76	78	81	82
26	56	58	58	60	62	66	68	70	73	75	76	79	81
27	54	56	56	58	60	64	66	68	72	73	75	78	79
28	52	54	54	56	55	62	64	66	70	72	73	76	78
29	50	52	52	54	56	60	62	64	68	70	72	75	76
30	48	50	50	52	54	58	60	62	66	68	70	73	75
31	46	48	48	50	52	56	58	60	64	66	68	72	73
32	44	46	46	48	50	54	56	58	62	64	66	70	72
33	42	44	44	46	48	52	54	56	60	62	64	68	70
34	40	42	42	44	46	50	52	54	58	60	62	66	68
35	38	40	40	42	44	48	50	52	56	58	60	64	66
36	36	38	38	40	42	46	48	50	54	56	58	62	64
37	34	36	36	38	40	44	46	48	52	54	56	60	62
38	32	34	34	36	38	42	44	46	50	52	54	58	60
39	30	32	32	34	36	40	42	44	46	50	52	56	58
40	28	30	30	32	34	38	40	42	46	48	50	54	56
41	26	28	28	30	32	36	38	40	44	46	48	52	54
42	24	26	26	28	30	34	36	38	42	44	46	50	52
43	22	24	24	26	28	32	34	36	40	42	44	48	50
44	20	22	22	24	26	30	32	34	38	40	42	46	48
45	18	20	20	22	24	28	30	32	36	38	40	44	46
46	16	18	18	20	22	26	28	30	34	36	38	42	44

47 14 16 16 18 20 24 26 28 32 34 36 40 42

METERS 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

[illegible]

SQUAD/RPG, NORMAL**METERS 300 400 500 600 700 800****TIME****(seconds)****POINTS**

10	100	100	100	100	100	100
11	90	93	93	93	94	94
12	80	85	85	85	88	88
13	70	78	78	78	82	82
14	66	70	70	70	76	76
15	62	66	66	66	70	70
16	58	62	62	62	66	66
17	54	58	58	58	62	62
18	50	54	54	54	58	58
19	46	50	50	50	54	54
20	42	46	46	46	50	50
21	38	42	42	42	46	46
22	34	38	38	38	42	42
23	30	34	34	34	38	38
24	26	30	30	30	34	34
25	22	26	26	26	30	30
26	18	22	22	22	26	26
27	14	18	18	18	22	22
28	10	14	14	14	18	18
29	6	10	10	10	14	14
30	2	6	6	6	10	10
31	0	2	2	2	6	6
32		0	0	0	2	2
33					0	0

SQUAD/RPG, ONE CONDITION

METERS 300 400 500 600 700 800

TIME

(seconds)

POINTS

10	100	100	100	100	100	100
11	94	94	95	95	96	96
12	88	88	90	90	92	92
13	82	82	85	85	87	87
14	76	76	80	80	83	83
15	70	70	75	75	79	79
16	66	66	70	70	74	74
17	62	62	66	66	70	70
18	55	58	62	62	66	66
19	54	54	58	55	62	62
20	50	50	54	54	50	58
21	46	46	50	50	54	54
22	42	42	46	46	50	50
23	38	38	42	42	46	46
24	34	34	38	38	42	42
25	30	30	34	34	38	38
26	26	26	30	30	34	34
27	22	22	26	26	30	30
28	15	18	22	22	26	26
29	14	14	15	18	22	22
30	10	10	14	14	18	18
31	6	6	10	10	14	14
32	2	2	6	6	10	10
33	0	0	2	2	6	6
34			0	0	2	2
35					0	0

Appendix N

Glossary

Section I. Acronyms and Abbreviations

AP	armor piercing	HEAT	high explosive antitank
APC	armored personnel carrier	HEI	high explosive incendiary
APDS-T	armor-piercing discarding sabot with tracer	HEI-T	high explosive incendiary with tracer
APFSDS-T	armor piercing fin-stabilized discarding sabot with tracer	IAW	in accordance with
AR	Army regulation	ID	identification
ARTEP	Army Training and Evaluation pro- gram ATGM	IRETS	infantry remoted target system
AZ	azimuth	IRP	initial rally point
BOT	burst on target	ITS	individual training standard
BPI	bolt position indicator	LAR	light armored reconnaissance
CDA	control display assembly	LAV	light armored vehicle
DC	direct current	LAV-25	light armored vehicle-25mm
DODAC	Department of Defense ammunition code	LAV-AT	light armored vehicle-antitank
DSE	direct support element	LCE	LAV-25 crew evaluator
DX	direct exchange	LD	line of departure (ground operations)
EAS	end of active service	LF	landing force
EL	elevation	LGST	LAV-25 gunnery skills test
EO	electro-optical	LOS	line of sight
EOD	explosive ordnance disposal	LP	listening post
FDC	fire direction center	LRF	laser rangefinder
FEBA	forward edge of the battle area	MCCRES	Marine Corps Combat Readiness Evaluation System
FM	field manual	MCRP	Marine Corps reference publication
FMFM	Fleet Marine Force manual	MCWP	Marine Corps warfighting publication
FO	forward observer	METL	mission-essential task list
FPF	final protective fire	METT-T	mission, enemy, terrain and weather, troops and support available, time available
FRAGO	fragmentary order	MILES	multiple integrated laser engagement system
FT	firing table	MOPP	mission-oriented protective posture
GTA	graphic training aids	MOS	military occupational specialty
HE	high explosive	MPRC	multipurpose range complex

MPS	meters per second	SALUTE	size, activity, location, unit, time, equipment
MTP	master training plan	SF	standard format
NATO	North Atlantic Treaty Organization	SNCO	senior noncommissioned officer
NBC	nuclear, biological, and chemical	SOP	standing operating procedure
NCO	noncommissioned officer	S RTP	short range training plan
NCOIC	noncommissioned officer in charge	TAVSC	training and audio visual support
NSN	national stock number	center	
NTSC	Naval Training System Command	TB	technical bulletin
OIC	officer in charge	TC	training circular
OP	observation post	T/E	table of equipment
OPFOR	opposing force	TM	technical manual
ORP	objective rally point	TOT	tracer on target
PC	personnel carrier	TOW	tube launched, optically tracked, wire command link guided missile
PCW	point calculation worksheet	TPDS-T	target practice discarding sabot with tracer
PDA	power display assembly	TP-T	target practice with tracer
PGS	precision gunnery system	TRP	target reference point
PL	phase line	TSC	training support center
PMCS	preventive maintenance checks and services	UTM	universal transverse mercator
RF	radio frequency	VAD	visual aiming device
RP	rally point	VC	vehicle commander
RPG	rocket propelled grenade		
RSO	range safety officer		

Section II. Definitions

WORM width over range times mils

air defense—All defensive measures designed to destroy attacking enemy aircraft or missiles in the Earth's envelope of atmosphere, or to nullify or reduce the effectiveness of such attack. (Joint Pub 1-02)

battlesight gunnery—The rapid engagement of targets based on range estimations within certain understood battlesight range bands.

distribution of fire—Either a planned pattern of projectiles about a point, or a planned spread of fire to cover a desired frontage or depth. (Joint Pub 1-02)

engagement area—An area along an enemy avenue of approach where the commander intends to contain and destroy an enemy force with the massed fires of all available weapons. (MCRP 5-2A)

fire control—The control of all operations in connection with the application of fire on a target. (Joint Pub 1-02)

phase line—A line utilized for control and coordination of military operations, usually a terrain feature extending across the zone of action. (Joint Pub 1-02)

precision gunnery—The method of engagement in which a deliberate range to target is estimated and applied, then corrections made to further engage the target.

range determination—The process of determining the distance between two points.

sabot—Lightweight carrier in which a subcaliber projectile is centered to permit firing the projectile in the larger caliber weapon. The carrier fills the bore of the weapon from which the projectile is fired; it is normally discarded a short distance from the muzzle. (Joint Pub 1-02)

sector of fire—A defined area which is required to be covered by the fire of individual or crew served weapons, or the weapons of a unit. (Joint Pub 1-02)

standing operating procedure—A set of instructions covering those features of operations which lend themselves to a definite or standardized procedure without loss of effectiveness. The procedure is applicable unless ordered otherwise. (Joint Pub 1-02)

target reference point—An easily recognizable point on the ground (either natural or man-made) used to initiate, distribute, and control fires. Target reference points are designated by maneuver leaders to define unit or individual sectors of fire. They are designated using standard target symbols and numbers issued by maneuver commanders. (MCRP 5-2A)

Appendix O
References and Related Publications

Joint Publication (Joint Pub)

1-02 DOD Dictionary of Military and Associated Terms

Army Publications

Army Regulation (AR)

385-63 Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat

Army Training and Evaluation Program (ARTEP)

17-57-10-MTP Mission Training Plan for the Scout Platoon

Army Training Circular (TC)

25-8 Training Ranges

Field Manual (FM)

1-402 Aviator's Recognition Guide

Firing Table (FT)

25-A-2 Firing Tables for Cannon, 25mm Gun: M242 on Infantry Fighting Vehicle, M2 and Cavalry Fighting Vehicle, M3; Firing Cartridge, APDS-T, M791; Cartridge, HIE-T, M792 and Cartridge, TP-T, M793

Technical Bulletin (TB)

9-1300-385 Munitions, Suspended or Restricted

Technical Manuals (TMs)

9-1005-313-10	Operator's Manual for Machine Gun, 7.62mm, M240, M240C, M240E1
9-6920-363-12&P	Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools List, Conversion Kit (Caliber .22 Rimfire Adapter) M261 for Rifle, 5.56mm, M16 and M16A1

Navy Publications

Space War Instruction (SPAWARINST)

5.100.12A	Navy Laser Radiation Hazards Prevention Program
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Naval Training System Command Manual (NTSC)

P-5603	Light Armored Vehicle (LAV-25) Training System Turret Trainer Device 17B19
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Marine Corps Publications

Marine Corps Warfighting Publication (MCWP)

3-15.1	Machine Guns and Machine Gun Gunnery
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Marine Corps Reference Publications (MCRPs)

3-0A	Unit Training Management Guide
3-0B	How to Conduct Training
5-2A	Operational Terms and Graphics

Fleet Marine Force Manual (FMFM)

6-5	The Marine Rifle Squad
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Technical Manuals (TMs)

08594A-10/1B	LAV-25 Turret
08594A-10/2	Light Armored Vehicle, LAV-25
08672A-20&P/1	Gun Automatic 25MM M242

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