UNITED STATES MARINE CORPS
Basic Officer Course
The Basic School
Marine Corps Combat Development Command
Quantico, Virginia 22134-5019

B2113

# INTRODUCTION TO ANTIMECHANIZED WEAPONS

SECTION I

INTRODUCTION TO THE AT-4 AND MK153 SMAW

Student Handout

1. **AT-4 LAW (Light Antitank Weapon)**

a. Description. The AT-4 is a light, recoilless, antitank weapon for close-range combat, designed to let part of the propellant gases escape to the rear.

b. Characteristics and capabilities

(1) Weight 14.8 pounds

(2) Discardable

(3) Self-contained rocket launcher

(4) Range, Maximum: 2100 meters

(5) Range, Maximum Effective: 300 meters

(6) Armor Penetration: In excess of 17.7 inches (homogeneous steel)

(7) Length 40 inches

c. Limitations

(1) Backblast - noise, dust, pressure, light.

(2) Weight 14.8 lbs.

(3) May need more than one hit to kill.

d. Backblast. The backblast danger area extends at a 90 degree angle arc from the rear of the launcher 5 meters. No large vertical objects may be 5 meters to the rear of the launcher. Extending another 55 meters behind the danger area, is the caution area. Personnel or equipment in this area could be injured or damaged by backblast or flying debris. A total area of 60 meters must be kept clear behind the launcher when firing. The AT-4 may be fired inside a building provided the structure has a volume of 50 cubic meters. All personnel must have ear protection and be forward of the rear of the launcher. The structure must have good ventilation with glass removed from windows. No objects can be within five meters of the rear of the launcher.
(See Figure 1.)

Figure 1. Backblast

Figure 2. Nomenclature

e. Functioning. The AT-4 has a 3.96 pound warhead with a shaped charged. (See Figure 3.)

(1) Penetration in excess of 17.7 inches is due to the shaped charged munroe effect.

(2) When the rocket travels 10 meters from the muzzle the detonator is in line with the explosive train.

(3) The fuze is activated by a piezoelectrical crystal, which on impact generates an initiation voltage, even at an angle of impact as shallow as 10 degrees, detonating the shaped charge.

Figure 3. Functioning

f. Inspection checklist for AT-4

(1) Transport safety pin should be inserted in weapon.

(2) Cocking lever in the "SAFE" position.

(3) Muzzle cover intact.

(4) Correct color band.

(5) Ensure sights are serviceable.

(6) Complete weapon servicveable (no cracks, dents, bulges etc.).

g. Preparing the AT-4 for firing

(1) Remove transport safety pin.

(2) Unfold shoulder rest.

(3) Shoulder weapon.

(4) Release sights.

(5) Unfold and push cocking lever forward and down to "FIRE" position.

(6) Adjust rear sight. (If range is less than 250 meters no adjustments are necessary.)

(7) Check backblast area.

(8) Aim in on target.

(9) Depress safety.

(10) Press trigger.

h. Immediate action procedures. Performed in the event that the AT-4 fails to fire.

(1) Keep pointed down range for 30 seconds.

(2) Cock weapon.

(3) Depress safety.

(4) Press trigger.

(5) If still misfires, point down range for 30 seconds.

(6) Secure safety catch, cocking lever and replace transport safety pin. Turn in for disposal.

i. Aiming rules. (See Figures 4 and 5.)

(1) Stationary targets (front and rear targets).

Figure 4. Aiming rules

(a) Set range.

(b) Aim with center post at center of mass.

| **Aiming rate** | **Targets** | **Sight pictures** |
|---|---|---|
| Aim with center post at center of mass | Stationary | |
| | | When target is proceeding directly at you or away from you. |
| Aim with center post at front of mass | All moving targets except front and rear targets and | |
| | | fast moving tank targets. |
| Aim with center post ahead of front of mass | Fast moving (faster then 15 mph) tank targets | |

Figure 5. Aiming rules (continued)

(2) Moving targets (except front and rear targets).

(a) Consider:

1 All oblique targets SLOW regardless of angle.

2 Flank targets slower than 15km/h SLOW.

3 Flank targets faster than 15km/h FAST.

(b) Aim with center post at front mass for SLOW targets.

(c) Aim with center post ahead of mass for FAST targets.

Figure 6. Sequenced firing

j. Methods of engagement

(1) Single firing. Target is engaged by one man, firing one AT-4, with no succeeding shots.

(a) Use at very short ranges (50 meters or less) or when the range to target is unknown.

(b) Probability of killing the target is low.

(c) May be used out to 200 meters if range to target has been accurately predetermined.

(2) Sequenced firing. One gunner equipped with two or more AT-4s engages the target. The gunner fires and observes the impact of his first round. If he hits, he continues to fire until the target is destroyed. If he misses, he should make adjustments in range and leads until the target is hit. The gunner continues to fire until the target is destroyed. To increase the rate of fire, several AT-4s should be inspected and prepared for firing prior to beginning the engagement. This method of engagement gives you a good chance of obtaining a hit--especially against a stationary target--but loses the effect of surprise on the enemy (10 seconds between rounds). (See Figure 6.)

Figure 7. Pair fire

(3) Pair firing. Two or more gunners, equipped with two or more AT-4s, engage target. (See Figure 7.)

(a) First gunner announces range and lead and engages targets.

(b) Second gunner observes the firing and announces a revised estimate of the range and lead and fires.

(c) Gunners continue exchanging information until target is hit.

Figure 8. Volley fire AT-4 Symbol

(4) Volley firing. Target is engaged by more than one gunner, each firing one or more AT-4s using the same sight data. (See Figure 8.)

(a) Used when the range target has been determined.

(b) May be used after range is established by "pair" or "sequenced" firing or calculated.

(c) Preferred method. (100 meters or less).

Figure 9. Wire diagram of weapons platoon

2. **MK153 SMAW (Shoulder-launched multipurpose assault weapon)**

a. Description. The MK153 SMAW is a one-man-operable 83mm smooth-bore, shoulder-fired, rocket launcher with a spotting rifle attached to the right side of the launcher tube. (See Figure 10.) The encased rocket is fitted into the aft end of the launcher and the fiberglass encasement is discarded after use. The spotting rifle, which improves first-round hit probability, is fed 9mm tracers by a magazine which holds six rounds. The 9mm round is ballistically matched to the 83mm rocket. The weapon is aimed by using either the iron sights, telescopic sight, or the AN/PVS-4 night vision sight, which is attached to the sight mount. The SMAW fires an HEDP rocket, which is employed against bunkers and field fortifications, and an HEAA rocket, which is employed against armor vehicles. Six MK153 SMAWs are currently found in the Assault Section of the rifle company's weapons platoon. The section is broken down into six teams each consisting of two Marines (with an MOS of 0351, Antitank assaultman) and one SMAW launcher.

b. Characteristics and capabilities

(1) Launcher (as carried)

(a) Length: 29.9 inches
(b) Weight: 16.9 pounds
(c) Caliber: 83mm

(2) Encased rocket (As carried)

(a) Length: 27.3 inches
(b) Weight: 12.7 pounds

(3) Spotting rifle

(a) Length: 27.3 inches
(b) Weight: 3.74 pounds
(c) Caliber: 9mm

(4) Telescopic sight (MK42 MOD 0)

(a) Length: 7.9 inches
(b) Weight: 1.99 pounds
(c) Magnification: 3.8x
(d) Field of View: 6 degrees

(5) Weapon, ready to fire

(a) Length: 53.1 inches

Figure 10. Major components of MK153 SMAW

(b) Weight: 29.0 pounds
(c) Minimum range : 10m
(d) Maximum range: 1800m
(e) Maximum effective range (HEDP): 250m

(f) Maximum effective range (HEAA): 500m
(g) Time of flight to 250m: 1.6 seconds

(6) Penetration capabilities

(a) Bunker, sandbag w/wood rein: 7 feet
(b) Brick: 12 inches
(c) Concrete: 8 inches
(d) Steel armor: 1 inch
(e) Anti-armor round: 23 inches

Figure 11. Sight mount

c. Nomenclature and description of major components. The twelve major components of the MK153 SMAW are depicted below:

(1) Front open sight. Consists of a metal sight post protected by a circular guard. It can be adjusted in elevation and windage by ordnance personnel.

(2) Rear open sight. Consists of a metal "U-shaped" notch through which the front sight post is aligned with the target. These sights are fixed for 250 meters.

(3) Launcher tube. 83mm smooth-bore reinforced fiberglass tube to which the encased rocket and all major components are attached.

(4) Spotting rifle. Blowback-operated, magazine-fed, semiautomatic rifle which fires a 9mm tracer round (with a 22 hornet primer) crimped into a 7.62 standard NATO casing. The tracer is visible out to a range of 500 meters.

(5) Bipod. Consists of two folding legs mounted near the shoulder rest on the underside of the launcher tube. The legs rotate downward and rearward from the stowed position and spread 60 degrees apart to support the center of gravity of the weapon when firing from the prone position.

(6) Front pistol grip. A hollow, black, plastic handle fastened to the underside of the launcher tube forward of the firing mechanism. It is used for supporting the weapon with the left hand providing stability when aiming and firing.

(7) Carrying sling. Webbed strap for carrying the launcher.

(8) Sight mount. Designed to accommodate either the telescopic sight or the AN/PVS-4 night vision sight. It is located on the left side of the launcher and provides range adjustment of the sights during use. There are four subcomponents of the sight mount: (See Figure 11.)

(a) Range window. Provides for range selection and temperature compensation. The window has two marks: white for normal/hot temperature operation and blue for cold temperature operation.

(b) Outer drum. Rotates to bring the HE window into position facing the rear of the sight mount.

(c) Inner drum. Rotates to provide range adjustments (in meters).

Figure 12. Firing mechanism

(d) Captive thumb screw. Used to secure the sight to the sight mount in either of two positions. The rearward position is usually used during normal firing; the forward position is used when wearing the field protective mask.

(9) Telescopic sight. 3.8 power, six-degree field of view with a cross hair reticle for adjusting the aim point. The lens is provided with a cover for protection when not in use.

(10) Shoulder rest. Consists of a folding metal bracket with rubber cushions. It is designed to rest on the gunner's shoulder to support the center of gravity of the loaded weapon while aiming and firing. When not in use, it is folded into a channel on the underside of the launcher.

(11) Firing mechanism. Provides control for firing the spotting rifle and launching the rocket, and a safety to prevent accidental firing. It is attached to the underside of the launcher tube and is operated with the gunner's right hand. It consists of the trigger and three control levers. (See Figure 12.)

(a) Safety lever. When in the "FIRE" position, it permits free manipulation of the trigger. When in the "SAFE" position it mechanically blocks the trigger action.

(b) Charging lever. Cocked during the firing sequence and remains in the "CHARGE" position until the rocket is launched.

(c) Launch lever. Operated with the thumb of the gunner's right hand. When the launch lever is depressed and held forward, and the trigger is pulled, the rocket is launched.

(12) Round. There are three types of rounds for the MK153 SMAW. (See Figure 13a & b.) They consist of two tactical rounds and one practice.

(a) Tactical

1 HE dual mode (HEDP). The rocket impact fuze causes immediate detonation upon contact with a hard target and also provides for a penetration time delay upon contact with a soft target.

2 HE anti armor (HEAA)

(b) Practice. Identical to the tactical round but with an inert warhead. Note. All Three types of rounds come with six 9mm tracer rounds found in the front cover of the fiberglass tube.

(c) Trainer. A simulator which weighs the same as a tactical round and provides overpressure and sound level training for the SMAW gunner. It uses a noise cartridge to provide the simulation.

Figure 13a.

Figure 13b.

d. Operating procedures

(1) Preparation for firing

(a) Steps to prepare the MK153 SMAW Launcher for firing:

1 Check the firing mechanism safety lever and ensure it is in the "SAFE" position, and the "CHARGE" lever is in the uncharged position. Check the launcher tube to ensure it is free of obstructions.

2 Inspect the round for obvious dents, cracks, or separations. Remove the front-end cap of the encased rocket by rotating it 1/4 turn counterclockwise. Place the cap on the deck with the magazine facing up. Do not touch the electrical contacts.

3 Insert the encased rocket into the aft end of the rocket launcher and rotate it clockwise until it locks in place.

(b) Steps to prepare the spotting rifle for firing:

1 Remove the spotting rifle magazine from the front-end cap.

2 Insert the magazine. Be sure the magazine is locked in place.

3 Keep the weapon pointed down range, then cock the spotting rifle by pulling the cocking lever to the rear and releasing it. The cocking lever is located on the top of the receiver of the rifle. The MK153 SMAW is now prepared for firing.

(2) Firing. The following steps are taken to fire the ARL/SMAW:

(a) Place the charging lever in the "CHARGE" position.

(b) Assume a firing position and sight in on the target.

(c) Place the safety lever in the "FIRE" position. When the trigger is pulled, the spotting rifle will fire. (SPOT MODE).

(d) Check the backblast area to ensure it is clear.

(e) Once sight adjustments have been made on the target, depress the "LAUNCH" lever with the thumb of the right hand, pull the trigger and the encased rocket will fire. (LAUNCH MODE).

(f) During the firing sequence, the charging lever will automatically return to the uncharged position. The gunner places the safety lever in the "SAFE" position and removes the magazine from the spotting rifle by depressing the locking mechanism on the left side of the magazine well. The gunner then ensures the spotting rifle chamber is empty by pulling the cocking lever to the rear. To remove the empty rocket casing, rotate it counterclockwise and pull it out the aft end of the launcher.

e. Methods of engagement

(1) Telescopic sight

(a) Estimate the range to the target in meters.

(b) Set the sight mount to "HE" by pulling down on and rotating the outer drum until the "HE" window appears at the rear of the sight mount. Note the temperature and rotate the inner drum to position the estimated range under the proper temperature index. (See Figure 14.) NOTE: The practice round uses the same setting as the HE (tactical) round.

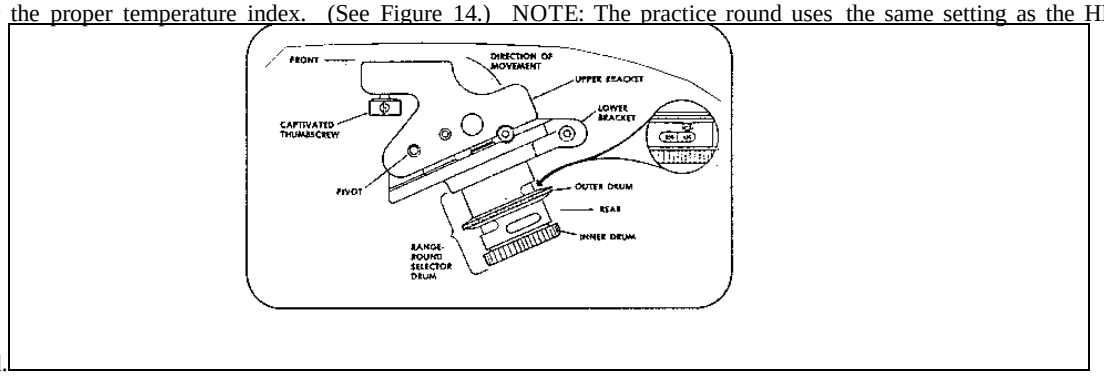



Figure 14. Sight mount

(c) Place the sight cross hairs on the target's center of mass. (See Figure 15.)

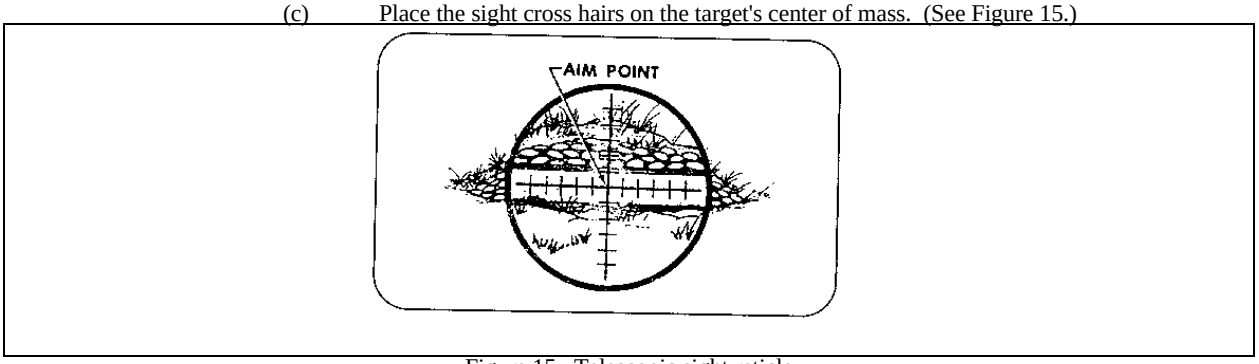



Figure 15. Telescopic sight reticle

(d) Fire and observe the first spotting tracer round. If no impact or a large error is observed, re-estimate the range to the target in 50-meter increments. Adjust the range selector knob and fire again. Repeat this process until a tracer strikes on or near the target.

(e) Observe the tracer point of impact on the target in relation to the sight reticle. (See Figure 16.) This point of impact on the sight reticle is now the adjusted aim point.

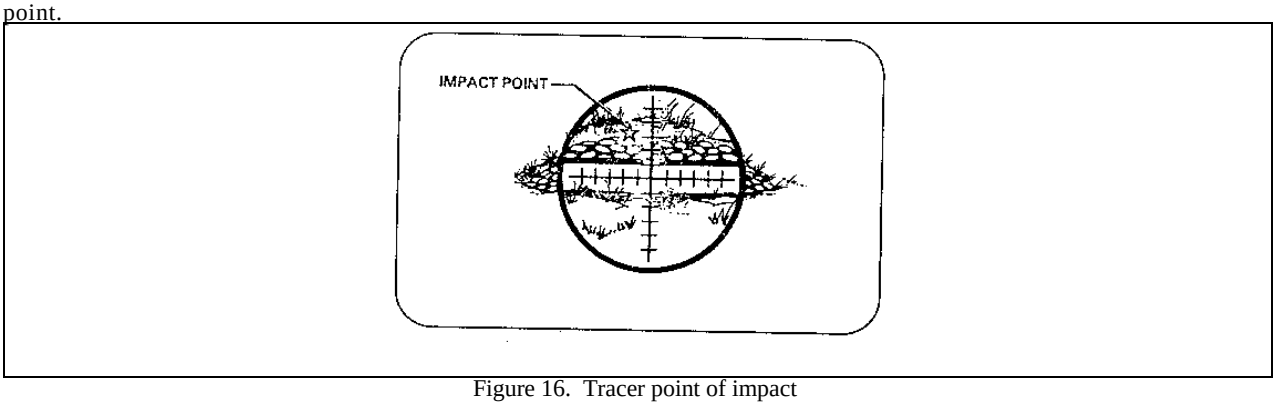



Figure 16. Tracer point of impact

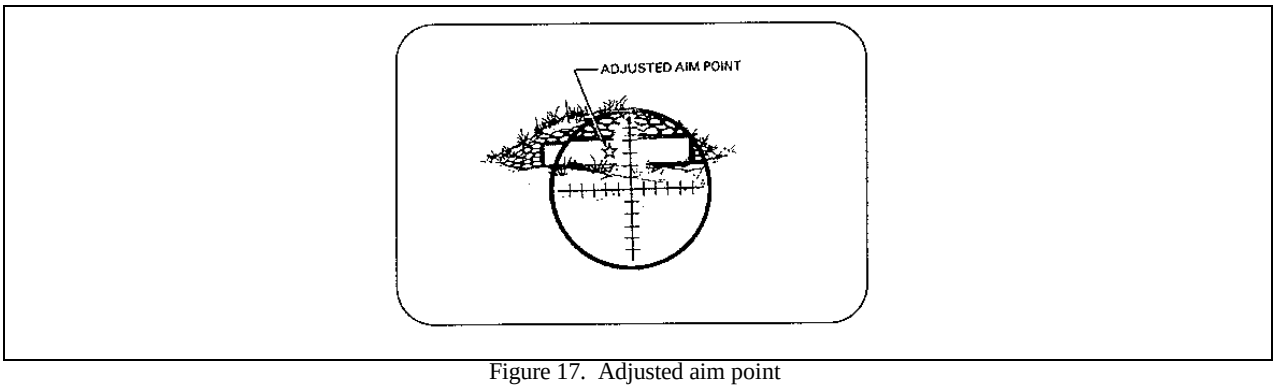



Figure 17. Adjusted aim point

(f) Move the adjusted aim point to the target center of mass by moving the weapon. (See Figure 17.) Repeat steps (d) and (e) until the desired target impact point is observed. Once the desired impact point is achieved, hold the weapon on that aim point, depress the "LAUNCH" lever, and squeeze the trigger to fire the rocket.

(2) Open sights. The open sights are intended as a backup for the telescopic sight. The open sights are illustrated below. When using the sights, the top of the front sight post is aligned with the top of the notched rear sight. Remember that the open sights are boresighted to a 250 meter target.

Figure 18 Figure 19

Figure 20

Figure 21 Figure 22

The open sights are aligned onto the center of mass of the target producing the target sight picture. (See Figure 20.) Tracer point of impact on the target is observed in relation to the sights (See Figure 21); the aim is adjusted by moving the weapon (figure 22) and confirmed by firing another tracer round. These steps are repeated until desired target impact point is achieved. The gunner then holds the correct adjusted aim point on the target, depresses the "LAUNCH" lever and squeezes the trigger to fire the rocket.

(3) Firing positions. The four firing positions for the MK153 SMAW are standing, sitting, kneeling, and prone. (See Figure 23.) The shoulder rest is used to balance the weapon on the gunner's shoulder when firing from the standing, sitting, or kneeling position. When firing from the prone position the weapon is balanced on the bipod legs, with the gunner's body lying at a 45 degree angle to the weapon.

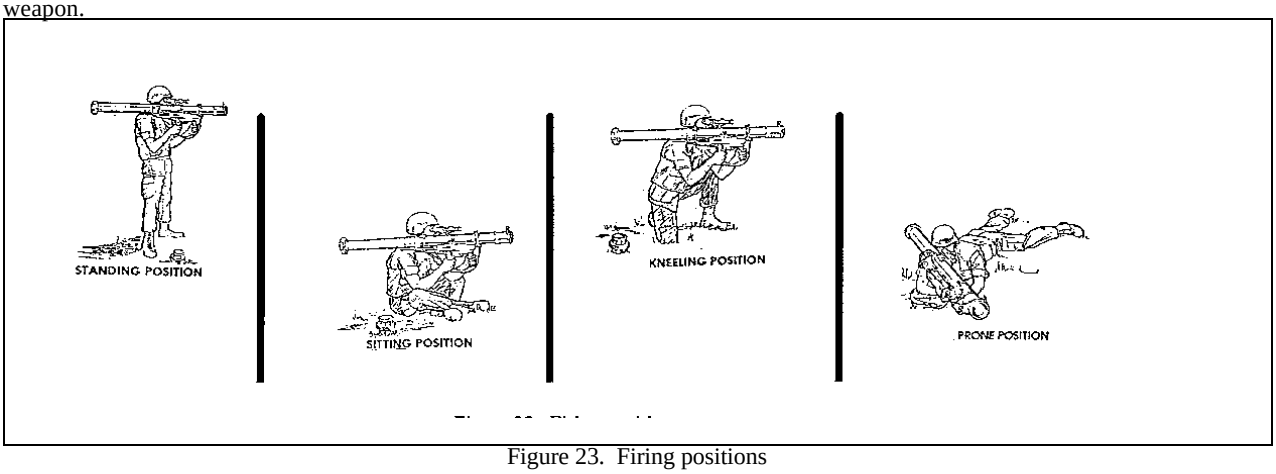
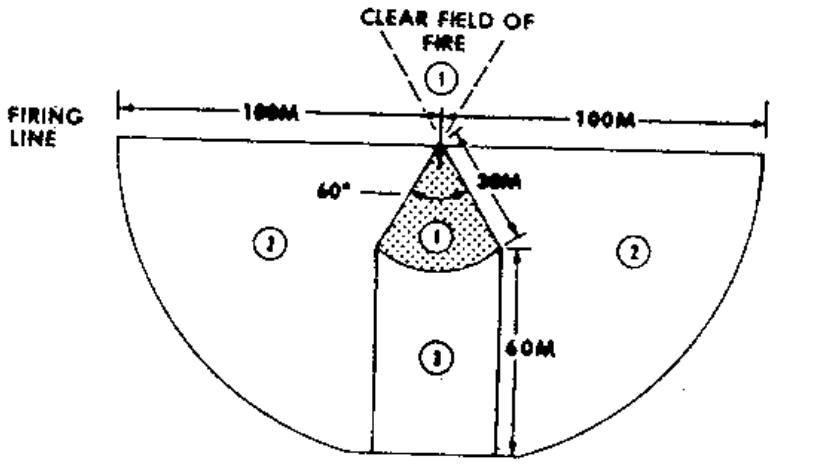



Figure 23. Firing positions

f. Safety precautions

(1) Backblast area. The backblast danger area extends at a 60 degree angle, 30 meters to the rear of the launcher and the caution area extends 60 meters to the rear of the danger area. All personnel should remain clear of these areas. Injury may be sustained from blast, flying debris, and excessive sound pressure levels. (See Figure 24.)




1. DANGER AREA - NO PERSONNEL ALLOWED
2. EAR PROTECTION CAUTION AREA
3. CAUTION AREA - NO PERSONNEL ALLOWED

Figure 24. Backblast

(2) Immediate action procedures

(a) Spotting rifle

1 Place the weapon on "SAFE."

2 Check to ensure the cartridge is seated in the chamber. A chambered cartridge can be viewed inside the receiver of the rifle by pulling the cocking lever rearward about one inch. Attempt to fire again.

3 If it fails to fire again, eject the cartridge by pulling the cocking lever to the rear and chamber another round. Ensure the bolt is fully forward.

4 Attempt to fire.

5 If the second cartridge fails to fire, notify ordnance personnel.

(b) Rocket launcher

1 Shout misfire.

2 Wait 15 seconds, keeping the weapon pointed down range.

3 Release the trigger and "LAUNCH" lever and place the safety on "SAFE."

4 Reset the charge lever to "CHARGE."

5 Attempt to fire.

6 Wait 15 seconds, keeping the weapon pointed down range.

7 Release the trigger and "LAUNCH" lever and place the weapon on "SAFE."

8 Remove the round by rotating it counterclockwise and pulling it rearward out of the launcher. Rotate the round one-half turn (180 degrees) and remount to the launcher.

9 Attempt to fire.

10 Wait 15 seconds, keeping the weapon pointed down range.

11 Release the trigger and "LAUNCH" lever and place the weapons on "SAFE."

12 Remove the round from the launcher and dispose of properly.

13 Obtain another round and continue the mission. If the next round fails to fire, the launcher may be faulty and should be repaired by ordnance personnel.

(3) Additional safety considerations

(a) After removing the front-end cover from the encased rocket, do not touch the electrical contacts. This could cause an electrostatic charge to be discharged into the rocket and set it off.

(b) If at any time while firing the spotting rifle, you do not see a tracer trail, stop firing immediately, clear the rifle by pulling the charging handle to the rear and remove the magazine, and inspect the bore to ensure it is clear.

(c) Do not look directly into the sun, flares, or search lights through the telescopic sight. This could severely burn the gunner's eyes.

(d) When firing from the prone position, the gunner must be careful that his body is positioned away from the backblast area.

(e) Before firing, ensure the bore of the launcher is free of obstructions.

(f) Minimum safe engagement ranges:

| TARGET | COMBAT | TRAINING |
|---|---|---|
| Brick/cement/sandbag | 50m | 100m |
| Steel/metal | 80m | 150m |

NOTE: The SMAW may be fired at a target as close as 10 meters if the gunner is in a defilade position.

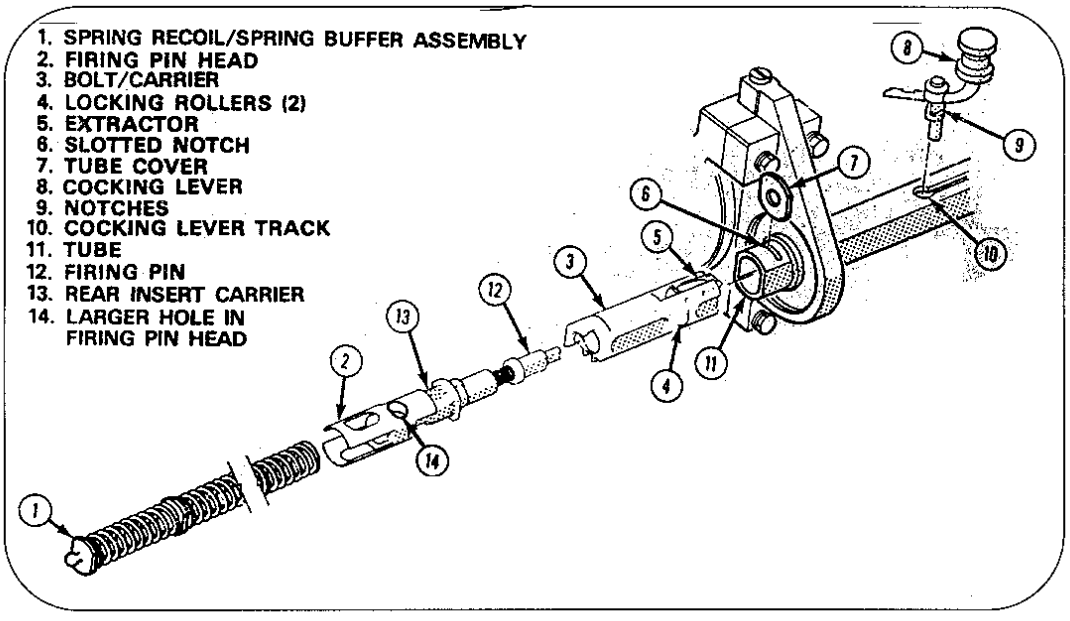



Figure 25. Spotting rifle

Figure 25. Spotting rifle

g. Operator maintenance

(1) Field stripping the spotting rifle

(a) Using a cleaning rod, depress the end of the spring assembly (1). Pushing in and up, start the tube cover (7) out of slotted notch (6). Remove the cleaning rod and, while holding your thumb over the rear tube opening, lift the tube cover (7) the rest of the way out of the slotted notch (6). (See Figure 26.)

Figure 26. Field stripping the spotting rifle

(b) Keeping your thumb partially covering the tube opening, carefully remove the spring assembly (1). (See Figure 27.)

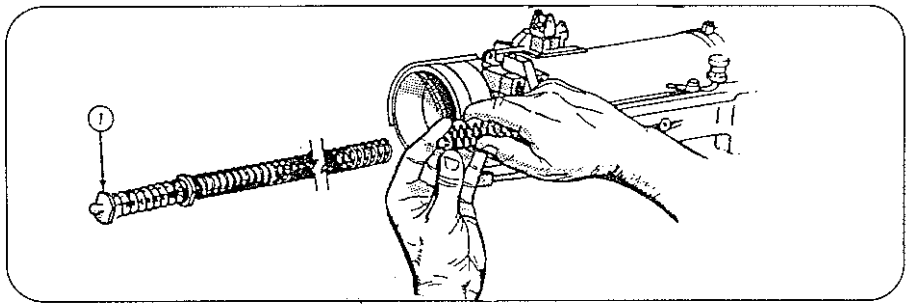



Figure 27. Spring assembly

(c) Pull the cocking lever (8) to the rear as if cocking the spotting rifle. (See Figure 28.)

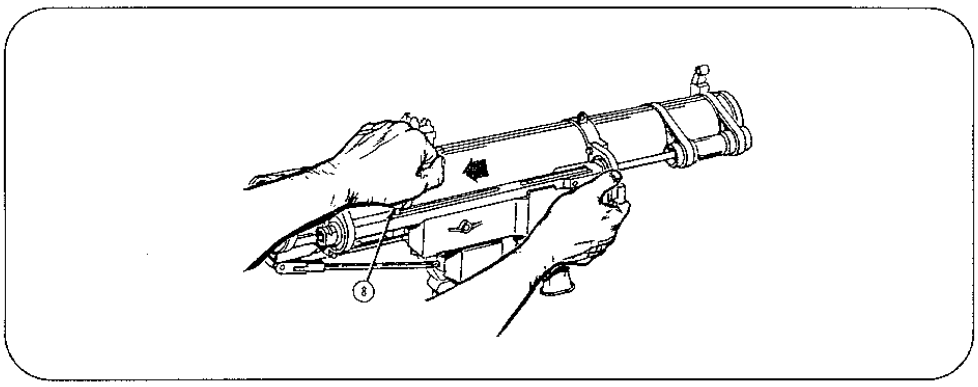



Figure 28. Cocking lever

(d) Lift the cocking lever (8) out of the tube. Using the tube cover (7), start at the forward end of the cocking lever track (10) and slide the bolt (3) rearward until the firing pin head (2) just clears the rear tube opening (3). (See Figure 29.)

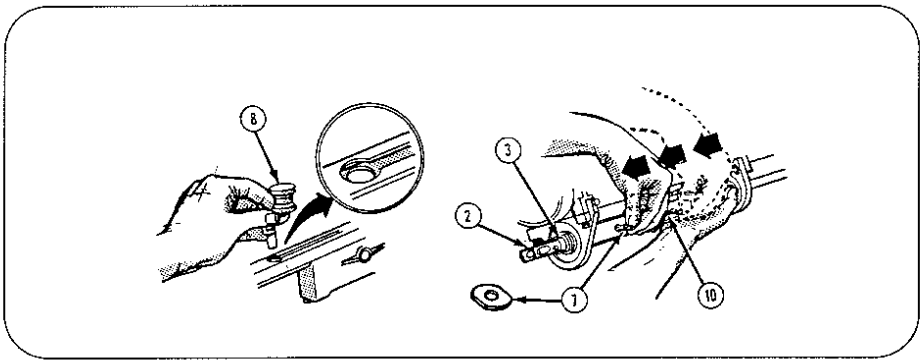


Figure 29. Removing bolt

(e) Pull the bolt (3) out of the tube (1). As the bolt is removed, the firing pin head (2) will snap forward, so do not let it pinch your fingers. (See Figure 30.)

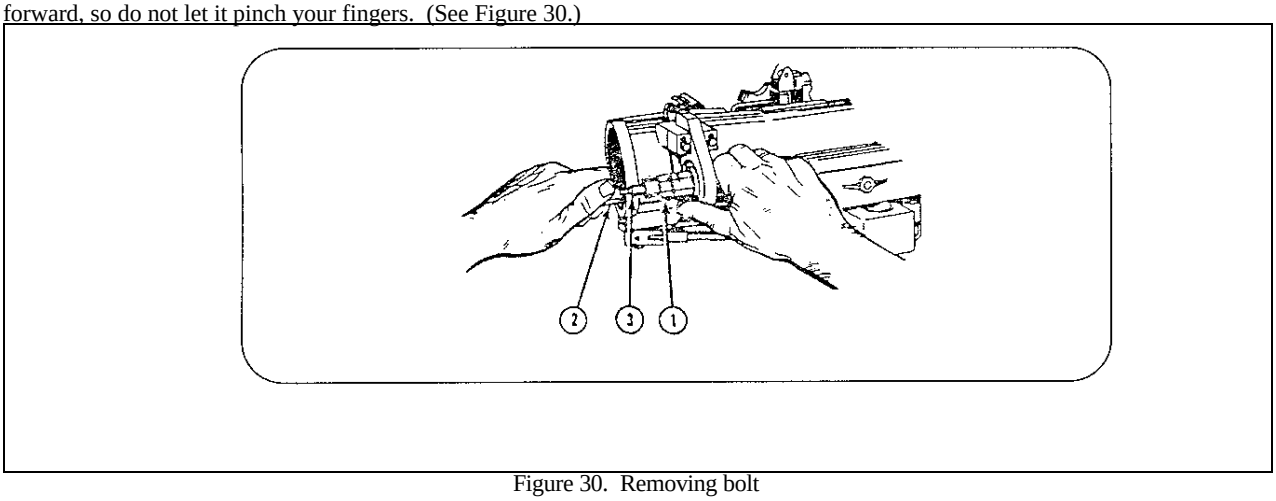



Figure 30. Removing bolt

(f) Holding the bolt, rotate the rear insert carrier (3) counterclockwise until the bolt separates into two pieces.

(2) Cleaning the MK153 SMAW

(a) Spotting rifle. Clean all internal components and external areas of the spotting rifle with CLP. Remove all carbon, corrosion, rust, and dirt. Each weapon has a bore brush, chamber brush, and cleaning rod. Use a toothbrush, patches, or Q-tips as necessary. Do not use abrasive materials. Lightly lubricate with CLP.

(b) Launcher. The launcher tube and all the attached components should be cleaned with a cloth dampened with CLP. Use a toothbrush, patches, or Q-tips as necessary. Wipe dry with a dry, clean cloth. Clean the inside of the launcher tube (1) by wrapping cleaning cloths dampened with CLP or hot soapy water around the 83mm borebrush (2) and running it back and forth through the launcher tube. (See Figure 31.) When the tube is clean, repeat the process--using dry, clean cloths to remove all but a light coat of CLP. The launcher must be cleaned out with water and the borebrush after every noise simulator is fired from the trainer.

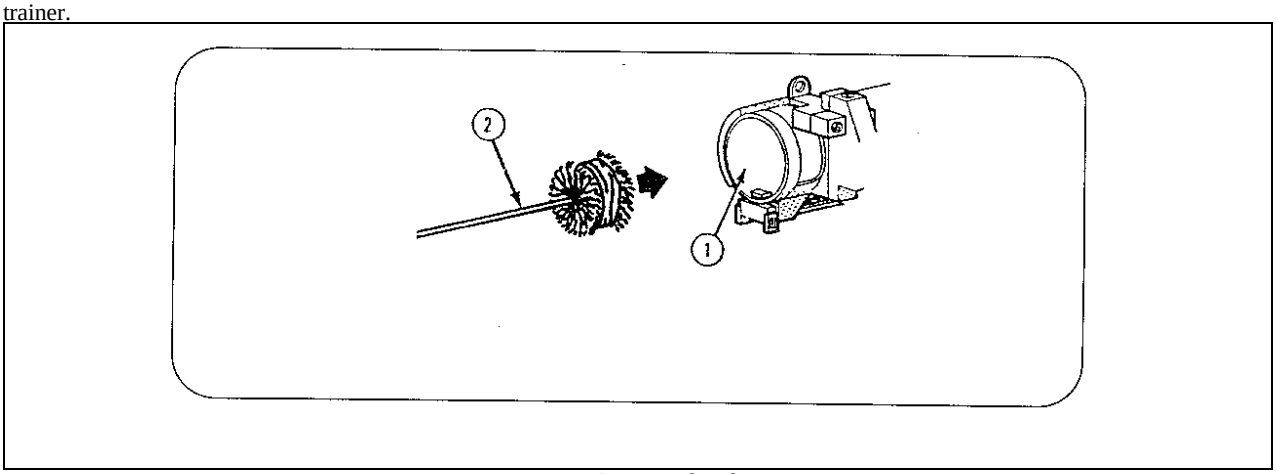



Figure 31. Bore brush

(c) Telescopic sight lenses. Remove the rear lens eyeguard by turning the knurled ring counterclockwise (1) until the eyeguard comes off. Flip up the front lens cover, and clean both lenses with an optics brush (2) then use a tissue dampened with ethyl alcohol if required. (See Figure 32.)

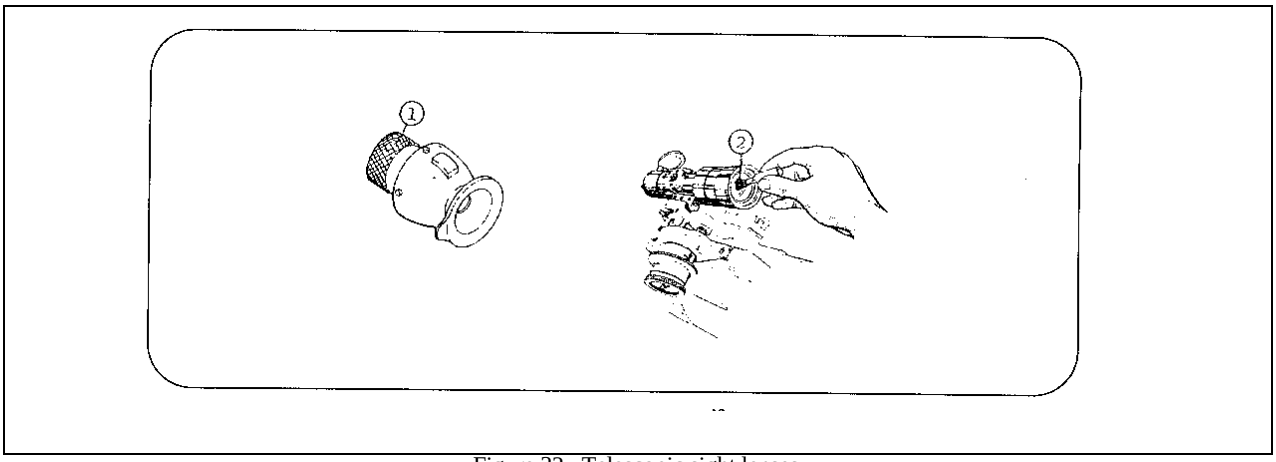
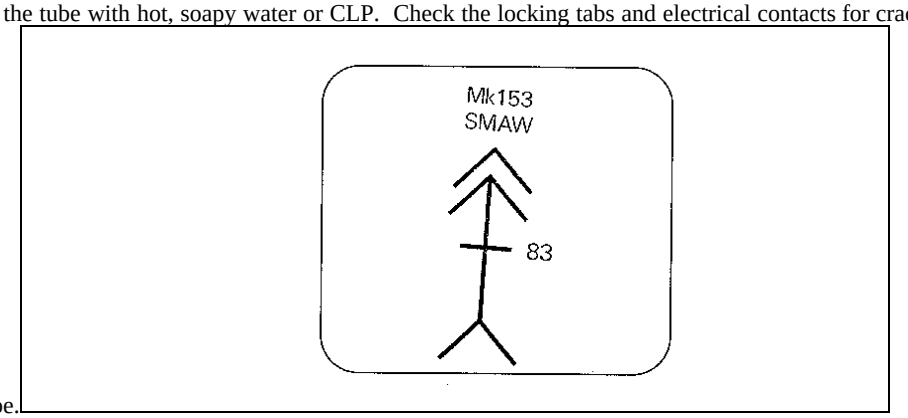



Figure 32. Telescopic sight lenses

(d) Trainer. Ensure there is not a noise simulator installed in the trainer. Remove the end-cap and clean the inside of the tube with hot, soapy water or CLP. Check the locking tabs and electrical contacts for cracks, chips, and separation from the tube.




MK153 SMAW Symbol

# INTRODUCTION TO ANTIMECHANIZED WEAPONS

SECTION II

INTRODUCTION TO THE DRAGON AND TOW

1. **Dragon**

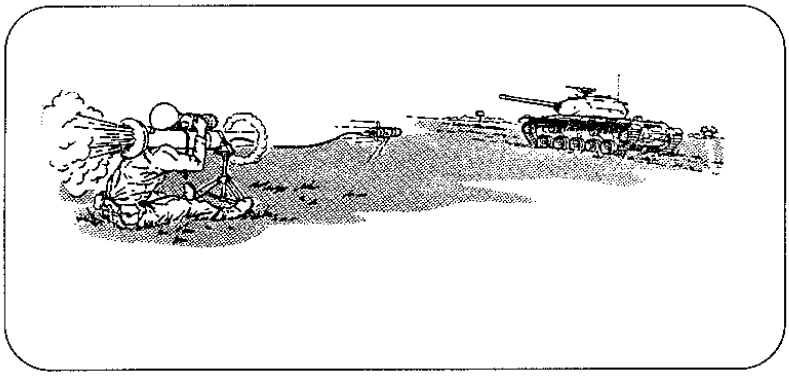


Figure 1. Dragon

a. Description

(1) The Dragon is a lightweight, recoilless, shoulder fired, tube-launched, optically tracked, medium antitank assault weapon.

(2) The Dragon consists of two major components.

(a) Round. The round, which consists of the launcher and the missile, is expendable and discarded after use. (Figure 2)

(b) Tracker. The tracker, which is the "*eye*" and the "*brain*" of the Dragon, attaches quickly to the round. It is what the gunner looks through in order to engage targets. There is the 6X magnification day tracker and the infrared night tracker. (Figure 3)

Figure 2. Encased Dragon round

Figure 3. Dragon trackers

b. Location. The Dragons are found in the antiarmor platoon, of the weapons company, in an infantry battalion. There are a total of 12 Dragon teams organized in three squads under a single section leader. (Figure 4)

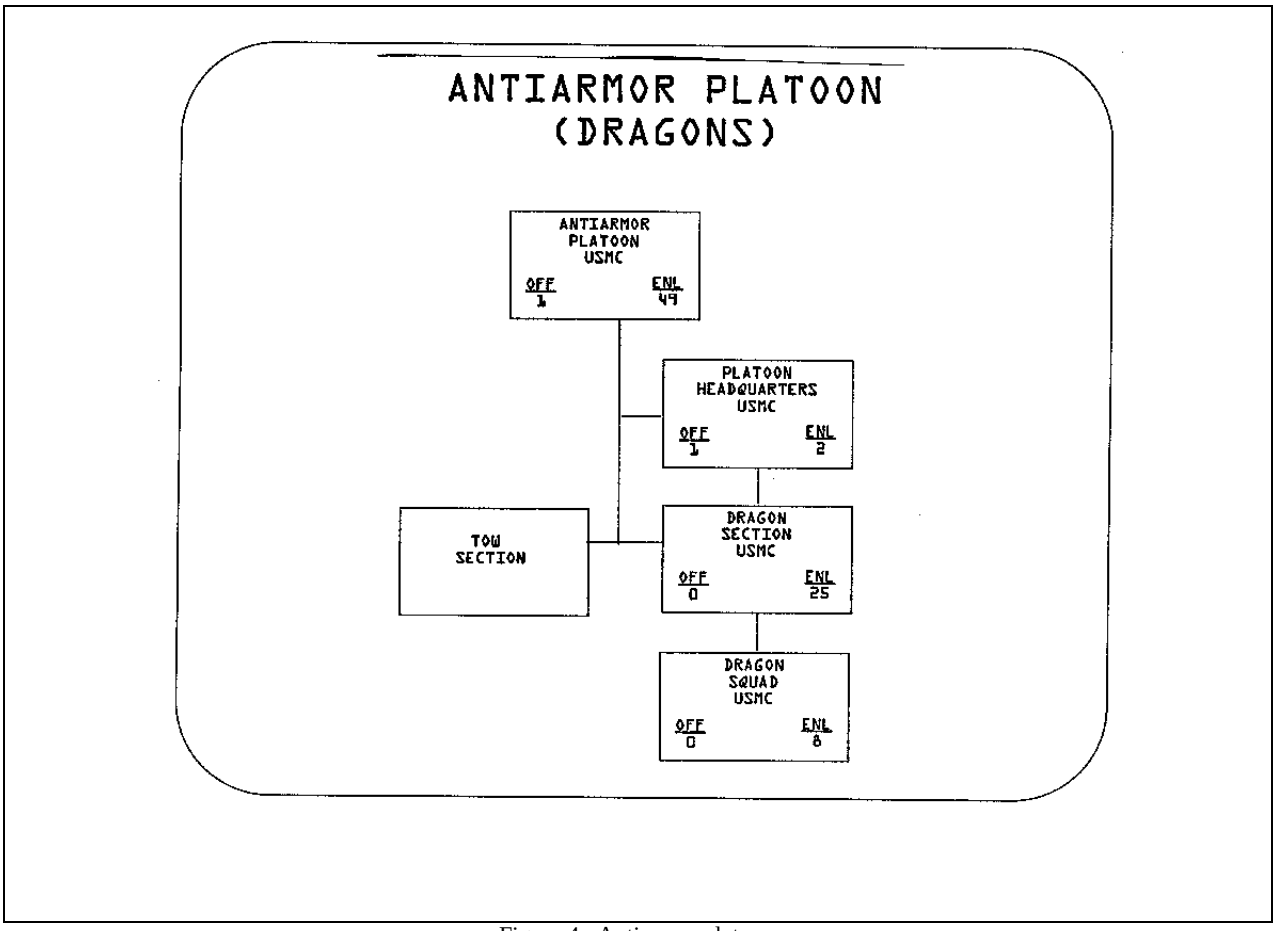



Figure 4. Antiarmor platoon

c. Characteristics

(1) Weight:

| | |
|---|---|
| Round | 25.3 pounds |
| Tracker, Day | 6.75 pounds |
| Tracker, Night | 21.65 pounds |

(2) Range, minimum 65 meters

(3) Range, maximum 1000 meters
2000 meters (Dragon II)

(4) Ammunition HEAT, Practice

(5) Penetration 24 inches of homogeneous steel

d. Capabilities

(1) High hit probability

(2) High lethality

(3) Easy to conceal

(4) Simple to acquire and track targets

(5) One man portable

(6) Night tracking with passive/thermal sight

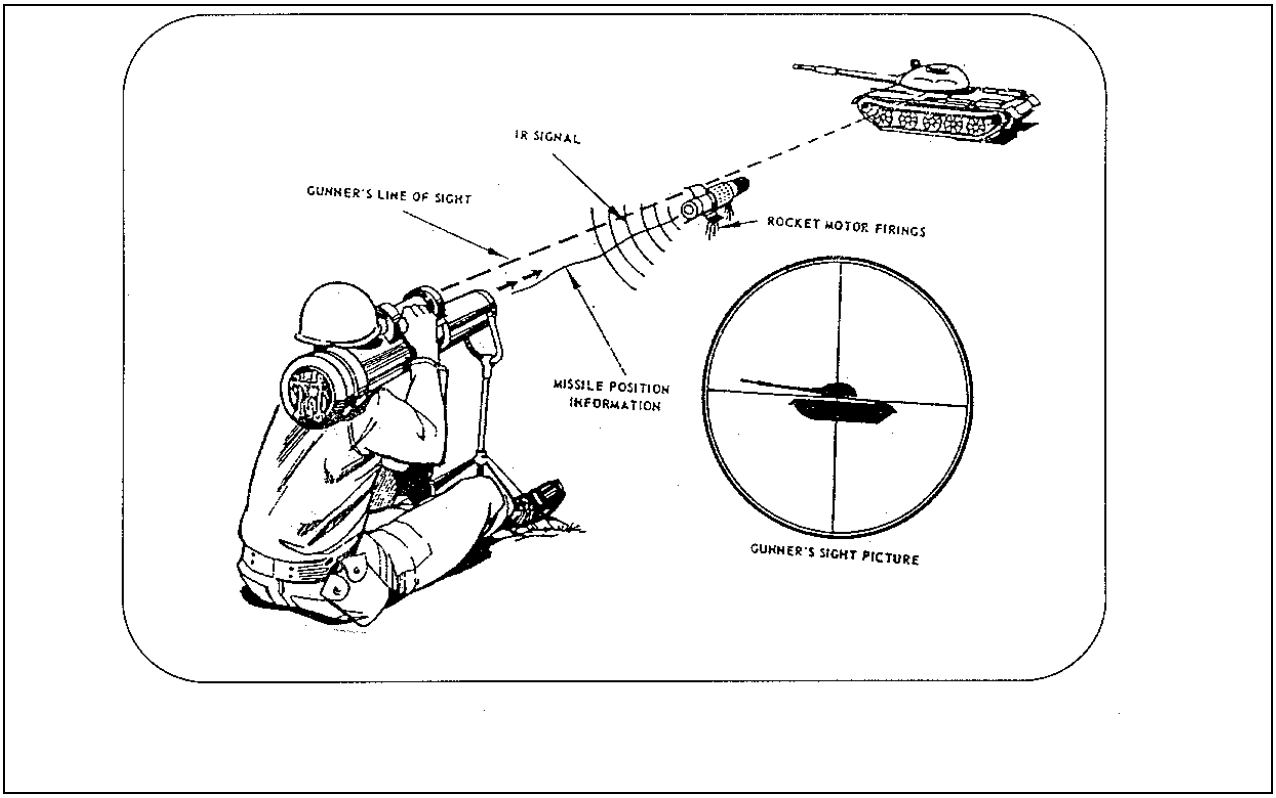



Figure 5. Gunner's sight picture

e. Limitations

(1) Sun interference. The gunner should not look directly into the sun with the trackers.

(2) Water. If there is a body of water between the gunner and the intended target, the distance of the shot becomes a factor. If the distance is greater than 500 meters, this is not the preferred method of employment due to the possibility of the wire coming into contact with the water and affecting the electronic guidance process.

(3) Prone firing. The gunner's body is exposed to the backblast of the weapon.

(4) Simultaneous engagements. The Dragons should be at least 50 meters apart, and they should not engage the same vehicle at the same time. The infrared receivers on the trackers could pick up the other gunner's missile and give it the wrong commands to get on target.

(5) Launch cant angle. The gunner's body is exposed to the backblast if the weapon is canted too high.

(6) Gunner and weapon vulnerability. The Dragon is a recoilless weapon; therefore, it produces a large backblast or signature. This signature announces the gunner's position to anyone on the battlefield.

(7) Backblast. The backblast for the Dragon comes out from the rear of the launcher at a 90 degree angle. It extends for 50 meters; the first 30 meters are a danger zone and the additional 20 meters are a caution zone. There should be no friendly troops inside the backblast area. (Figure 6)

(8) Time of flight. At 1000m the gunner is tied to the weapon for ten seconds, the max time of flight for the Dragon.

(9) Weight. Up to 50 pounds.

(10) Clear line of sight. Necessary for proper engagement. Will prevent proper tracking or premature detonation.

(11) 150-200m needed to regain control of missile. Due to whiteout, the missile is not properly tracked for the initial one to two seconds of flight.

(12) Whiteout. Backblast preventing gunner from seeing the target and tracking properly.

Figure 6. Dragon backblast area

2. **TOW**

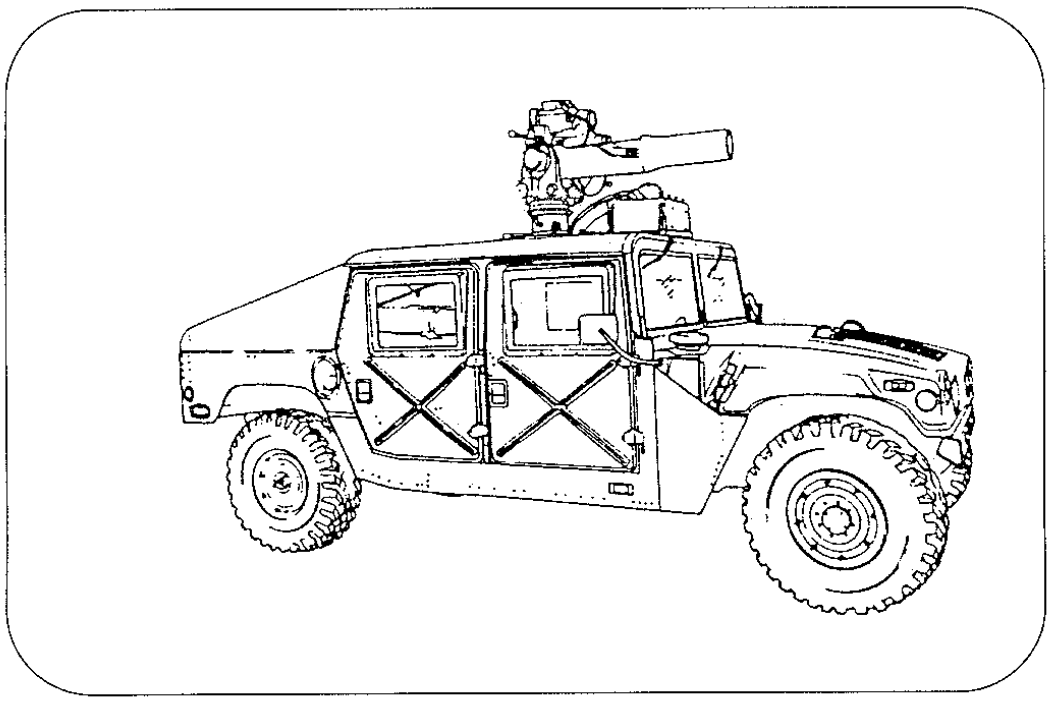


Figure 7. Mounted TOW

a. Description

(1) The TOW is the heavy antitank weapon for the Marine Corps. *TOW* is the acronym for *T*ube launched, *O*ptically tracked, *W*ire command linked.

(2) Major TOW components

(a) Launcher

1 Launch tube. The fiberglass launch tube provides mechanical guidance for the initial flight of the missile.

2 Traversing unit. Acts as a base for the rest of the equipment to mount. Allows for the connection between the system and the launcher.

3 Missile guidance set. Acts as the "*brains*" of the system. The missile guidance set makes the comparison between the missile in flight and the cross hairs in the sight. It then sends electrical impulses through two wires to the missile in order to correct its flight path to the target.

4 Battery assemblies. The missile guidance set and the night sight are run off of batteries. The MGS batteries are good for 50 missile firings, and the night sight batteries are good for eight hours of continuous operation.

5 Day sight tracker. The day sight is a 13X magnification sight with a cross hair reticle pattern in it for target engagement.

6 Tripod. The tripod is used when the TOW is to be ground mounted only.

7 Power conditioners. The power conditioners are used to convert the vehicle's power into power for the MGS and the night sight.

8 Night sight. The night sight, by the use of a selector lever, is either a 12X or 4X magnification sight. It also has a cross hair reticle pattern in it for target engagement. The night sight is the primary sight for today's modern battlefield because it can see through smoke and other battlefield obscurations.

(b) TOW Missile. The TOW missile varies in range due to modern technology. The basic TOW has a maximum range of 3000 meters whereas TOW2B has a maximum range of 3750 meters.

(3) The TOW system can be mounted on a tripod, 1/4 ton jeep, HMMWV, and when modified it can be mounted on the LAV and the TOW Cobra helicopter.

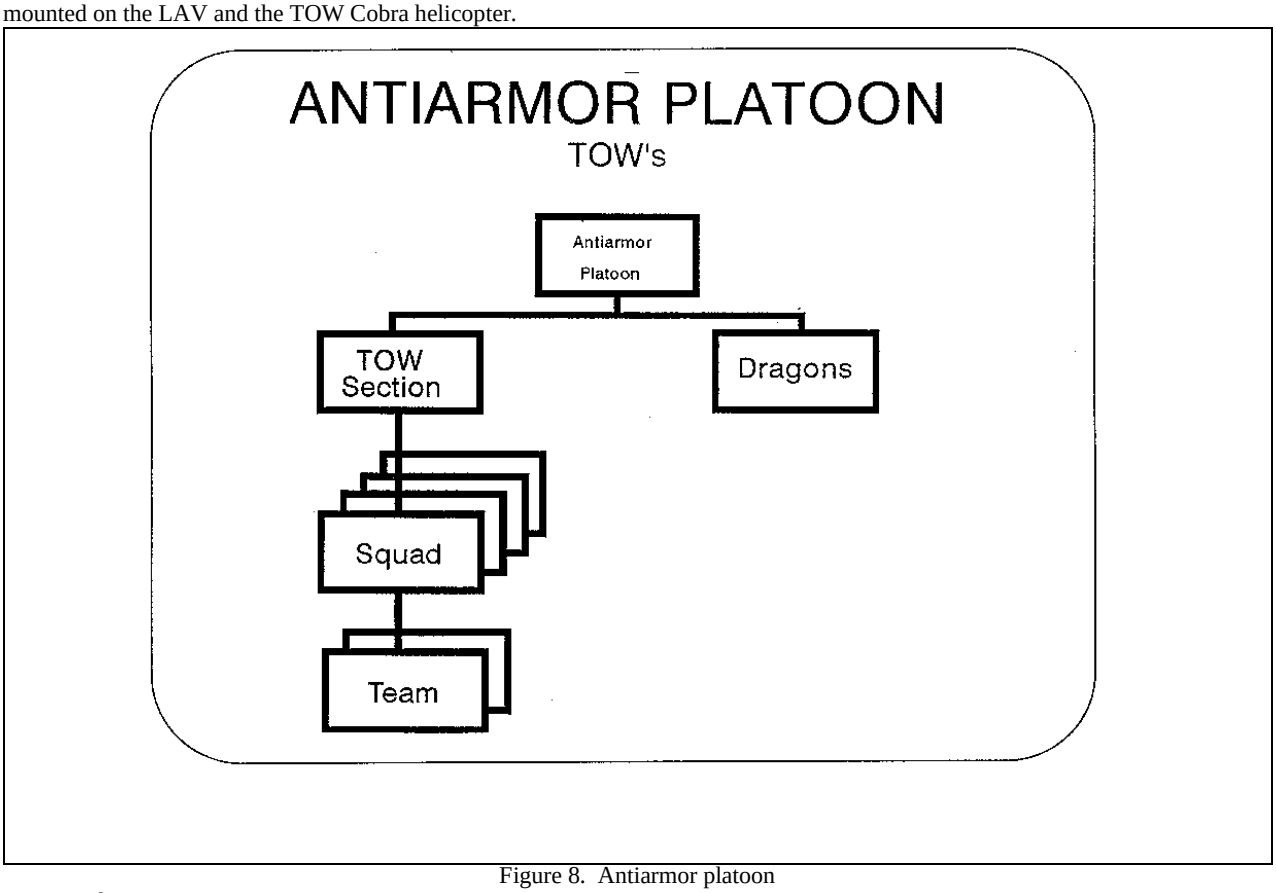



Figure 8. Antiarmor platoon

b. Location

(1) Infantry Battalion:

(2) Light armored infantry battalion

(3) Infantry regiment TOW platoon

c. Characteristics

(1) Weight:

(a) Launcher (complete with night sight) 203 pounds

(b) Missile 65 pounds

(2) Range, minimum 65 meters

(3) Range, maximum 3750 meters

| | | |
|---|---|---|
| (4) | Ammunition | HEAT, Inert |
| (5) | Penetration | 26 inches of homogeneous steel |

* TOW II-2B is a top attack missile with a dual warhead.

d. Capabilities

(1) Operates in all weather conditions in which the gunner can see the target through the day sight tracker or the night sight.

(2) Operates in temperatures of -32 degrees to +60 degrees C (-25 degrees to +140 degrees F).

(3) Operates at altitudes up to 3,050 meters (10,000 feet). Cold weather (< 0 degrees F) range decreases to 3000 meters.

(4) High first round hit probability against stationary or moving targets.

(5) Easy to operate.

(6) Standoff - Maximum effective range is greater than enemy's maximum effective range. When used, provides a form of tactical advantage.

(7) Mobility - Due to being mounted on vehicles and aircraft, TOWs are able to move quickly.

(8) Lethality - Long range, great penetrating ability relative to other direct fire weapons.

e. Limitations

(1) Gunner and weapon vulnerable to enemy fire during tracking due to the large signature effect.

(2) Slow rate of fire. The rate of fire will be determined by the team's experience. If a team were to stay in one place and engage multiple targets, the average rate would be two rounds per minute.

(3) Limited effectiveness in wooded, congested avenues of approach. The gunner must have a clear line of sight during engagement. Obstacles in the missile's flight path may prevent proper tracking or cause premature detonation.

(4) Do not look directly into the sun with the sights.

(5) Water - If there is a body of water between the gunner and the intended target, the distance of the shot becomes a factor if the distance is greater than 2100 meters. This is not the preferred method of employment due to the possibility of the wire coming into contact with the water and affecting the electronic guidance process.

(6) TOWs should be at least 300 meters apart from each other, and they should not engage the same target at the same time.

(7) The backblast for the TOW extends 75 meters from the rear of the launcher at a 90 degree angle. The first 50 meters are a danger area and the additional 25 meters are a caution area. There should be no friendly troops in the backblast area. (Figure 9)

(8) Weight - 300 pounds (ground mounted ready to fire).

(9) Signature - Sound, light, smoke shows position on battlefield.

(10) Time of flight - 23 seconds out to 3750 meters.

(11) 150-300m to regain control - Due to whiteout, gunner is prevented from observing and properly controlling missile.

(12) Whiteout - Backblast preventing gunner from seeing target and tracking properly.

Figure 9. Tow backblast area

3. **Preparing Antiarmor Range Cards**

a. Purposes of range cards

(1) Control massing and shifting of fires.

(2) Aid in distribution of fire.

(3) Used to designate targets.

(4) Aid during relief in place.

b. When range cards are prepared, make two copies. One will be used at your location; the other is forwarded up the chain of command.

c. Steps in making a range card

(1) Determine sectors of fire.

(2) Identify prominent terrain features as target reference points.

(3) Put down magnetic north on sketch.

(4) Draw in terrain features, roads, buildings, streams, hills.

(5) Show location of your position in relation to a nearby terrain feature.

(6) Sketch in terrain features causing dead space.

(7) Indicate the dead space with diagonal lines.

(8) Sketch the anticipated target reference points, numbering them 1 through 10, left to right.

(9) Indicate sectors of fire.

(10) Indicate maximum range of weapon.

(11) Draw lines to target reference points and indicate azimuth and range.

d. Essential components of an antiarmor range card in their order of priority

(1) Boundaries of the sector of fire, to include the maximum engagement line.

(2) Location and distance to anticipated target engagement locations.

(3) Location of target reference points in or near the sector of fire.

(4) Deadspace

(5) The Dragon/TOW Symbol.

(6) Marginal data, to include:

(a) Date and time of preparation

(b) Unit designation (squad, platoon, and company)

(c) Position description (primary, alternate or supplementary)

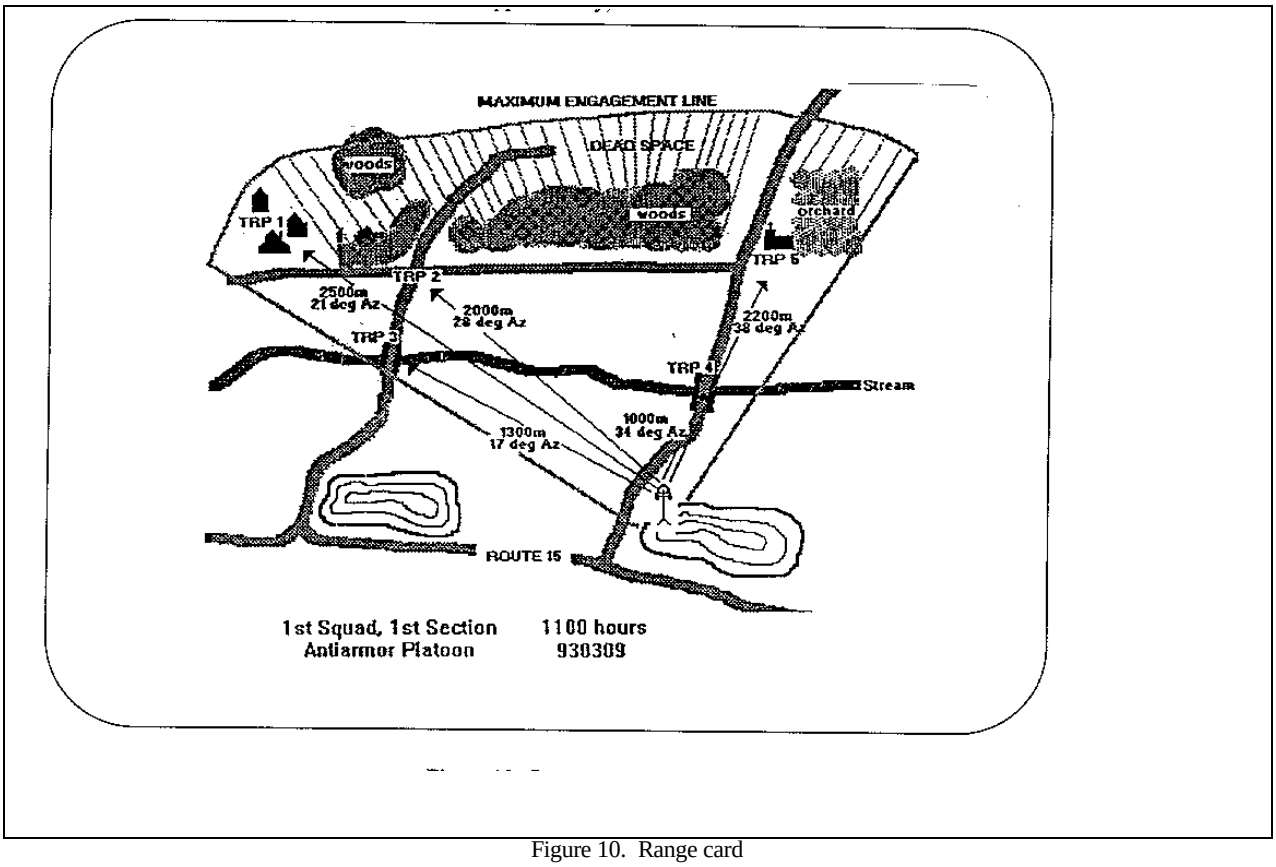



Figure 10. Range card

4. **Principles of Employment**

a. Pairs. Provides continuous coverage of an assigned sector of fire.

b. Terrain. Always use terrain to maximum advantage. Avoid conspicuous terrain features. Look to achieve cover and concealment from air/ground observation and to mask backblast.

c. Maximum range. Position to achieve fields of fire out to maximum range.

d. Flank shots. Position to achieve flank shots. As a general rule, frontal shots should be avoided when advancing. Armor observation is usually to the front, making flank and rear observation difficult.

e. Mutual support:

(1) Interlocking

(2) Fire on each other's position

f. Security. Integrate with infantry.

g. Dispersion. This is the most effective measure you can use to negate the effects of the threat artillery. Weapons should be dispersed both laterally and in depth so a single volley from an artillery battery would not destroy all of your antiarmor assets. Guided missiles should be dispersed at least 50m apart (Dragons) and 300m apart (TOWs). (Figure 11)

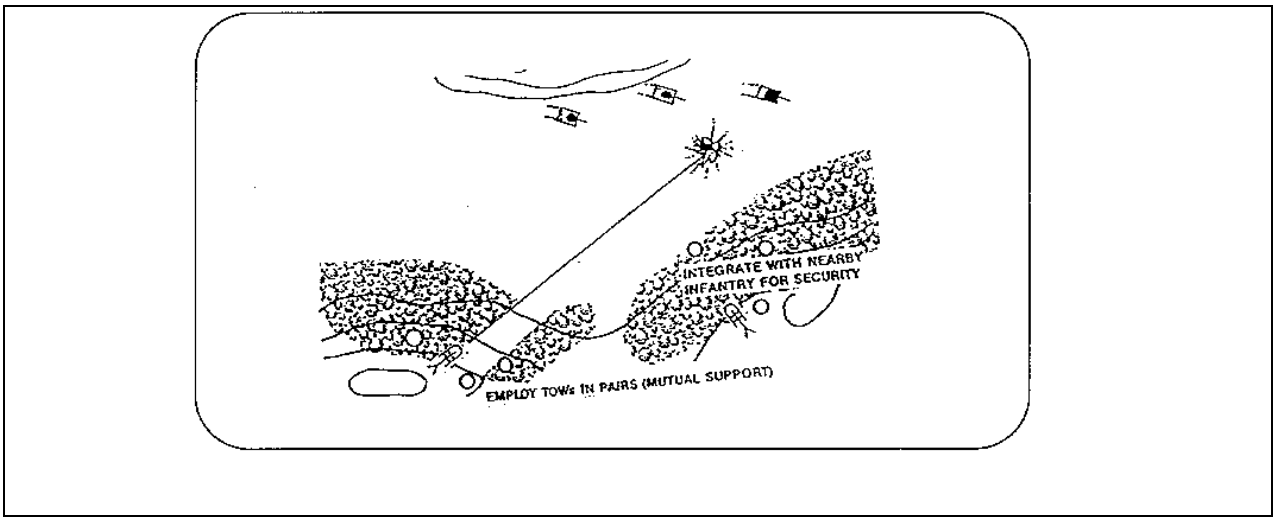



Figure 11. Dispersion

5. **Positions**

a. Primary position. A primary position is a position where the main mission can be accomplished.

b. Alternate position. An alternate position is an entirely different position from the primary; however, it is a position that can accomplish the same main mission.

c. Supplementary position. A supplementary position is both a different position and a different mission.

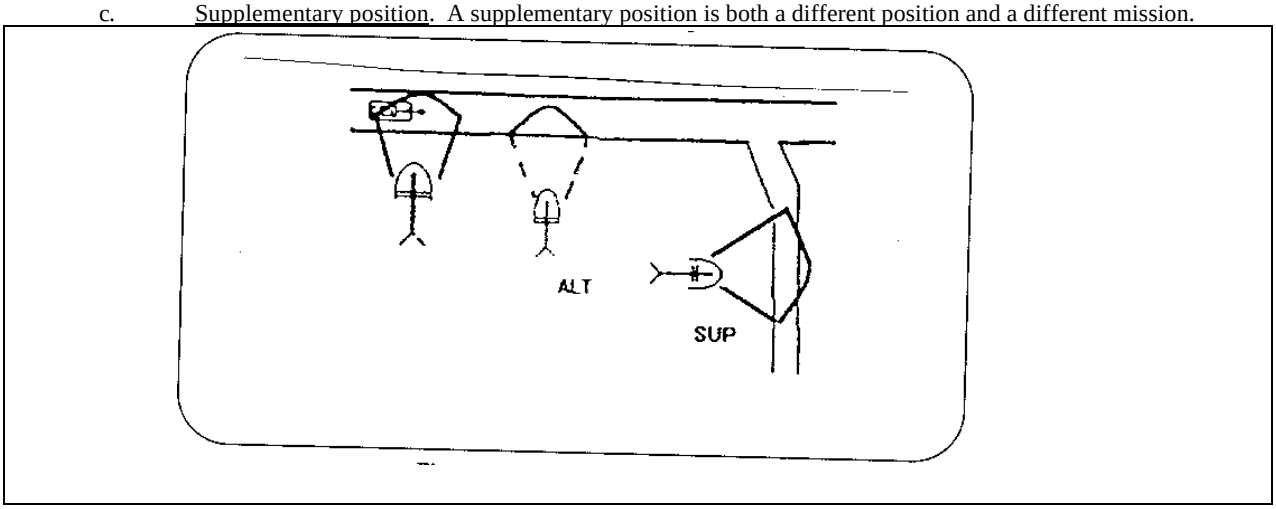



Figure 12. Weapons positions

d. Hot. Position on ground where gunner will launch the round.

e. Cold. Also called hide position. Ideally to rear or flank of the hot position, providing cover and concealment. This is the position where the team holds until it is time to engage.

6. **Methods of Control**

a. Engagement area. An area on the ground in which the commander wants to engage the enemy with all available weapons.

b. Sector of fire. An area assigned to a specific gun/team used to ensure full coverage of the assigned area of responsibility.

c. Target priorities. An engagement checklist in descending order of priority of targets to engage.

d. Trigger point. Establishes a specific spot on the ground, typically an easily identifiable terrain feature or man-made object, that triggers the firing sequence.

e. There are many more methods that can be used to control fire; they can be used in conjunction with each other as well (i.e., engagement area with sectors of fires, target priorities and a trigger point).

7. **Antiarmor Methods of Engagement**

a. Methods of engagement. There are two general methods of antiarmor engagement: HAW, MAW, LAW and massed surprise fires.

(1) HAW, MAW, LAW Concept: Heavy Antiarmor Weapon (TOW and Tanks), Medium Antiarmor Weapon (Dragons), Light Antiarmor Weapon (AT-4 and SMAW AA rnd). HAW, MAW, LAW is a concept in which friendly antiarmor weapons engage targets at their maximum effective ranges. The idea is to destroy the enemy armor as far forward of the friendly positions as possible. (Figure 13)

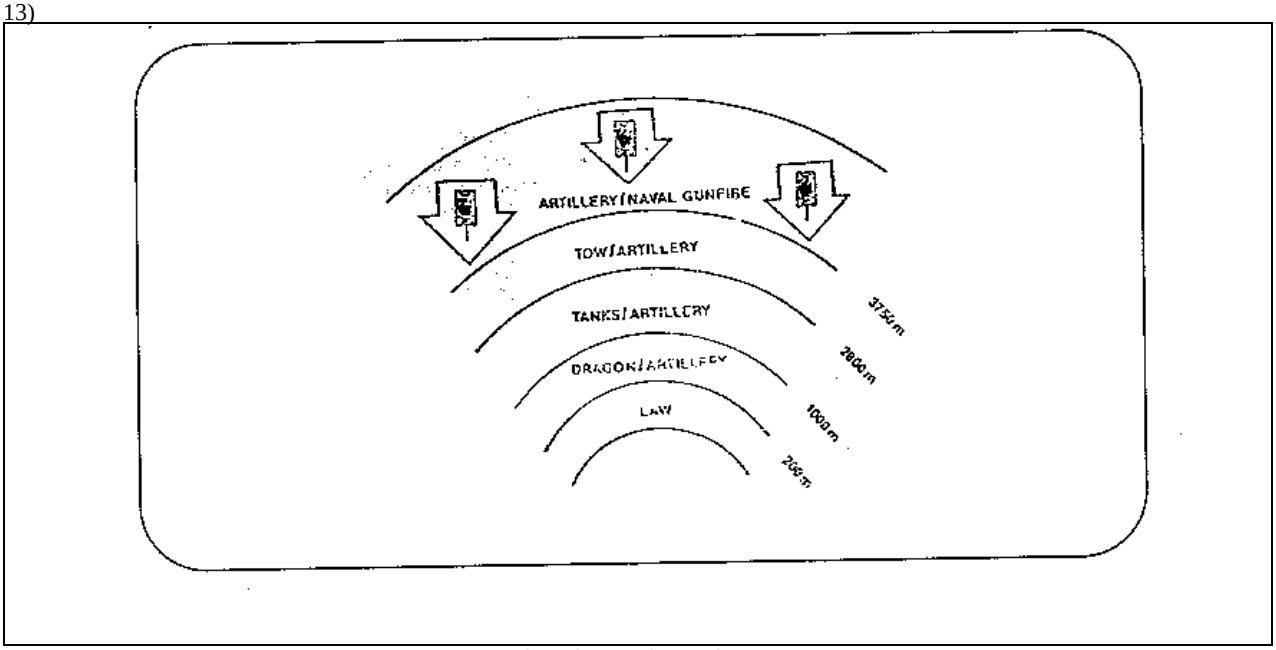



Figure 13. HAW, MAW, LAW concept

(2) Massed surprise fires. This method of engagement uses all direct fire weapons engaging the enemy simultaneously. This method is ideal in the ambush of individual or small armored units. When utilizing massed surprise fires, your weapons do not have to be all together. However, the principles of employment as previously discussed in paragraph 4 still apply. (Figure 14)

Figure 14. Massed surprise fires

b. Target engagement window. The exposed area between two covered areas that allows an antiarmor gunner sufficient time to engage a target that is moving from one covered area to another across the exposed area is the target engagement window. An antiarmor gunner must be aware of the missiles' time of flight at various ranges and the vehicle's speed (average speed over terrain is 10m second). (Figure 15)

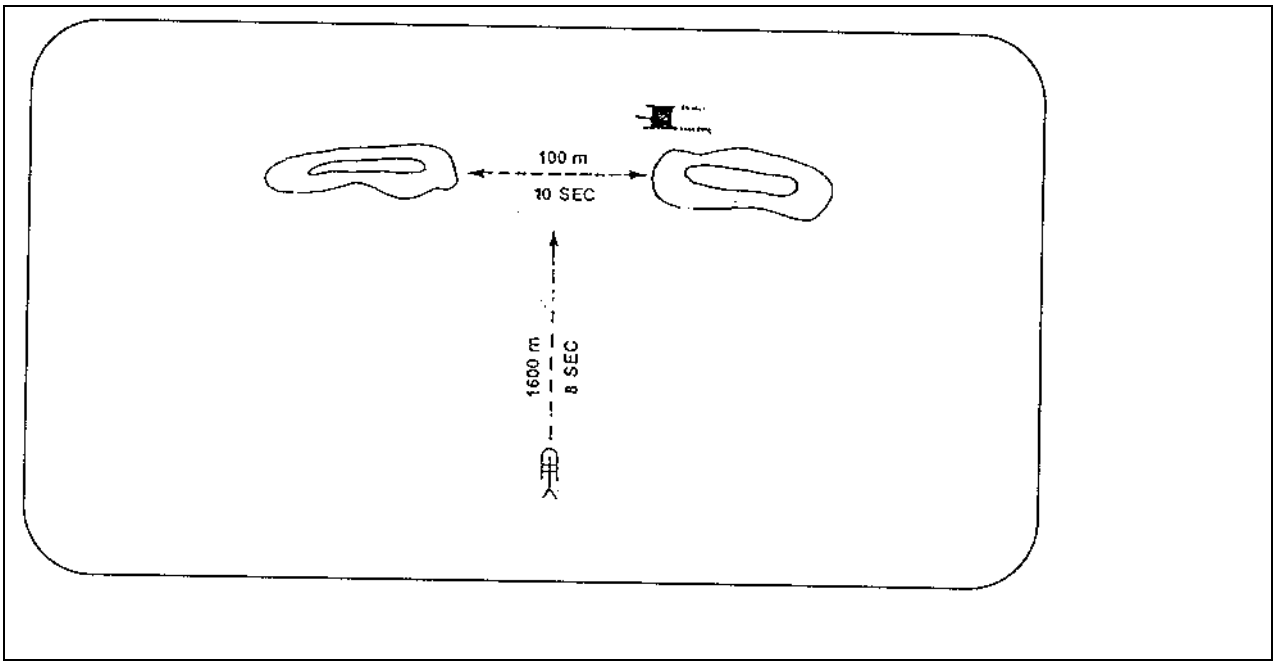
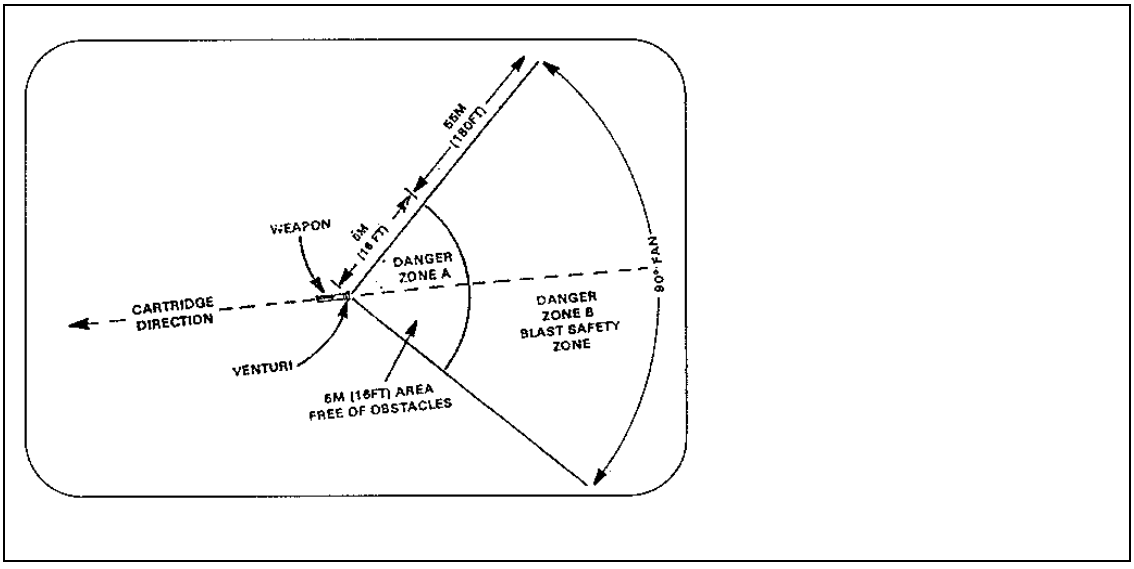



Figure 15. Target engagement window

c. Tank killer teams. Commonly referred to as "Hunter Killer Teams" or "CAATs" (Combined Antiarmor Teams). They are normally squad sized. Tank killer teams destroy enemy armor without becoming decisively engaged. They are also used to call for and adjust indirect fires and to report enemy activities. Tank killer teams may use helicopters or vehicles for their mobility. Their primary technique of engagement is the ambush technique utilizing massed surprise fires. Tank killer teams usually have, but are not limited to, one squad of TOWs, two squads of heavy guns, one fireteam of infantry and one squad of Dragons. Remember, a tank killer team can consist of any of your assets; it is only limited by your imagination.



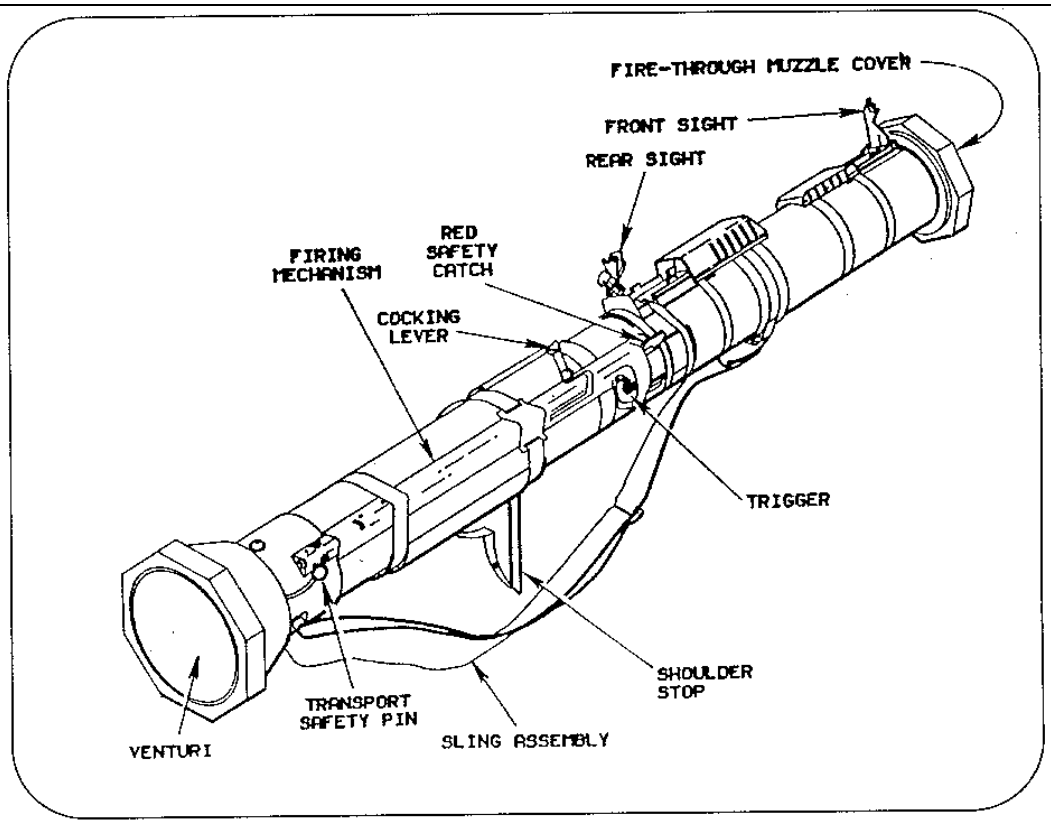
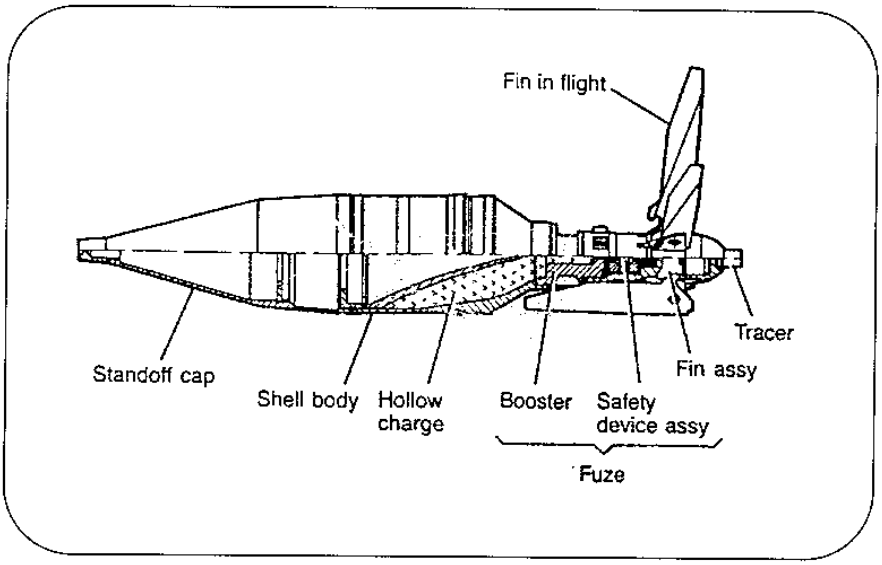
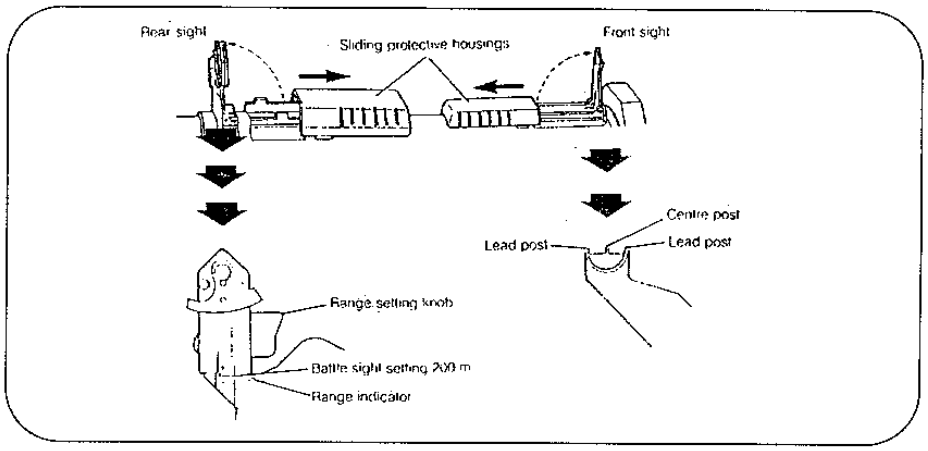
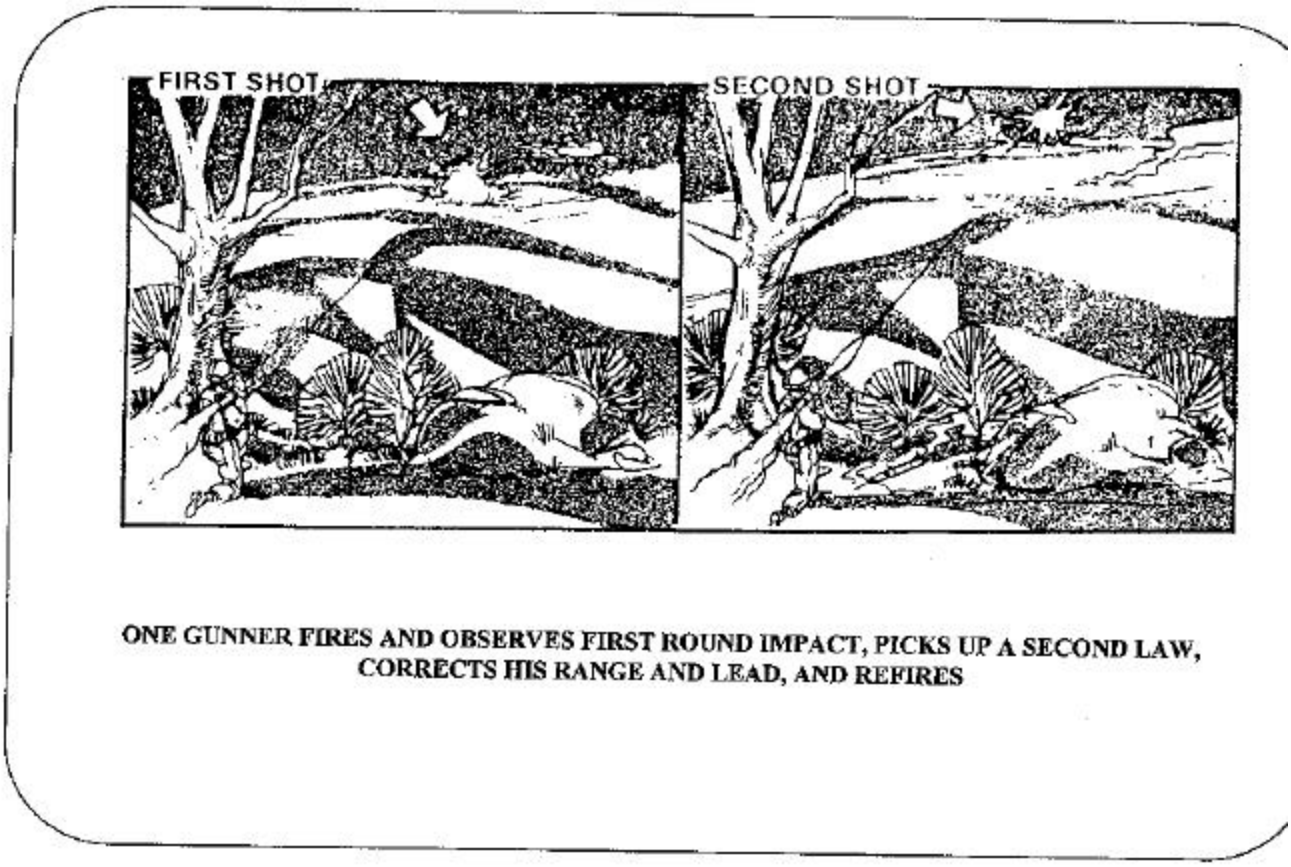


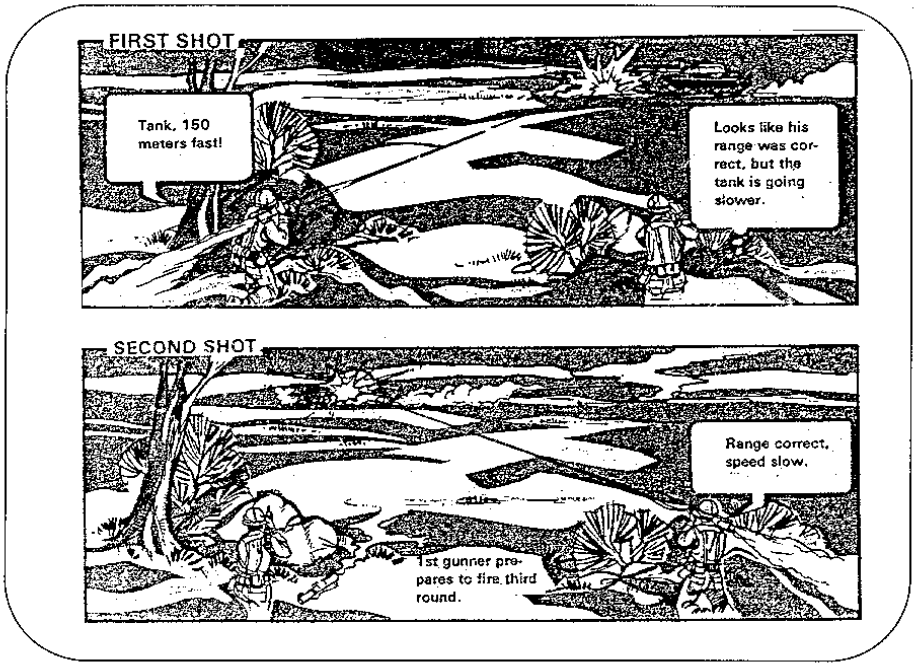

Figure 2. Nomenclature

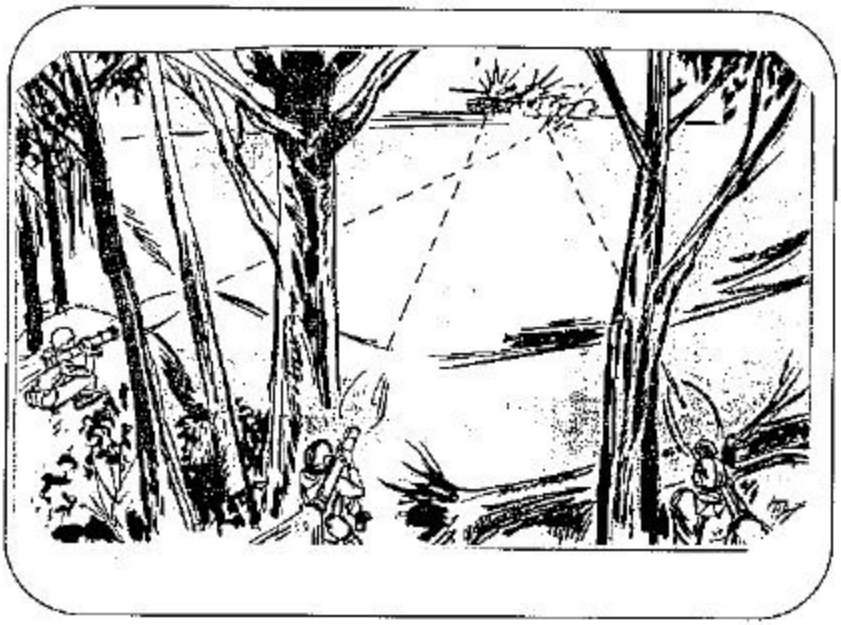


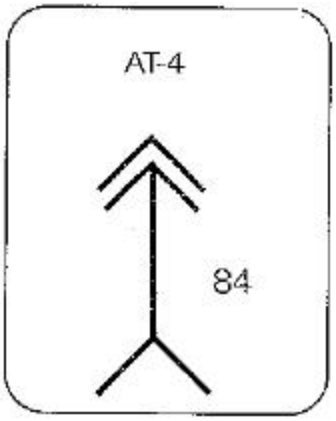


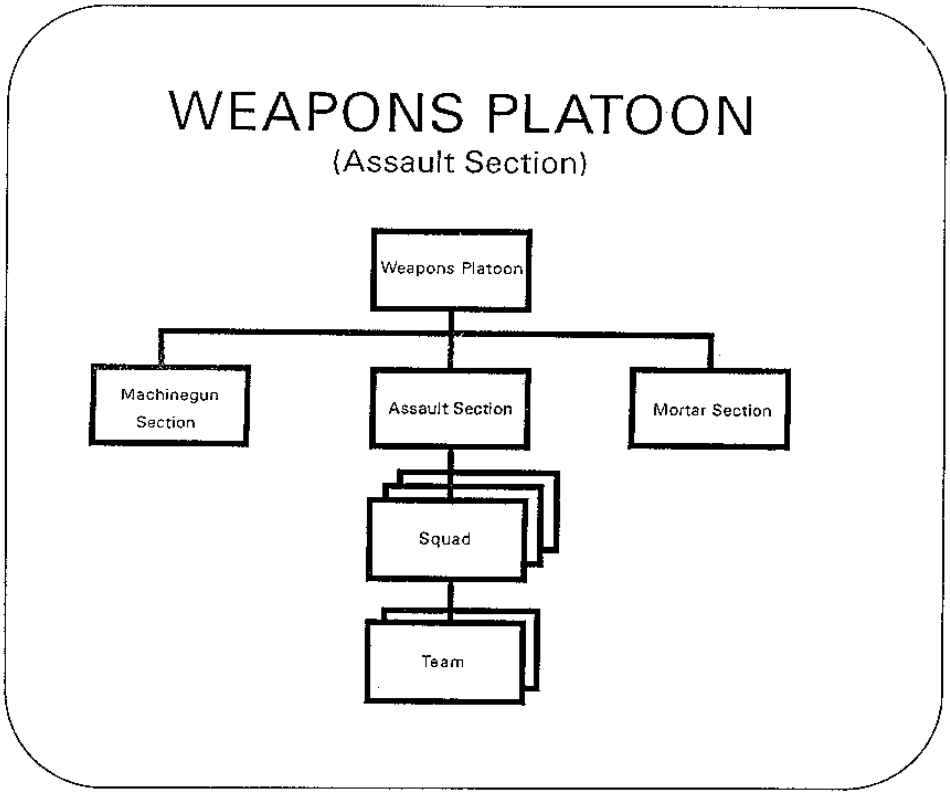



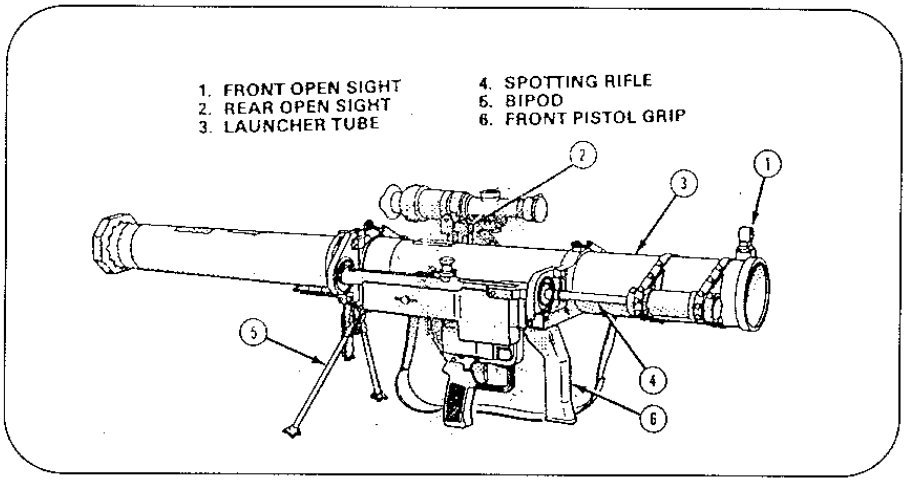

**ONE GUNNER FIRES AND OBSERVES FIRST ROUND IMPACT, PICKS UP A SECOND LAW, CORRECTS HIS RANGE AND LEAD, AND REFIRES**

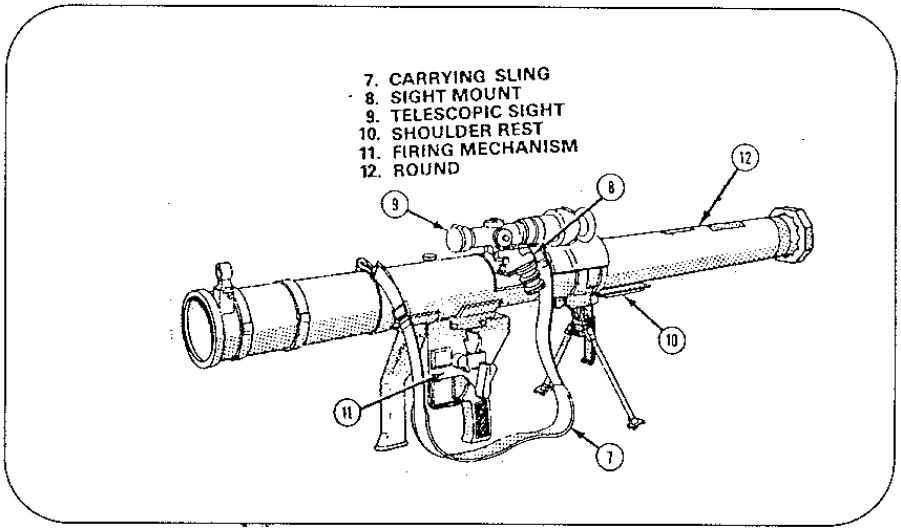

FIRST SHOT
Tank, 150 meters fast!
Looks like his range was correct, but the tank is going slower.
SECOND SHOT
Range correct, speed slow.
1st gunner prepares to fire third round.



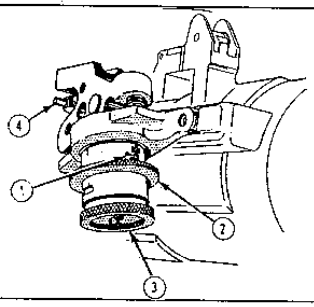

AT-4
84

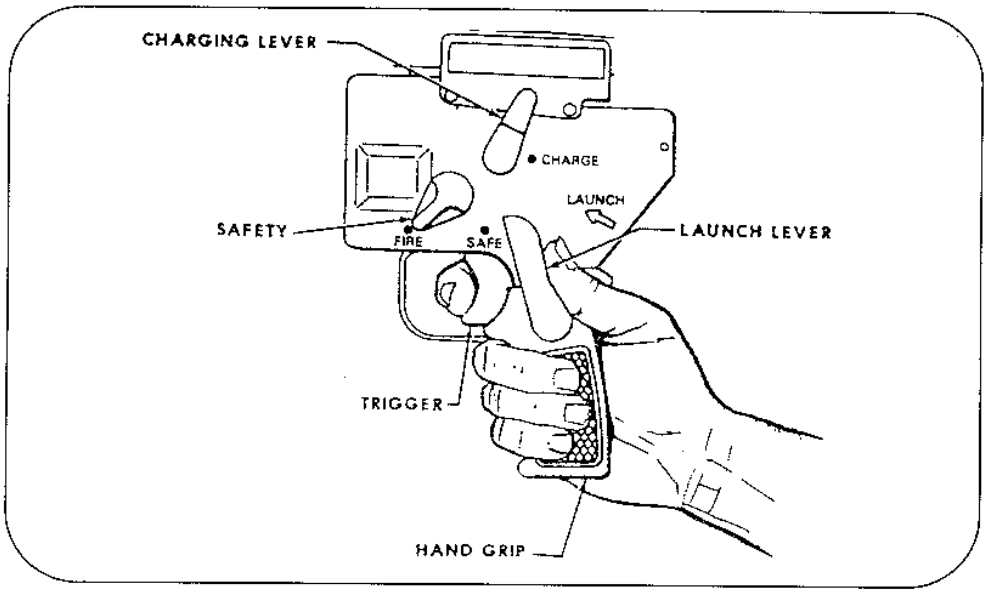

WEAPONS PLATOON
(Assault Section)
Weapons Platoon
Machinegun Section
Assault Section
Mortar Section
Squad
Team

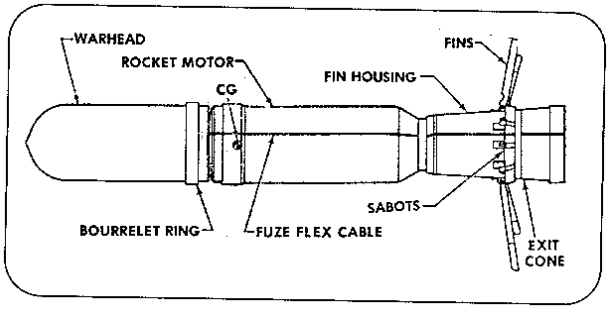


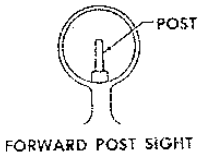

1. Range Window
2. Outer Drum
3. Inner Drum
4. Captive Thumb Screw





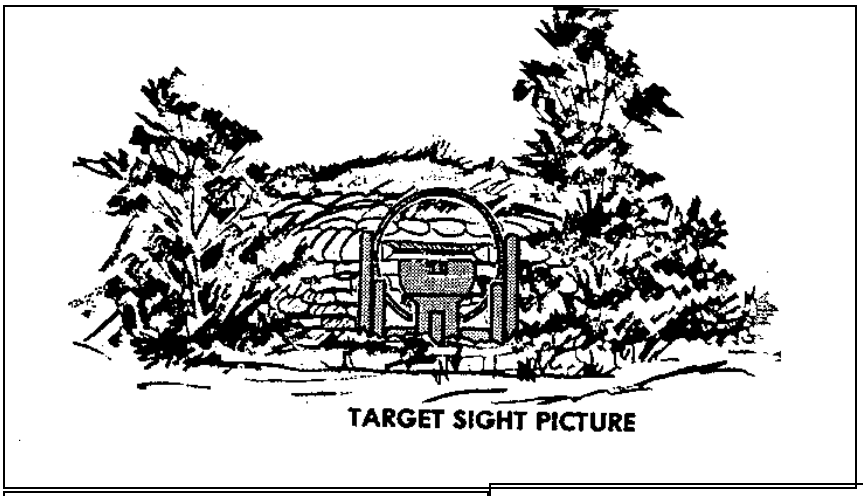





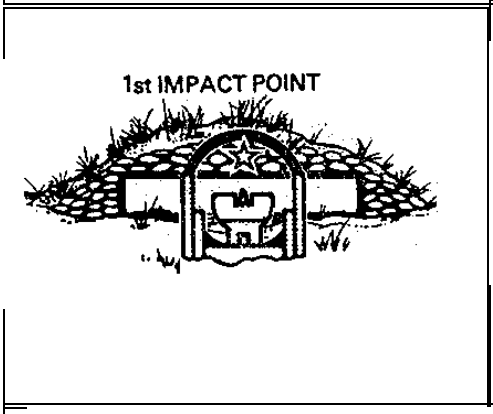


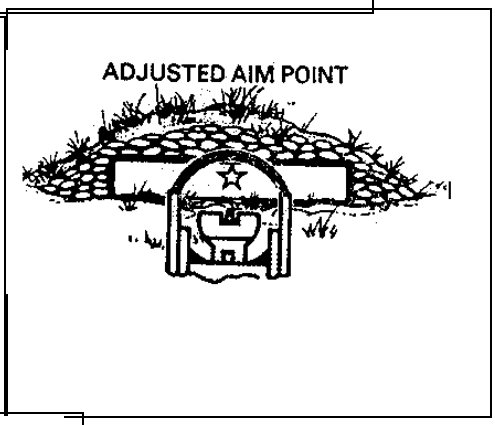

FORWARD POST SIGHT

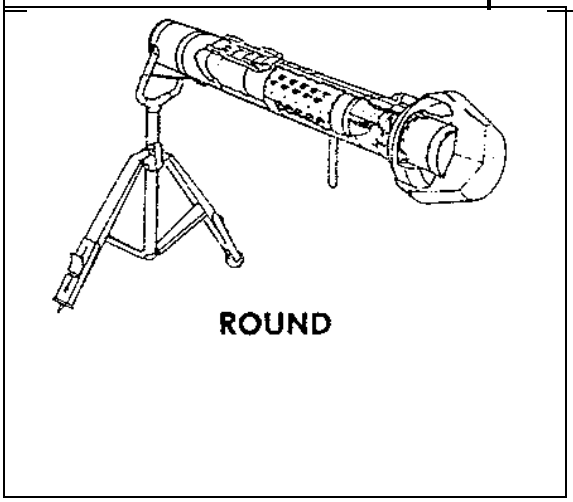
REAR NOTCHED SIGHT



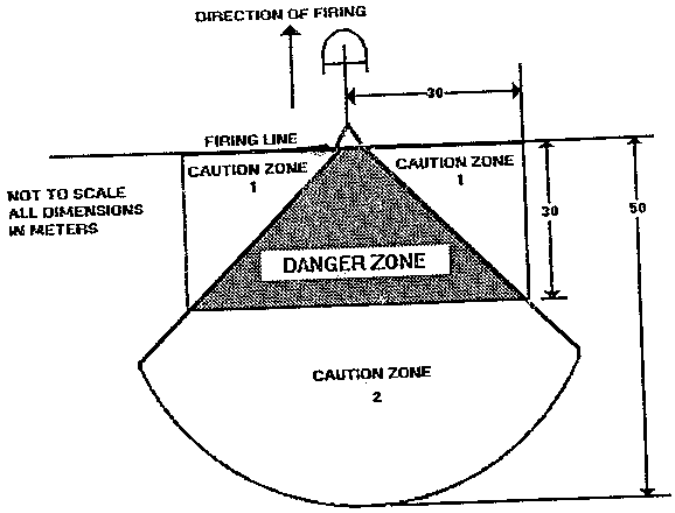
TARGET SIGHT PICTURE



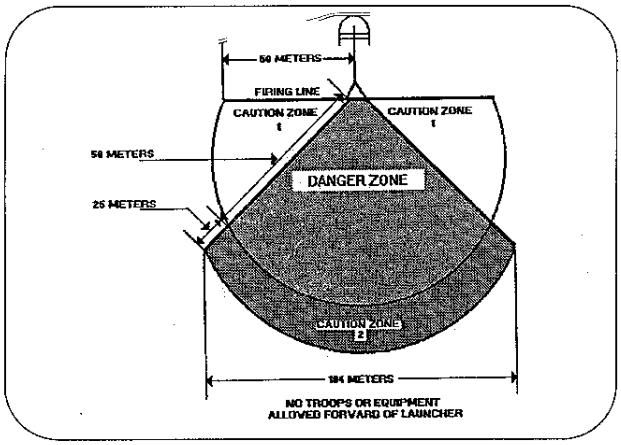



ROUND




M47 Dragon




M220A1 TOW