FM 23-3

FIELD MANUAL

TACTICS, TECHNIQUES AND CONCEPTS OF ANTIARMOR WARFARE

HEADQUARTERS, DEPARTMENT OF THE ARMY
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*This manual supersedes FM 23–3, 15 August 1966, including all changes.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Purpose and Scope

a. As we look to the future, one of the infantry's missions will continue to be to maintain the capability and readiness to defeat large enemy armor forces. In accomplishing this mission the infantry will be supported by all available means; to include at various times, tactical aircraft, field artillery, attack helicopters (some armed with a TOW), and tanks. But all of this support does not diminish the requirement that the infantryman be highly skilled and confident in using his organic antiarmor weapons and expedient devices to slow, canalize, and destroy armor. Intensive training is required in order to develop such skill and confidence. Commanders and leaders must be resourceful and imaginative in training their infantrymen and employing the proper weapons, field expedients, tactics, and techniques so that the infantry will defeat enemy armor on any future battlefield.

b. This manual illustrates and describes most of the current armored vehicles, while describing the means and technique the infantryman has for defeating them. The combat examples included are designed to provide some insight into the problems and solutions of antiarmor warfare encountered during previous conflicts.

c. Users of this manual are encouraged to submit recommendations to improve its clarity and accuracy. Comments should be keyed to specific page, paragraph, and line of the text in which the change is recommended. They should provide reasons for each comment to insure understanding and to permit complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications) and forwarded direct to the Commandant, United States Army Infantry School ATTN: ATSIN–I–T, Fort Benning, Georgia 31905.

2. Antiarmor Warfare

a. The future battlefield may feature very fluid battle conditions. To successfully conduct a war under these conditions, it is essential for combat forces to possess highly mobile and flexible organizations so that they can adjust to rapid and continuous changes in the situation. With the increasing emphasis being placed on the development of armored and mechanized infantry units, the individual infantryman must be prepared to operate on a battlefield dominated by armored formations. Operating with or without armored vehicles, the soldier must be capable of defeating armored attacks. To accomplish this the infantryman must know the characteristics of armored vehicles, how they operate, and finally, but most important, how to use all the organic and nonorganic firepower means at his disposal in destroying them.

b. With the forces and weapons available and the concepts which will dominate the battlefield, the infantry will have the preponderance of antiarmor weapons. This is not a new concept or change in doctrine; neither is it a new mission for infantry or a degradation of the role of armor. Rather, it is merely the correct implementation of current doctrine.

c. The HAW, MAW, and LA W(heavy, medium, and light antitank weapons) concept of antiarmor defense revolves around the destruction of enemy armor at the greatest possible ranges from friendly positions utilizing the HAW, further engaging the surviving armor with an increasing number of antiarmor weapons as they come within range of the MAW, and finally, at shorter ranges, the destruction of remaining enemy armor by LAW, densely placed within the battle area. All types and principles of defense as dictated by terrain and situation are used in conjunction with the HAW, MAW, and LAW concept.

3. Small Units

a. There are certain overriding principles which govern the successful use of organic and attached antiarmor weapons by a small unit (company, platoon and squad). This unit will habitually have various antiarmor weapons to employ. Regardless of the number and type of antiarmor weapons a unit has, it should strive for—

(1) Antiarmor weapon positions which provide good fields of fire to the weapon's maximum effective range.

(2) Antiarmor weapon positions which are mutually supporting.

(3) Antiarmor weapon positions which afford oblique fire on armor approaches.

(4) Antiarmor weapon positions which provide all-round defense and defense in depth.

(5) Selection of alternate and supplementary positions which allow weapon crews to displace frequently and rapidly without losing effectiveness.

(6) Local security for antiarmor crews which is integrated with other elements of the unit.

(7) Antiarmor positions that dominate the most likely armor avenue of approach.

b. When engaging armored formations, the unit must attempt to separate the tanks from the accompanying infantry, using artillery, attack helicopters and small arms fire. If enemy tanks are accompanied by armored personnel carriers (APC's) or infantry combat vehicles (ICV's) a unit should use the principle of engaging the most dangerous target first. Unit leaders, through fire control and fire discipline, must insure that weapons crews distribute their fires in sector, while maintaining antiarmor fires throughout the unit zone.

c. Field artillery should be used to the greatest extent possible. Ideally, engagement should be made where tanks are most canalized and when their freedom of movement is limited. Enemy armor should be engaged at the maximum range of the supporting field artillery. A mixture of time and impact fuzed projectiles will cause the tank crews to "button up" and any accompanying dismounted infantry to disperse. Should any of the enemy armor be immobilized by the field artillery area fire techniques it can then be destroyed by using destruction fire procedures. White phosphorous projectiles used in conjunction with time and impact fuzed HE projectiles will ignite gasoline from ruptured enemy armor fuel cells. Smoke from white phosphorous will restrict the vision of the enemy tank crews and thereby reduce their command and control, making them more vulnerable to infantry attack. As the enemy armor approaches the friendly positions, too close for safe employment of HE or white phosphorous munitions, field artillery fired white smoke can be used to further restrict the vision of the enemy tank crews while the infantry remains hidden until ready to attack with their organic antiarmor weapons.

4. Individual Actions

a. When individuals engage tanks and accompanying infantry, without the benefit or organic antiarmor weapons or supporting field artillery, a maximum effort should be made to isolate and to engage the tanks separately. The infantry must be destroyed or pinned down while the tanks are engaged. Tanks normally work in platoons, and their machineguns and APERS rounds provide mutual security against attack. For this reason, the tanks should be engaged first with artillery and small arms fire, thereby making them "button up." The tank crews must then operate with more restrictive vision. Next, by using smoke, tank crews can be "blinded." Once visually isolated, tanks are deprived of mutual support. Ideally, engagement should be made where tanks are most canalized and when their freedom of movement is limited. By taking advantage of the deadspace, the infantryman can approach and destroy the tank.

b. The infantryman must learn to use terrain and weather to his advantage when operating without antiarmor weapons or supporting field artillery. Heavy woods, terrain barriers, rain or darkness favor the dismounted soldier, while open areas and good visibility favor the tank. Ambushes in passes or along wooded trails or roadways give every advantage to the dismounted elements waiting in concealed positions. Once a tank has been blinded and slowed down, it can be stopped by destroying the suspension system. A well-placed explosive will break the track, or a log properly placed in the teeth of the drive sprocket will immobilize the tank. It can be destroyed with lethal devices such as molotov cocktails, hand thrown antitank mines, thermite grenades, or other explosive devices.

CHAPTER 2

ANTIARMOR WEAPONS

Section I. ORGANIZATIONAL WEAPONS

5. General

This chapter deals with the antiarmor weapons organic or attached to the infantry battalion. Also covered are the antiarmor field expedients and obstacles which may be used in small unit operations. Field expedients recommended are the type which an individual soldier can construct when faced with the problem of fighting enemy armored vehicles. Construction of these expedients is limited only the soldier's ingenuity. For more detailed information on any subject in this chapter, the appropriate publication(s) listed in appendix A should be consulted.

6. Battalion Antiarmor Defense Plan

a. The battalion antiarmor defense plan incorporates all available means in defending against enemy armor. Our attached tanks can initially engage personnel and other soft targets with their main guns at extended ranges. Enemy tanks are engaged at extended ranges with missiles, and with conventional ammunition at ranges of 2000 meters and less. As the enemy approaches the forward edge of the battle area, other antiarmor weapons engage enemy armor within their range capabilities.

b. The long range and high rates of fire available with 20mm and .50 caliber machineguns are ideal complements to the HAW, MAW, and LAW antiarmor weapons depicted in figure 1. In addition to the light armor piercing capability of both guns, the 20mm, as presently mounted on the M114A1, has high explosive ammunition. The AP or HE will suppress infantry which either accompanies tanks or deploys from troop carriers, while the heavy volume of fire available from either the 20mm or .50 caliber machinegun will cause armored vehicle crewmen to button up and become more vulnerable to the HAW, MAW, and LAW. The .50 caliber machinegun, HB, M2 has a cyclic rate of fire of 450 to 550 rounds per minute and a maximum effective range of 1825 meters against ground targets. The 20mm, M139, Automatic Gun has a cyclic rate of fire of 800 to 1050 rounds per minute and a maximum effective range of 1800 meters against ground targets. A representative reinforced infantry battalion antiarmor defense plan, utilizing all weapons available, is illustrated in figure 1. Note that as the range decreases, the number of weapon systems capable of engaging enemy armor increases. (See paragraphs 51 through 67 for more information.)

7. TOW, M151 (HAW)

a. Description. The TOW Weapon System (fig 2) is a vehicle mounted or crew-portable, heavy antitank assault weapon. It consists of a launcher, which has tracking and control capabilities, and the TOW (tube-launched, optically-tracked, wire-command link) guided missile. The launcher is equipped with self-contained, replaceable components. The TOW system can be effectively employed in all weather conditions, provided the gunner can see his target through the optical sight. The missile can be launched from a ground emplacement or from a vehicle, and is effective against armored vehicles and targets such as pillboxes, gun emplacements, and bunkers. Two important features of the TOW weapon system are its mobility and simplicity of operation.

(1) *Mobility.* Since the entire ground-mounted launcher can be hand carried by a four-man squad, emplacement sites can be changed quickly to minimize detection or to engage targets that cannot be observed from a single emplacement. The vehicle-mounted launcher provides a greater degree of mobility and can be quickly prepared for use. Assembly and disassembly of the launcher is accomplished quickly in the field without the use of tools.

(2) *Simplicity.* The operational condition of the assembled launcher can be checked anytime by the use of built-in self-test circuits. The automatic tracking and control capabilities of the TOW system provides a high first-round hit probability. Once the missile is fired, deviations of the missile from the line of sight to the target are detected by the infrared sensor within the optical

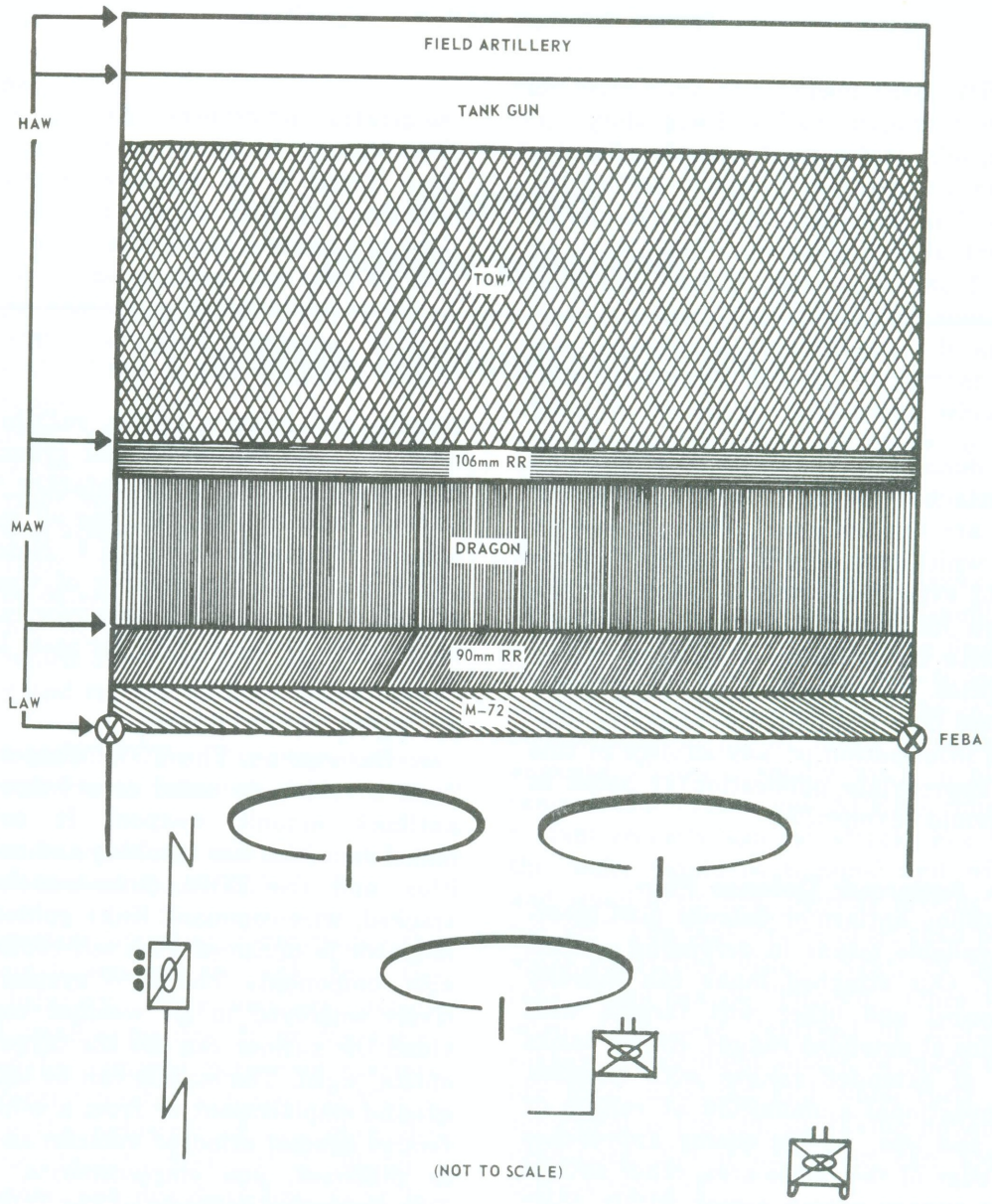


Figure 1. Reinforced infantry battalion antiarmor defense plan.

sight. Flight corrections developed in the missile guidance set are sent over the command-link wires to the missile. If the gunner keeps the crosshairs on the target, he will achieve a target hit. (See TC 23–23 for more information.)

b. Tabular Data and Specifications.

Weight	227 lbs with encased missile loaded 173 lbs without encased missile
Length	87 inches
Maximum range and maximum effective range	3000 meters
Ammunition:	
High Explosive Antitank (HEAT) Missile XBGM 71A	54 lbs
Practice (Inert Warhead) Missile XBTM 71A	54 lbs
Muzzle velocity	Classified
Crew	Four men

8. 106-MM Recoilless Rifle, M40A1 (MAW)

a. Description. The 106-mm recoiless rifle (fig 3) is a recoilless weapon designed for both antiarmor and antipersonnel roles. It is an air-cooled, breech-loaded, single-shot recoilless rifle which fires fixed ammunition. The 106-mm rifle is designed primarily for use as an antiarmor weapon. It can also be used against bunkers and grouped personnel. A caliber .50 spotting rifle, mounted above the 106-mm rifle, is designed to assist the gunner in determining range and leads to the target. The spotting rifle fires a special caliber .50 spotting ammunition containing a tracer element and a white phosphorous filler which, on impact, emits a puff of white smoke. Although the 106-mm recoilless rifle can be traversed a full 360 degrees, it cannot be fired directly to the rear when mounted on the carrier because of danger

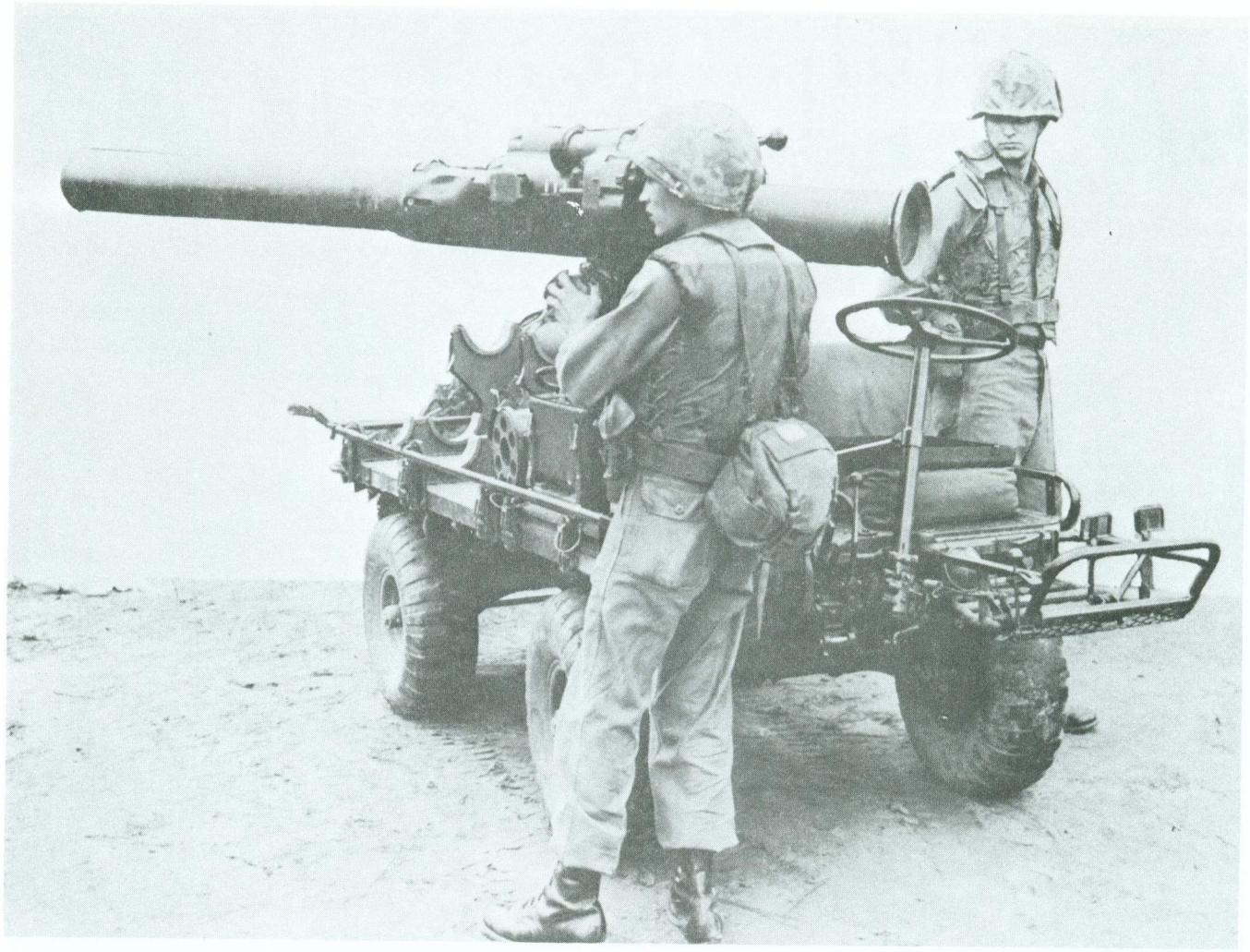
① Ground

Figure 2. TOW weapons system.

from the backblast, and the barrel must have five inches or more clearance when firing to the front. As with all recoilless weapons, this backblast is a major factor in the selection of firing positions. The 1/4-ton truck M151A1C used to transport the 106-mm rifle provides limited cross-country mobility; it carries six rounds of major caliber ammunition. The APC M113A1 used to transport the 106-mm rifle provides cross-country mobility; it carries 18 rounds of major caliber ammunition. (See FM 23–82 for more information.)

b. Tabular Data and Specifications.

Weight	460 lbs
Length	134 inches
Height	44 inches (ground mounted)
Maximum effective range	1100 meters
Maximum range	7700 meters
Ammunition:	
High Explosive Antitank (HEAT), M344-series	37 lbs
High Explosive Plastic w/Tracer, (HEP–T, M346)	38 lbs
Caliber .50 Spotter-Tracer, M48A1	0.24 lbs
Antipersonnel w/Tracer (APERS–T), XM581	41 lbs
Rates of Fire:	
Maximum rapid	One round every 6 seconds not to exceed five rounds (A 15-minute cooling period must be allowed after firing at the rapid rate.)
Maximum sustained	One round per minute (indefinitely).
Sight graduation	The vertical range line is calibrated in 100 meter increments from 0 to 2400 meters.
Crew	Seven man squad. (Squad leader plus two 3-man firing teams.) (Drivers for APC M113A1.)



② Mule
Figure 2—Continued.

9. Dragon, XM 47 (MAW)

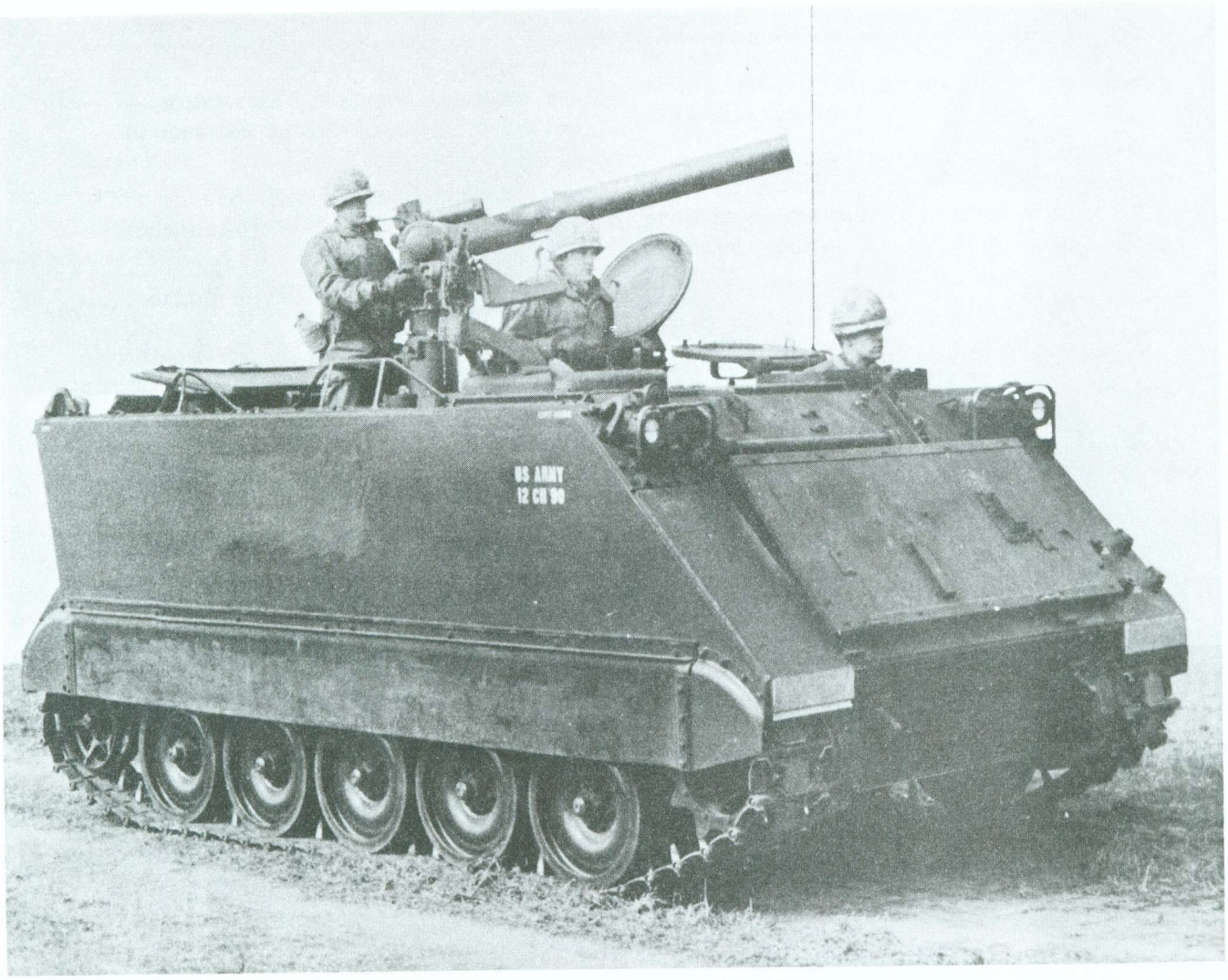
a. Description. The DRAGON is a comand-to-line-of-sight guided medium antitank assault weapon system. Fired from a recoilless, disposable-type launcher, the missile is tracked optically and guided automatically through a wire link (fig 4). The DRAGON provides the foot soldier with a capability that is unique in antiarmor weaponry. Its light weight and simplicity of operation permits fast employment by one man in any terrain that affords line-of-sight to the target. The weapon system is composed of two components: the tracker and the round. The tracker, a reusable portion of the system, contains the optical sight, optical error sensor, the electronics package, and the trigger. The round is the expendable portion of the system. It consists of the launcher and the missile, and it serves as a shipping and launch container. The automatic tracking and control capabilities of the DRAGON system provide a high first round hit probability. The gunner keeps the crosshairs of the tracker on his target. The tracker sends missile position information to the missile electronics. The missile generates flight correction commands in the form of rocket firings. The rocket motors fire to correct the missile's line of flight and provide acceleration. DRAGON will provide an increased tank killing capability to the infantryman on long range patrol or airmobile operations.

b. Tabular Data and Specifications:

Weight	30.5 lbs
Length	44 inches
Ammunition	High Explosive Antitank (HEAT) Missile
Range	Classified

10. 90-MM Recoilless Rifle, M67 (LAW)

a. Description. The 90-mm recoilless rifle is a lightweight, recoilless weapon designed primarily as an antiarmor weapon. However, it can be employed in the antipersonnel role. It is a direct fire, single-shot, air-cooled, breech-load recoilless rifle



③ APC
Figure 2—Continued.

that fires fixed ammunition. The rifle is equipped with a manually operated breech mechanism and a percussion-type firing mechanism. The weapon can be employed against stationary or moving targets. The sights afford the gunner a 15 mph lead capability for moving targets. When the 90-mm rifle is fired from the prone position, stability is achieved through the use of the monopod and bipod legs. In the employment of the 90-mm, as with the 106-mm, provisions must be made for the back-blast area (fig 5). (See FM 23–11 for more information.)

b. Tabular Data and Specifications:

Weight	35 lbs
Length	53 inches
Sight	2½ lbs
Maximum effective range	400 meters
Maximum range	2100 meters
Ammunition:	
High Explosive Antitank (HEAT), M371-series	9.25 lbs
Antipersonnel (APERS) XM90E1	6.79 lbs
Practice, M371	9.25 lbs
Rates of Fire:	
Rapid	One round every 6 seconds not to exceed five rounds. After five rounds have been fired, a 15-minute cooling period must be observed.
Sustained	One round per minute (indefinitely).
Sight graduation	0 to 800 meters
Lead capability	15 miles per hour
Crew	Two men (gunner and loader)
Organization	Two 90-mm rifles are found in the weapons squad of the rifle platoon.

11. 66-MM High Explosive Antitank Rocket, M72A2 (LAW)

a. Description. The 66-mm HEAT rocket,

Figure 3. 106-mm recoilless rifle.

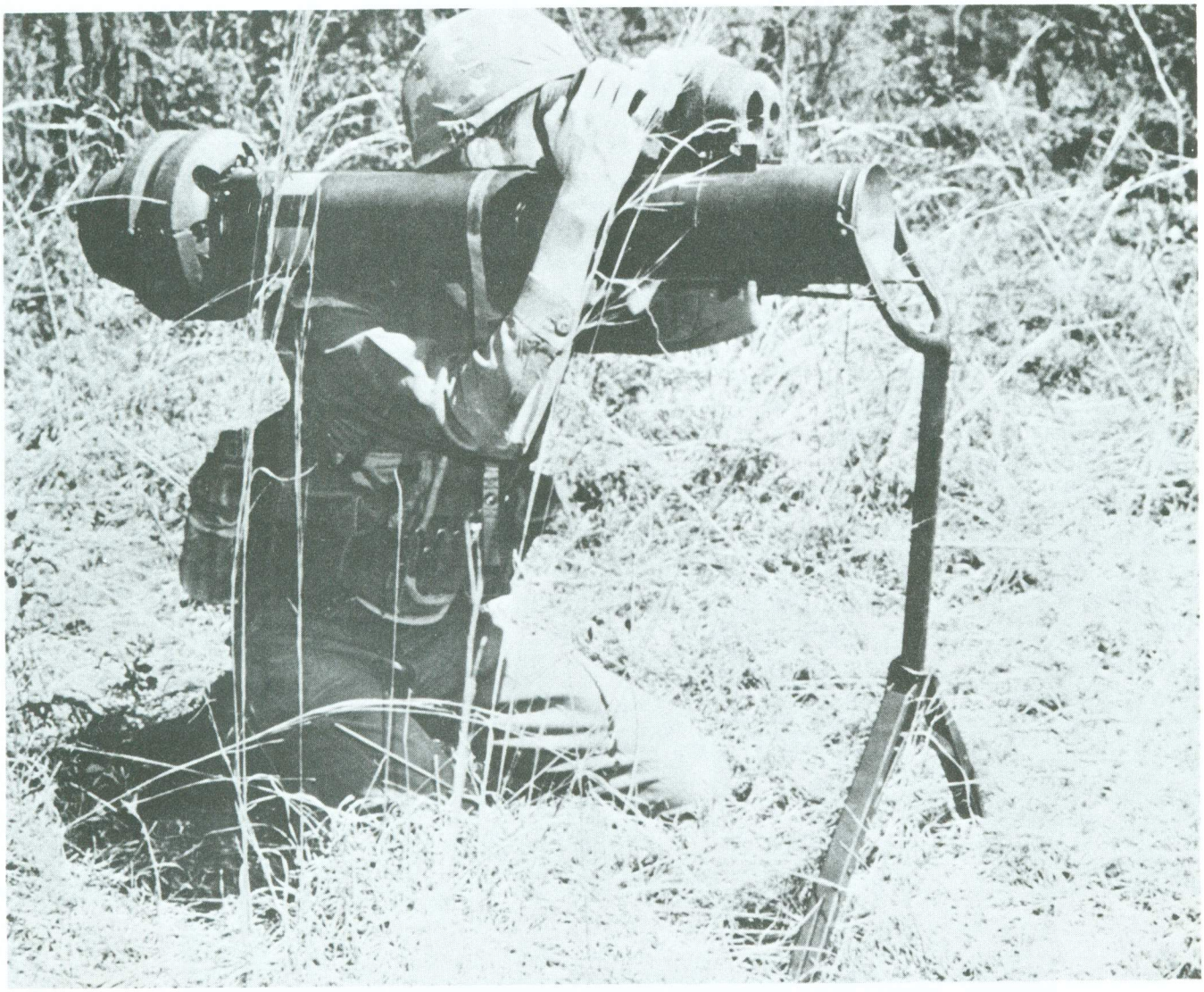
M72A2 (fig 6), is a close-in, lightweight, smoothbore, percussion-fired antiarmor weapon which is designed to give the individual infantryman the capability of defeating armored fighting vehicles. The M72A2 is a self-contained unit consisting of a 66-mm rocket packed within its own expendable launcher. In the closed position, the launcher serves as a waterproof packing container for the rocket; however, it extends telescopically in order to launch and guide the rocket toward the intended target. When the rocket has been fired, the launcher is discarded. The M72A2 is designed as a supplementary weapon; that is, to be issued to and used by the infantryman on an "as needed" basis. The weight and size of the M72A2 allow it to be carried by the individual infantryman in both offensive and defensive situations. The M72A2 is much lighter and smaller than other self-contained antiarmor systems issued to the infantry, and it is an excellent weapon to use in armor-killer operations or on long range patrols. (See FM 23–33 for more information.)

b. Tabular Data and Specifications:

Weight	5.2 lbs
Length	26 inches (closed) 35 inches (extended)
Maximum effective range	200 meters
Maximum range	1,000 meters
Ammunition (packed with launcher):	
High Explosive Antitank (HEAT)—2.2 lbs	
Sight graduation	Calibrated in meters from 50 to 350 (in 25-meter increments)
Lead capability	15 miles per hour

12. M202 Launcher, Rocket: 66-MM, 4-Tube/ M74 Incendiary Rocket and M96 Riot Control Agent Rocket

a. The M202 rocket launcher is a lightweight shoulder-fired, 4-tube launcher that requires little maintenance. It is fired from the right shoulder from the standing, kneeling, sitting, or prone position. Ammunition for the launcher is supplied in rocket clips. Each clip is preloaded with four



① Ground
Figure 4. DRAGON missile.

rockets that slip fit into the four launcher tubes. The launcher can fire from one to four rockets semiautomatically at a rate of one per second and can be reloaded with a new rocket clip (fig 7).

b. The launcher consists of a tube assembly, front cover, rear cover, trigger-handle assembly, firing-pin mechanism assembly, reflecting sight assembly and sling assembly.

c. To operate the launcher, open the rear cover and extend the launcher tubes to the fully extended position and lift the weapon to the shoulder. Open the front cover and engage the front cover handle in the toggle latch to release the trigger handle. Extend the trigger handle downward to the locked position. Rotate the sight to the extended position, open the lens cover and aim the weapon. Each trigger pull fires one rocket.

d. There are two authorized rounds for the M202 launcher; M74 incendiary rocket and XM96 riot control agent rocket.

(1) The M74 rocket consists of the M235 warhead which contains 1.3 pounds of thickened triethylaluminum, an adapter, and the M54 rocket motor.

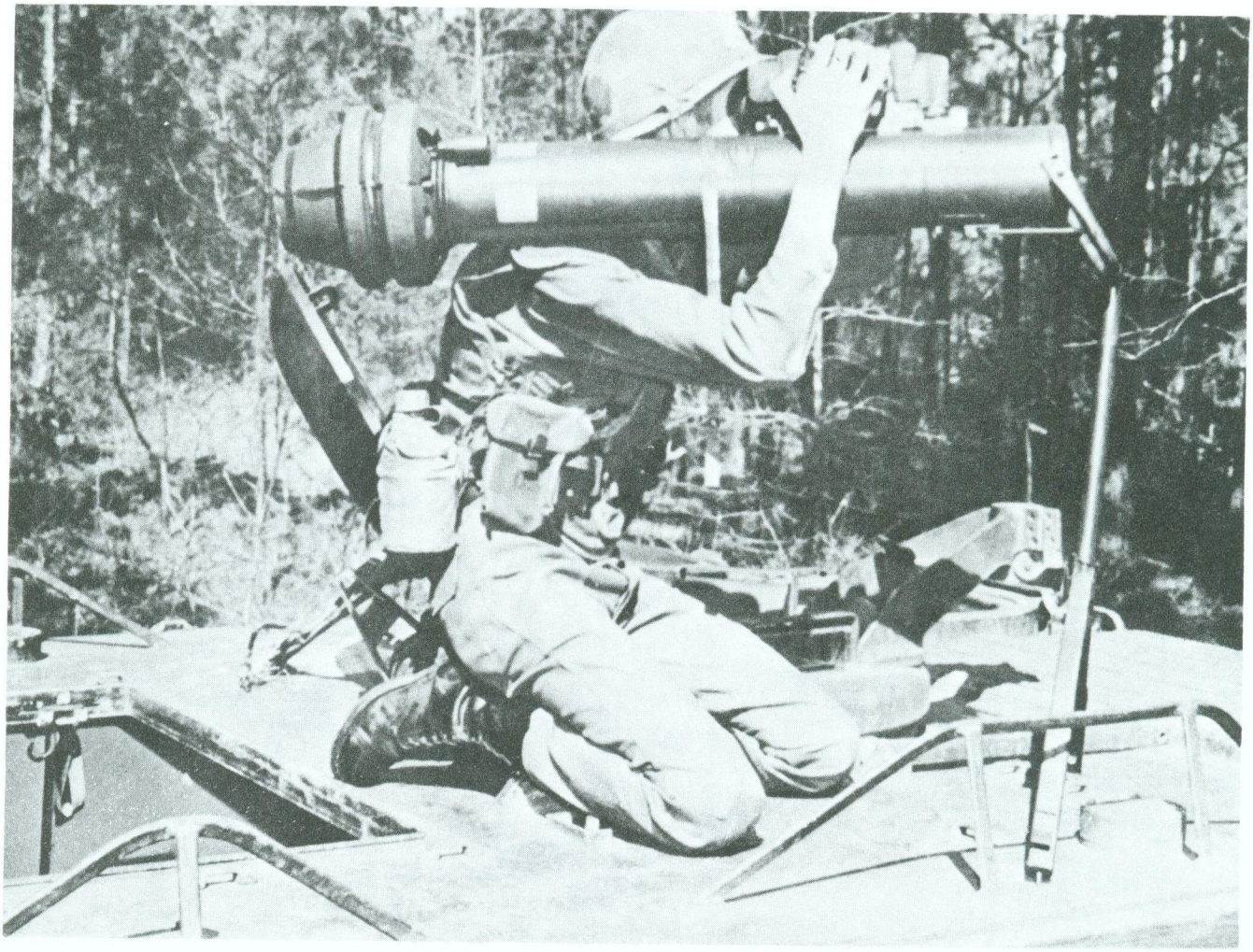
(2) The XM96 rocket consists of the XM244 warhead which contains 227 grams of CS2, an adapter and the M54 rocket motor.

(3) Both rounds become armed between 5.5 and 13 meters of rocket travel.

e. Tabulated Data:

M202 Rocket Launcher:

Overall length, closed (approx)	27 in
Overall length, firing position (approx)	35 in
Weight unloaded	11.5 lbs



② Mounted on APC
Figure 4—Continued.

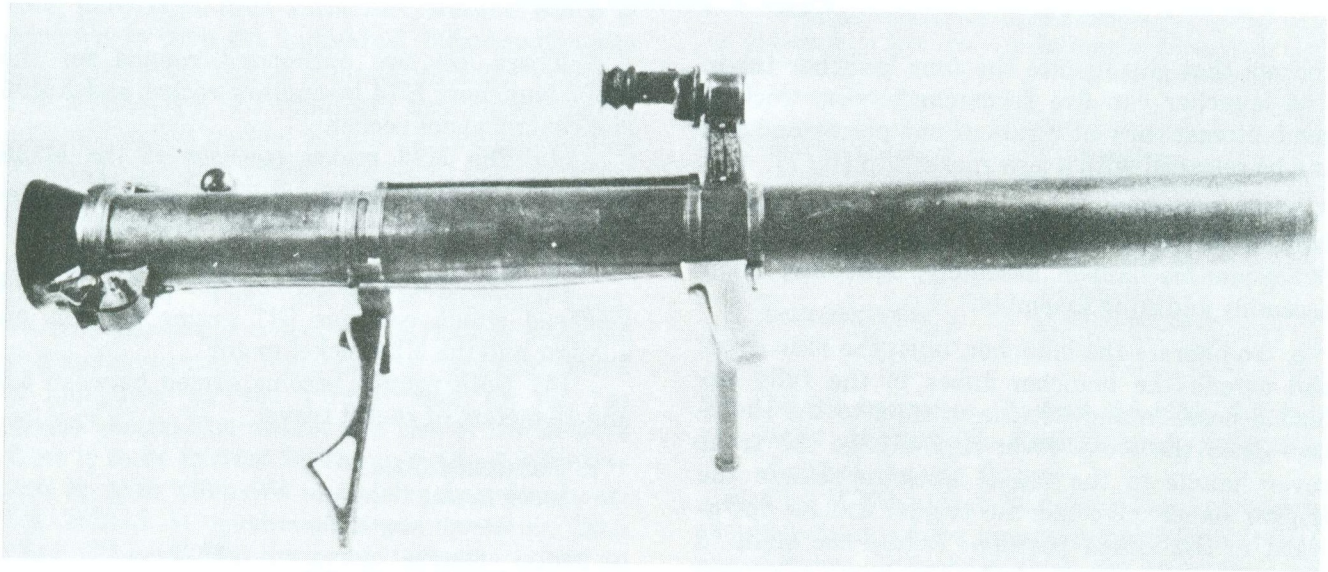


Figure 5. 90-mm recoilless rifle.

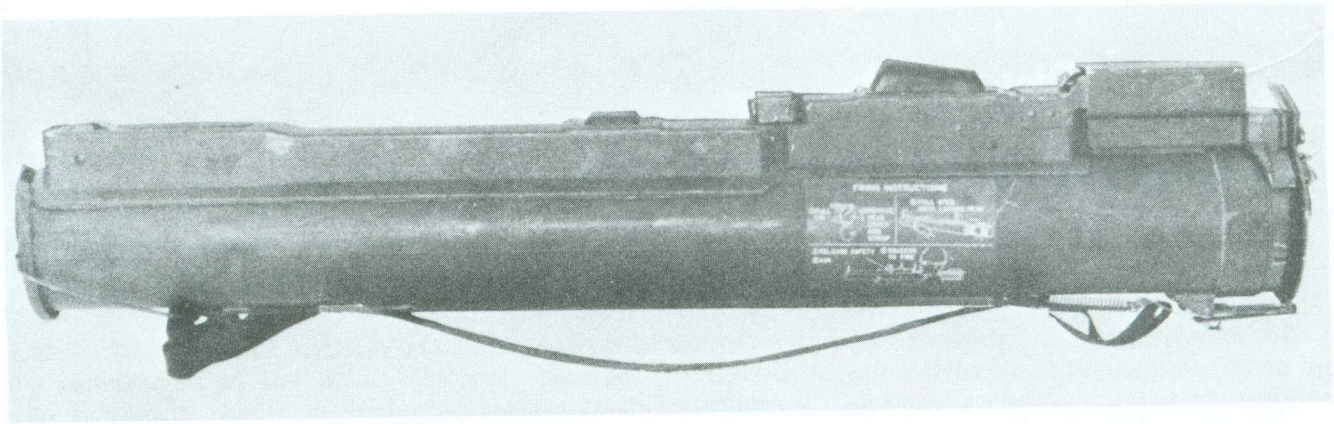


Figure 6. The M72A2.

Figure 7. M202 rocket launcher.

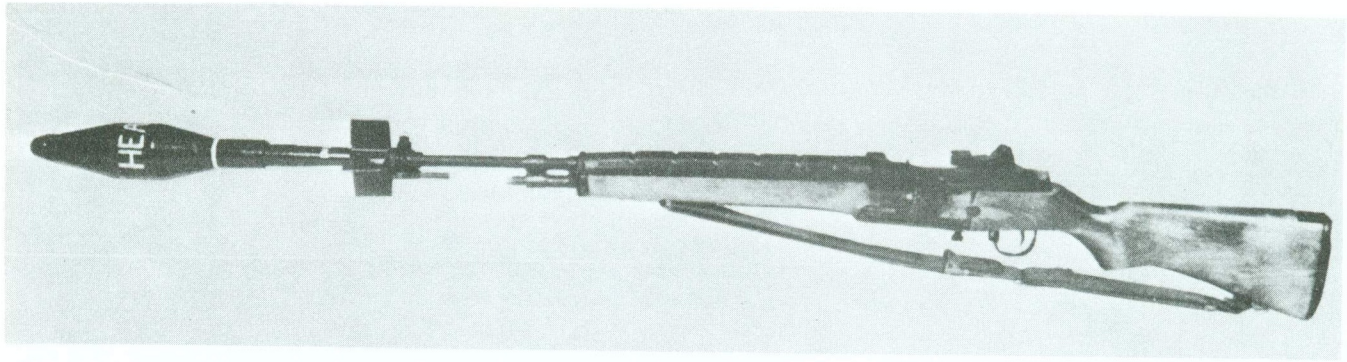


Figure 8. M31 HEAT rifle grenade.

Operating temperature limits	+32°F to 140°F
M74 Incendiary Rocket:	
Length (approx)	21 in fins closed
Weight (approx)	3 lbs
Range (max)	750 meters
Range (min)	20 meters
Muzzle velocity (approx)	375 ft per second
Bursting radius (approx)	65½ feet
Weight of 4-round clip	15.1 lbs
XM96 CS2 Rocket:	
Length (approx)	21 in fins closed
Weight (approx)	3 lbs
Range (max)	750 meters
Range (min)	20 meters
Muzzle velocity (approx)	375 ft per second
Area coverage (approx)	5,200 sq ft at 1½ ft above ground 3,300 sq ft at 6½ ft above ground

f. Packing:

(1) One rocket launcher and accessories are packed with cushioning material in a fiberboard box which is placed in a water-vaporproof barrier bag. The bag-covered box is packed in a fiberboard-lined, hinged plywood box. The box is approximately 32 7/8 by 11 7/8 inches and weighs about 40 pounds.

(2) Each rocket clip is packed in a molded foam overpack which is sealed in a water-vaporproof barrier bag and then packed in a fiberboard box. Four fiberboard boxes are packed in a 25 by 25 by 28 3/4 inch wood box. The complete box holds four rocket clips and weighs 140 pounds.

13. High Explosive Antitank Rifle Grenade, M31

a. Description. The M31 HEAT rifle grenade (fig 8) is constructed of thin sheet steel. The M31 is fired from the 7.62-mm M14 rifle using a grenade launcher. The grenade's shaped charge can defeat light tanks and thin-skinned vehicles, and it is most accurate at extremely close ranges. To fire the M31 HEAT grenade, an M76 grenade launcher is required. The hollow stabilizer tube of the M31 fits over the barrel of the launcher. Graduations, called annular grooves, have been placed on the barrel of the launcher. To make changes in range for high angle fire, the same angle of elevation is maintained with the rifle; however, different positions are used on the launcher barrel. For direct fire, the grenade is fully seated on the launcher. When firing direct fire, the standing and kneeling positions are normally used. When applying leads, one lead is the length of the target as it appears to the gunner.

b. Tabular Data and Specifications:

Weight	1½ lbs
Length	23 inches
Maximum effective range	115 meters
Maximum range	185 meters
Sight graduation	0° to 60°

14. Cartridge, 40-MM HEDP, M433

a. Description. The M433 cartridge is impact type ammunition intended for use with the grenade launcher M79/M203. The dual purpose characteristics of this round provide the capability of penetrating 2 inches of steel on lightly armored vehicles at zero degrees obliquity and inflicting personnel casualties in the vicinity of the target by fragmentation effects.

b. Tabular Data and Specifications:

Weight	230 grams
Length	4.05 inches
Diameter	1.62 inches
Fuze arm distance	45 to 90 feet
Velocity	250 feet per second
Maximum range	400 meters
Maximum effective range	200 meters

Section II. OBSTACLES

15. General

An obstacle is defined as any obstruction that stops, delays, or diverts movement. Obstacles may be natural: deserts, rivers, forests, swamps, or mountains; or they may be artificial: antitank minefields, barbed wire entanglements, pits, concrete, or metal antimechanized traps, and the like. Artificial obstacles may be fixed or portable, and they may be issued ready-made or they may be constructed in the field. Whenever possible, the Engineers should be contacted for technical advice on construction of manmade obstacles, because of their specialized training in this area.

16. Antiarmor Obstacles (Fig 9)

Because of their dependence on hard, trafficable surfaces, armored forces are especially vulnerable to obstacles. When selecting unit positions in antiarmor operations, careful assessment of existing terrain and weather conditions is necessary to obtain maximum, natural canalization of the enemy forces. Manmade obstacles can reinforce or augment natural obstacles on likely armored approaches. Obstacles emplaced to halt or canalize enemy armor must not afford easy bypasses, and they must be heavy or deep enough to be impassable to tanks. Obstacles must be constructed in depth and covered with fire to prevent easy breaching or removal. To delay breaching operations, consideration should be given to the use of mines and boobytraps in conjunction with any of the obstacles described in this manual. When authorized, the employment of persistent chemical agents should be considered. This will enhance the value of the obstacles for the defender. Commanders must provide sufficient time for the construction and maintenance of obstacles.

17. Artificial Obstacles

Manmade obstacles, for example: roadblocks, minefields, craters, and antiarmor ditches, are used to augment or take place of natural obstacles. Although their emplacement is time consuming, they enhance defensive capabilities and can be placed to accomplish specific missions, such as

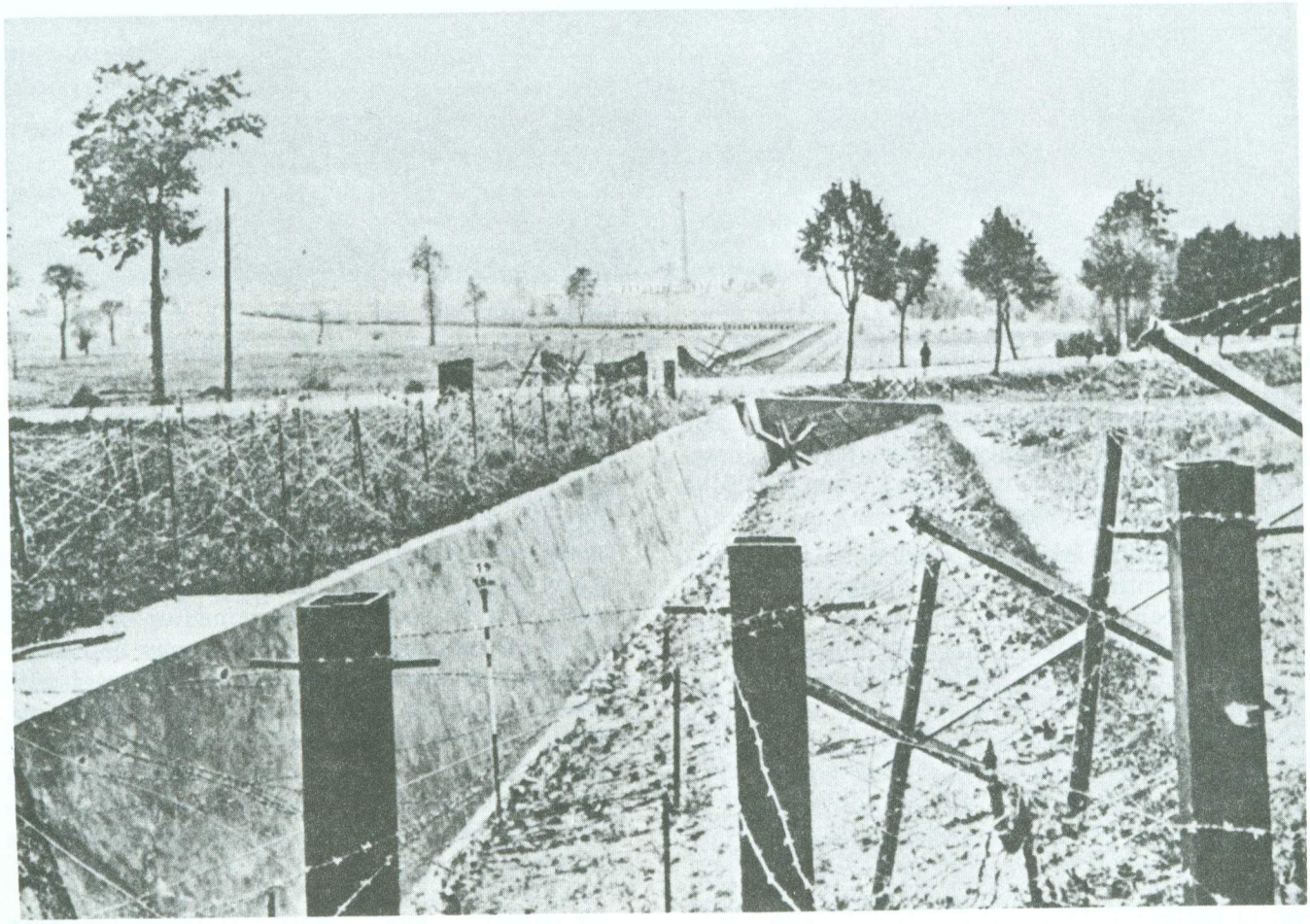


Figure 9. Antiarmor obstacles. ①

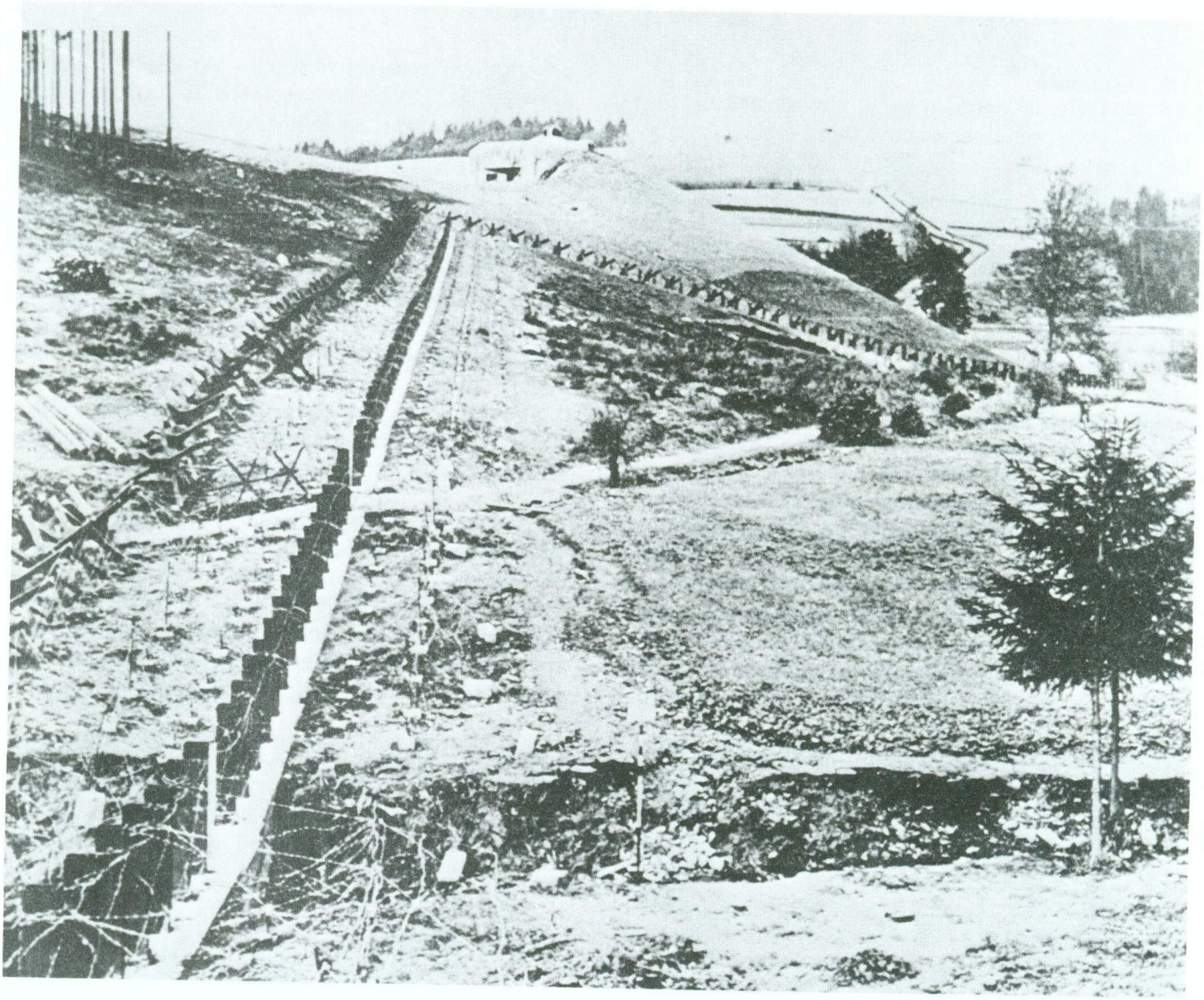


Figure 9—Continued. ②

filling gaps and adding depth to positions. The use of manmade obstacles is dependent on materials available for construction. (See FM 5–34 and FM 31–10 for more information.)

a. Minefields. Minefields provide excellent obstacles to both mounted and dismounted forces, and they can be removed and reused. When authorized, integrating of chemical mines with antiarmor and antipersonnel landmines adds an additional dimension to the employment of mines as obstacles. Permission must be obtained from proper authority to employ mines (FM 20–32). The location and composition of minefields must be properly reported and recorded. Minefields must be covered by fire to prevent the enemy from easily breaching the field and easily obtaining a supply of mines.

b. Abatis (Fig 10). Abatis are roadblocks constructed by felling trees in an interlocking manner on likely armored approaches in a way they will block the approach and make their removal difficult. The trees must be felled so that the trunk remains attached to the stump, and the top of the tree falls toward the enemy at a 45 degree angle. The flanks should be mined or covered by fire to prevent bypassing. Abatis may be rapidly emplaced in wooded areas by felling trees with power equipment, handtools, or demolitions. When authorized, use of persistent chemical agents and riot control agents with the abatis will increase its effectiveness as a road block. See FM 5–25, *Explosives and Demolitions,* for more information.

c. Stump and Post Obstacles (Fig 11). Wooded areas with trees 15 inches in diameter are armor obstacles, provided the individual

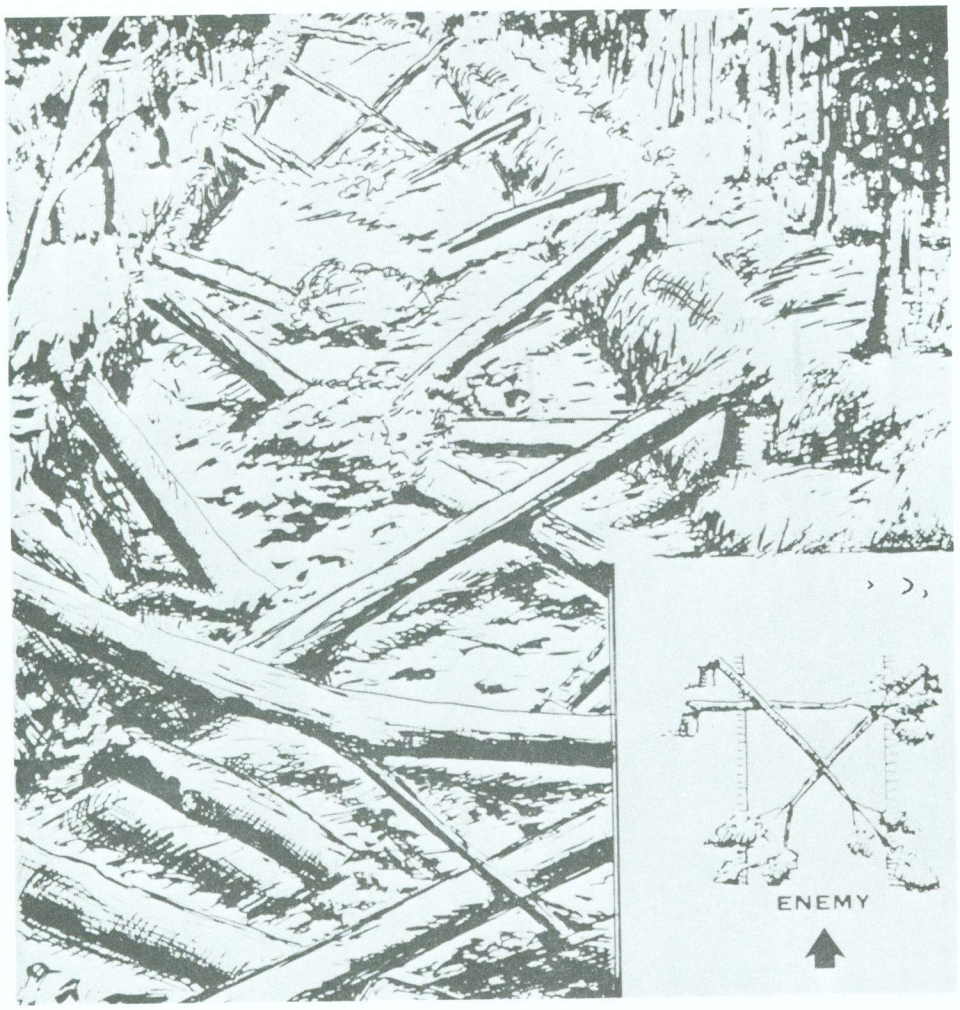


Figure 10. Abatis.

trees are sufficiently close to prohibit movement between them. Tree stumps or vertically imbedded posts 15 inches in diameter and 2 1/2 to 4 feet in height are obstacles to armor movement. Stump obstacles are relatively easy to construct by hand or by use of power equipment. Extensive stump obstacles may be constructed in a fairly short time; they are most effective when combined with tactical wire, mines, and boobytraps. If posts are being used, they should be sunk to a depth of 5 feet, with mines and wire interspersed.

d. Log Obstacles. Heavy logs may be used to build artificial escarpments or "dragon's teeth" to prevent vehicular movement. Mines, wire, and flame fougasses will enhance the value of such obstacles. Log hurdles are the simplest log obstacles to construct and will slow tracked vehicles or stop wheeled vehicles. A three-log hurdle is constructed of four 6- to 8-inch uprights and three 8- to 10-inch horizontals. Four uprights are used as a frame, while the thicker logs are placed horizontally between the uprights. Wire or cable is then laced between the uprights providing additional support and making removal more difficult. The uprights must be imbedded at least as deep as they protrude above the ground surface. In addition, log cribs are designed to stop all types of vehicles and are more time consuming to construct. Basically, they are constructed the same as log hurdles and consist of three sides, each braced with uprights, then filled with dirt, rubble or any other locally available material. Log hurdles and log cribs may be constructed with pioneer equipment.

e. Tank Ditches (Fig 12). Ditches of sufficient width and depth are impassable to tanks and other tracked vehicles. Usually, ditches are employed in open terrain when other obstacles are not available. As a guide, ditches should be 4 meters wide and 1.8 meters deep. They require considerable time and effort to construct by hand, and ditching equipment or demolitions are necessary for extensive employment. If available, tactical wire should be used to fill the ditch to prevent enemy troops from using it for shelter. If possible, watercourses may be diverted to fill the

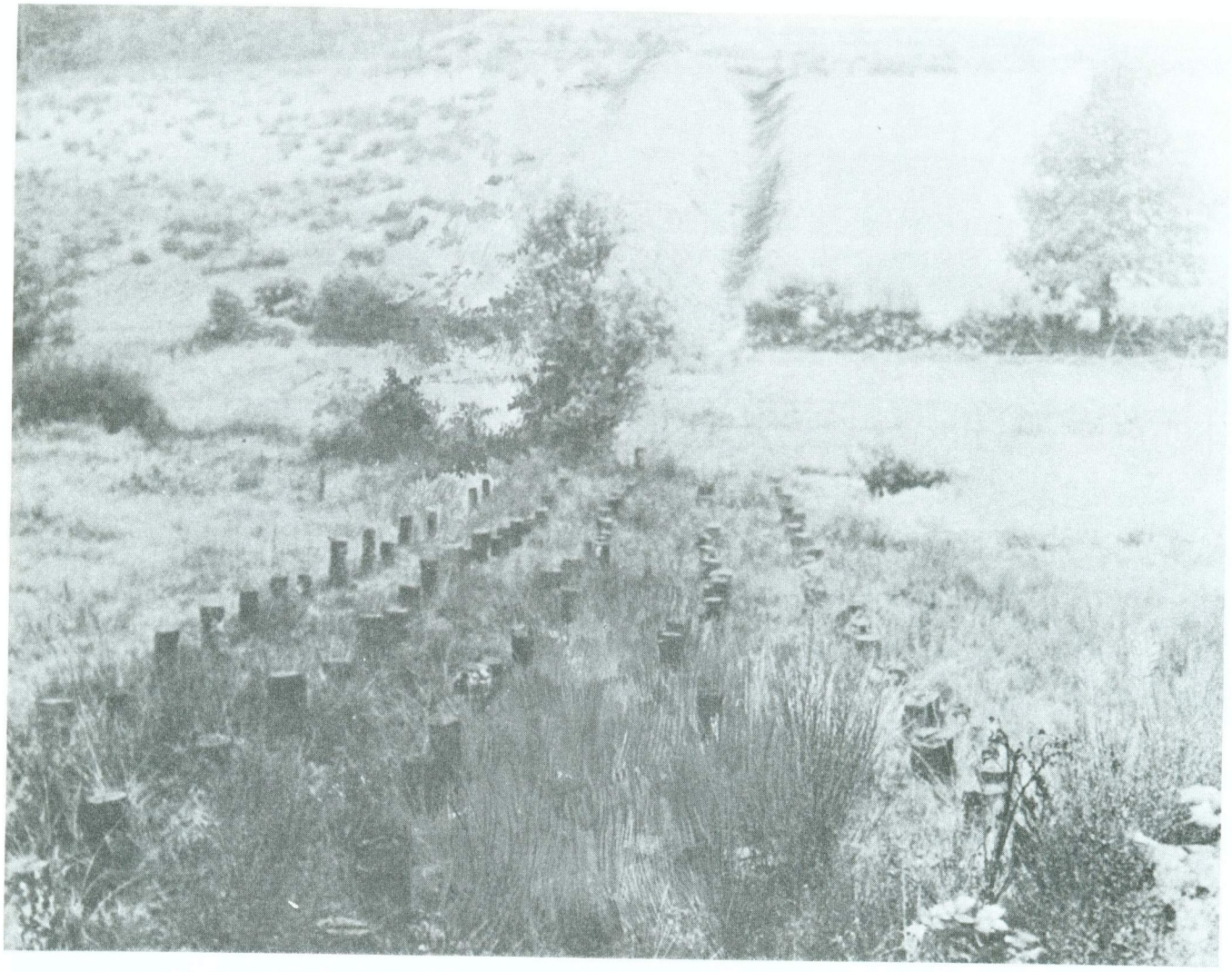


Figure 11. Post obstacles.

ditch, thus denying its use to the enemy. The approaches, sides, and bottoms of tank ditches should be mined with antipersonnel and antitank mines to delay breaching operations. When authorized use of persistent chemical agents and riot control agents may delay breaching operations. Tank ditches which are not covered by antitank fires have little obstacle value because they can easily be bridged by tank-launched bridges similar to the AVLB.

f. Demolition Obstacles. Demolition obstacles are those created by the destruction of an existing object or terrain feature. Properly emplaced or directed, demolitions can create rockslides, road craters, and other obstacles which restrict vehicular traffic. Specially designed demolition charges are available for preparation of most types of demolition obstacles. If cratering charges are not available, craters may be dug by hand and should be the same in dimensions as the tank ditch. The sides of the crater may be revetted with the crater spoil, making it difficult for a tank to back out. Whenever possible, tank ditches, particularly road craters, should be camouflaged and revetted.

g. Wire. Wire fortifications or entanglements are useful in separating accompanying infantry from armor. They can also be effectively employed as roadblocks against wheeled vehicles. Tactical wire should be used in conjunction with other obstacles wherever possible. Wire is relatively easy to breach and must be covered by fire to be effective.

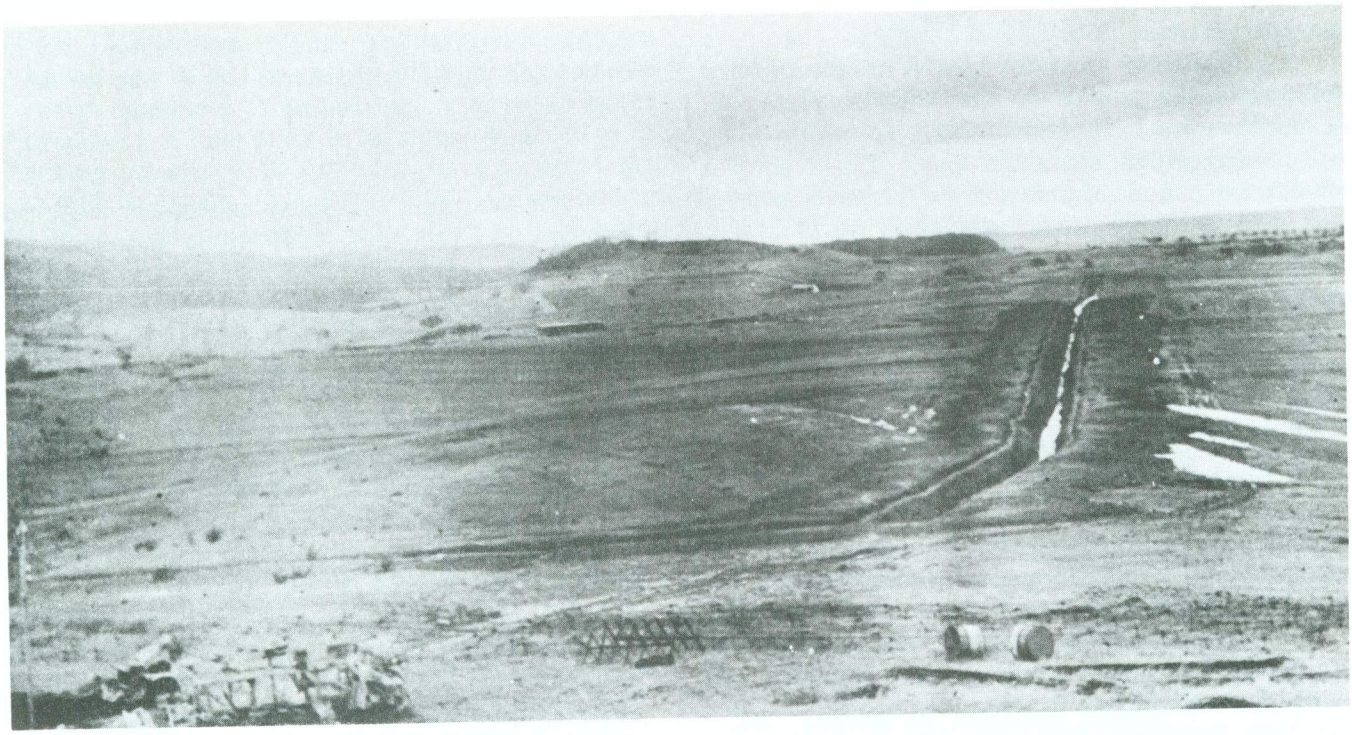


Figure 12. Tank ditch.

Section III. MINES

18. General

An antitank mine is an explosive charge, usually encased in relatively light metallic or plastic material, equipped with a main fuze and often with one or more secondary fuzes. The mine is designed to be laid on or in the ground, by hand, machine, or aerial emplacement. It may be detonated by target contact or influence, wire or radio control, or by a preset timer. In addition to the mines described in this section, antitank mines can be improvised from explosive items appropriately primed and fitted with firing devices. Antitank mines are one of the most used and effective antiarmor weapons. They may be employed in quantities varying from one mine placed in a restricted avenue of approach to thousands in a minefield incorporated into a barrier plan. (See FM 20–32 for more information.) Standard United States antitank mines are of three basic types.

a. Blast. The blast AT mine is designed to disable the wheels or tracks of vehicles (M15 and M19 mines).

b. Vertical Penetration. The vertical penetration AT mine is designed to puncture the bottom of a vehicle, thereby killing or injuring the occupants as well as damaging or destroying the vehicle (M21 mine).

c. Horizontal Effect. The horizontal effect (off-route) AT mine is designed to penetrate the side of a vehicle, to damage the engine, and to kill or injure the vehicle occupants (M24 mine).

19. M15 Antitank Mine (Fig 13)

a. General Description.

(1) Type: Blast.
(2) Weight: 30 pounds.
(3) Explosive: 22 pounds of composition B.
(4) Material: Steel.

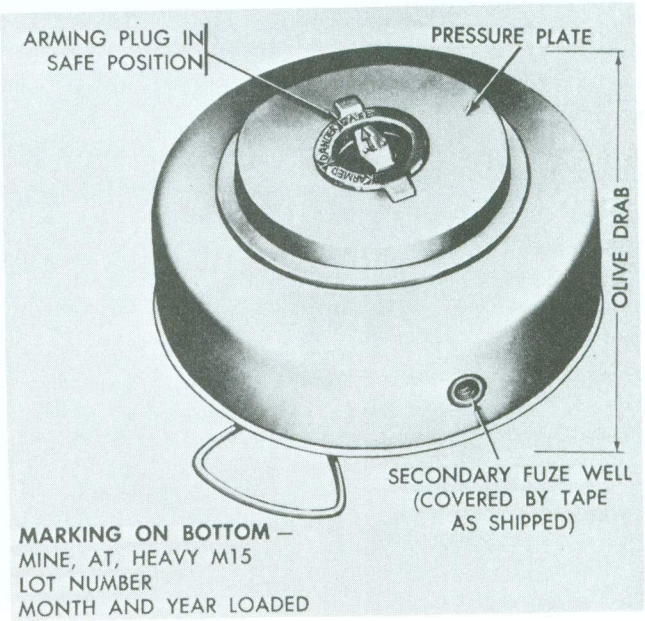


Figure 13. M15 antitank mine.

(5) Fuzes:

(*a*) M603 antitank fuze. A minimum force of 300 to 400 pounds on the pressure plate will cause the mine to function.

(*b*) M608 sustained pulse fuze requires 200 to 300 pounds of pressure for 3.5 seconds.

(6) Secondary fuze wells: two.

b. Effectiveness: This mine will disable the heaviest tank by breaking its track.

c. Packing. One mine with fuze and activator in a wooden box weighs 49 pounds.

20. M19 Antitank Mine (Fig 14)

a. General Description.

(1) Type: Blast.

(2) Weight: 28 pounds.

(3) Explosive: 21 pounds of composition B.

(4) Material: plastic.

(5) Fuzes: M606 integral fuze. A minimum force of 350 to 500 pounds on the pressure plate will cause the mine to function.

(6) Secondary fuze wells: two.

b. Effectiveness. This mine will disable the heaviest tank by breaking its track.

c. Packing. Packed two mines (with two fuzes M606, one wrench M22, and two detonator holder assemblies in a cardboard carton, overpacked in a barrier material bag; and two activators M2 in individual metal containers) in a wooden box. The entire package weighs 71.4 pounds.

21. XM-34 Mine

The XM-34 mine will be a helicopter delivered antitank/antivehicular, scatterable munition. It will weigh approximately 6 1/2 pounds and feature a long pulse pressure fuze. The XM–56 dispenser will deliver the XM–34 from a UH1H helicopter.

22. M21 Antitank Mine (Fig 15)

a. General Description.

(1) Type: Vertical penetration.

(2) Weight: 18 pounds.

(3) Explosive: 11 pounds of composition H–6.

(4) Material: steel.

(5) Fuzes: M607. This fuze, which is shipped with the mine, will function with or without the extension rod. With the extension rod removed, 290 pounds on the pressure ring will cause the mine to function. With the extension rod attached, a minimum horizontal force of 3.75 pounds is sufficient to tilt the rod approximately 19°, causing the mine to function. The M612 pneumatic fuze is also available, and it requires minimal pressure to activate.

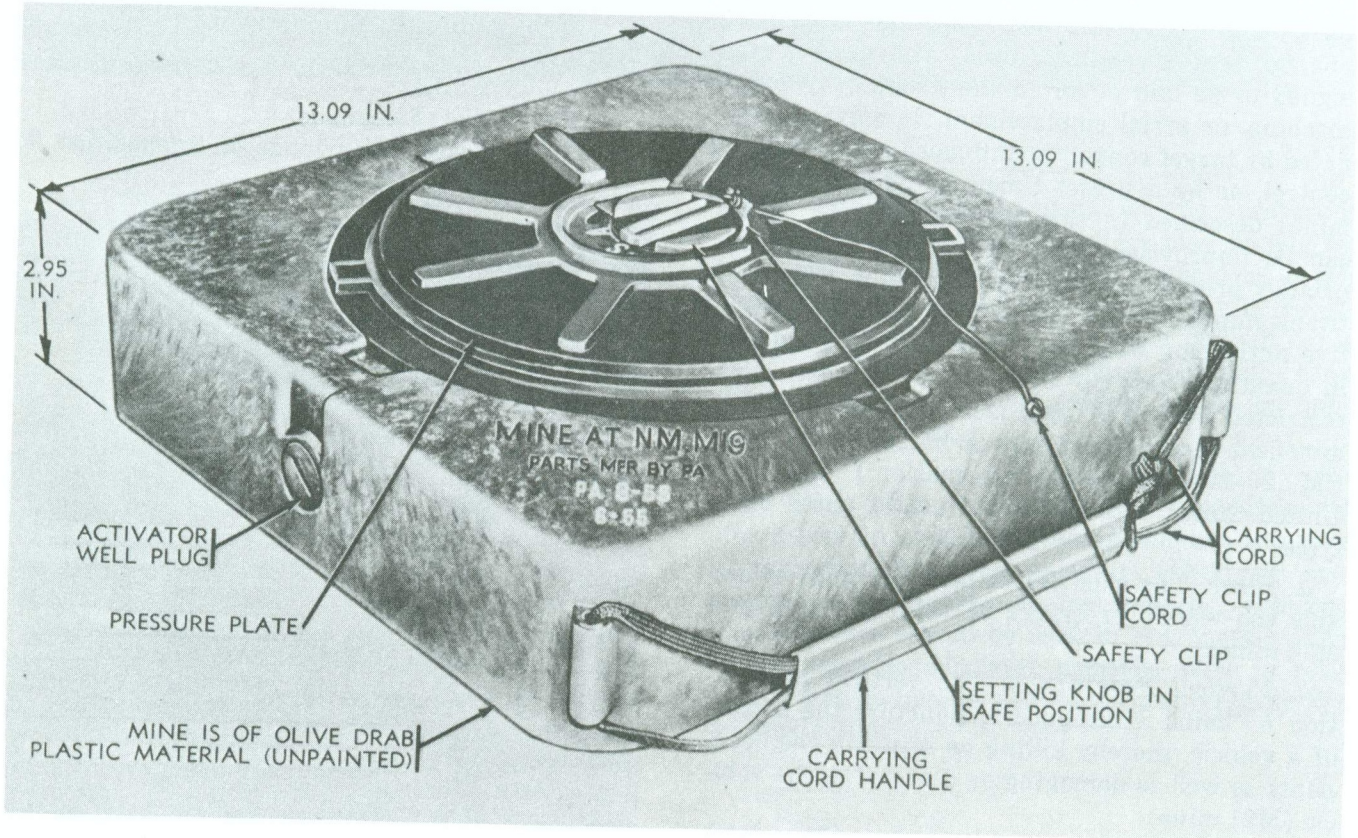


Figure 14. M19 antitank mine.

b. Effectivenss. In its primary role against armor, the M21 derives its effectiveness by the energy produced from the high explosive charge propelling a steel plate in an upward direction at a high velocity with sufficient force to penetrate the belly of the armored vehicle. A secondary role, pressure operation, will result in immobilizing a tank by breaking the tracks.

c. Packing. Two bags in a wirebound box, each bag containing two mines, two M607 fuzes, and one M26 wrench. The weight of one box is 90.8 pounds.

23. M24 Antitank or Antivehicular, Off-Route Mine (Fig 16)

a. General Description.

(1) Type: off-route, shaped charge (modified 3.5-inch rocket).

(2) Weight: 23.75 pounds.

(3) Explosive: 2 pounds (approximate) composition B.

(4) Dimensions: rocket in launching tube—24 inches long, 4 inches in diameter.

(5) Fuze: M2 segmented tape switch with M61 demolition firing device. The tape switch is laid across the road and attached to the firing device.

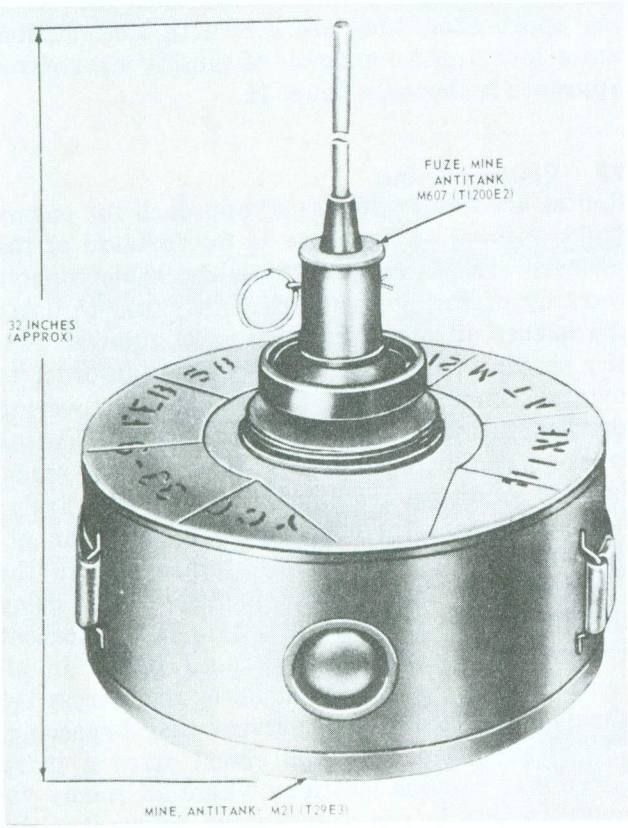


Figure 15. M21 antitank mine.

(6) Safeties: Shorting clip on the 3.5-inch rocket and an electric arm-safe switch.

(7) Detonation: 40 ounces of pressure on two adjacent segments of the tape switch fires the rocket. The rocket can be command-fired using standard electric firing devices, such as the M57 firing device used with the Claymore antipersonnel mine.

b. Effectiveness. This mine will penetrate in excess of three inches of armor at ranges up to 100 feet. The rocket has a 98 percent hit probability when it is actuated by the target vehicle while the vehicle is traveling in any direction at speeds less than 35 miles per hour at ranges up to 100 feet.

c. Packing. All components are packaged in two cloth bags to form one kit weighing 23 3/4 pounds. Two kits (2 mines) are shipped in a wooden box (total weight, 70 pounds).

24. Laying of Antitank Mines

Antitank mines are usually laid whenever the enemy is capable of attacking with tracked or wheeled vehicles. Essentially, there are three methods to employ antitank mines: by special technique mining operations, such as scatter mining (para 30); a hasty mining operation wherein the mines are quickly laid on top of the ground and covered only with dirt or brush; and a deliberate mining operation which is a systematic process involving the burial of the mines.

25. Employment of Antihandling Devices on Mines

A boobytrapped mine is one which will explode when disturbed. A mine that is equipped with an antihandling device will explode when it is disturbed, even though the primary fuze well is disarmed. When the enemy discovers antitank mines, he will often try to remove them, particularly if they are blocking a road, a bridge, or an installation. It is desirable that such mines be boobytrapped to inflict casualties when they are moved (fig 17). Not only will the enemy's morale be lowered by such casualties, but his advance will be slowed by the necessity of using special means of disposing of such mines. Theater commanders prescribe policies for the employment of boobytrapped mines, and unless specifically prohibited from doing so, field army commanders are authorized to employ them. This authority cannot be delegated lower than division and comparable commands. Boobytraps and other dirty-trick devices are reported and recorded in the same manner as minefields. See FM 20–32 and FM 5–31 for additional information.

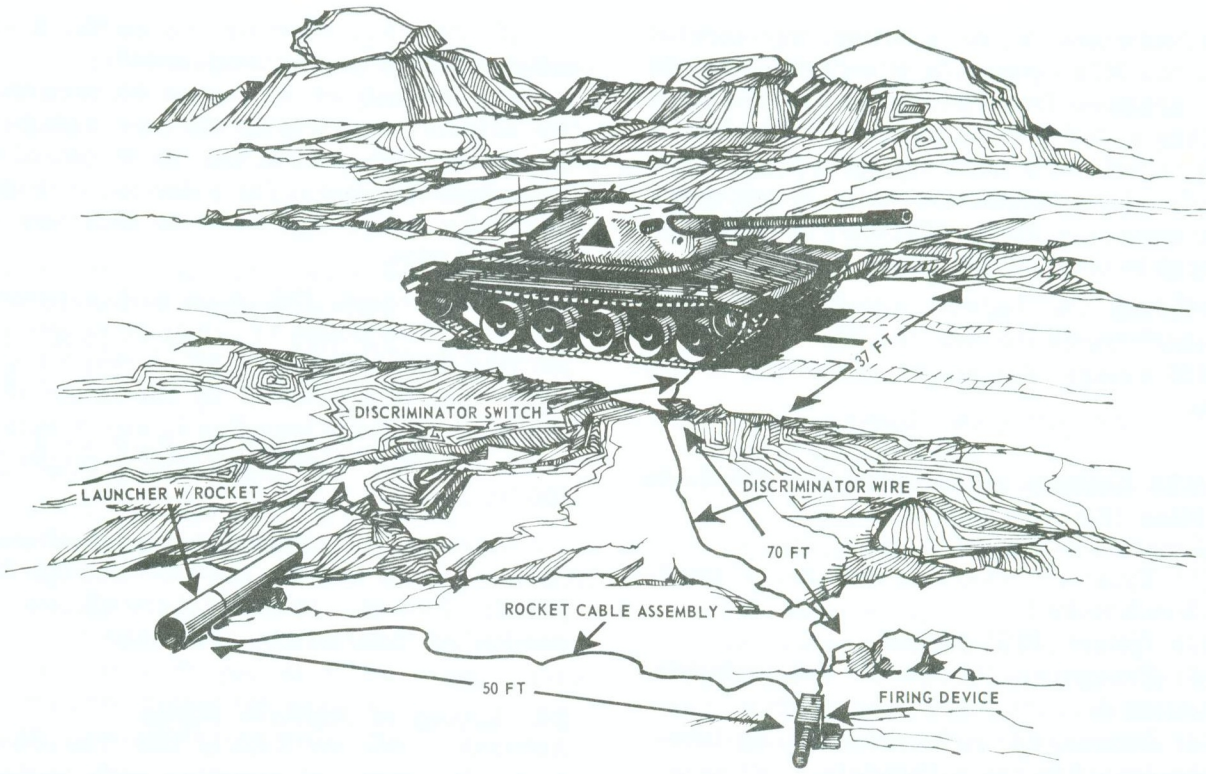


Figure 16. M24 antitank or antivehicular, off-route mine.

26. Employment of Antitank Mines

The authority to employ mines in the various type minefields is described in FM 20–32. These minefields must also be reported and recorded, and will be marked, dependent upon the type of minefield utilized. Detailed instructions in the employment of antitank mines may be found in FM 20–32.

27. Mines With Obstacles

a. Minefields are located where they will delay hostile armor and strengthen defense. Terrain and other factors, such as the availability of antiarmor weapons, may indicate that mines be used to reduce the number of approaches by connecting two obstacles, thus permitting a greater concentration of antiarmor fire on the remaining approaches. An example of mining one apprach is shown in figure 18.

b. If the number of mines is limited, and the approaches have the same characteristics except width, mine the approach which can best be blocked with the available mines. If the number of mines available is insufficient to connect obstacles, mines may be used to extend one of the obstacles across that portion of the approach containing the most restricted defensive fields of fire. Enemy armor attempting to use this covered portion of the approach is met with the combined effectiveness of mines and antiarmor fires. If tanks bypass the minefield and use the open portion of the approaches, they are met with concentrated antiarmor fire. An example of mining a restricted approach is shown in figure 19.

28. Route Mining

Routes are likely avenues of approach for enemy tanks. Mining of the route as far forward of the security echelon as feasible is desirable to give warning of the approach of armor and to delay the enemy advance. However, the greatest density should be near the unit's position in order to take maximum advantage from the fire covering the field. Any group of mines should be located where it is difficult to bypass. Hard surface roads, in good condition, are difficult to mine effectively; however, where there is a probability of an armored thrust by the enemy, mines laid in the roadbed, even if poorly camouflaged, will delay the thrust. The M24 off-route mine is an excellent system for mining hard surfaced roads. In all route mining, the mines should extend across the shoulders of the road to prevent easy bypassing. The friendly side of a hill creast or of a sharp curve may provide locations where an enemy vehicle is likely to run over a mine before it is detected. Mines in these locations or at the bottom of steep grades, also result in following vehicles

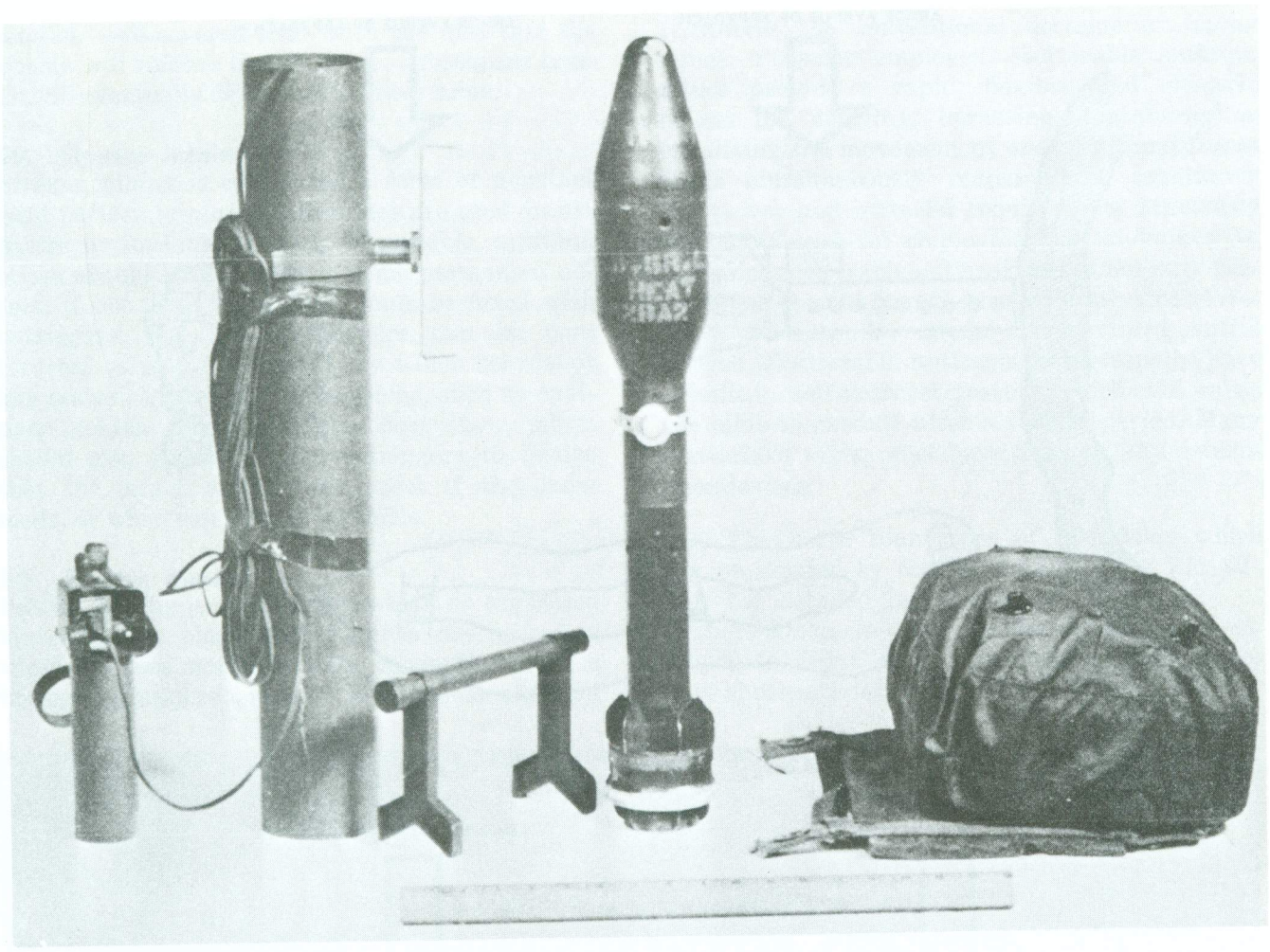


Figure 16.—Continued. ②

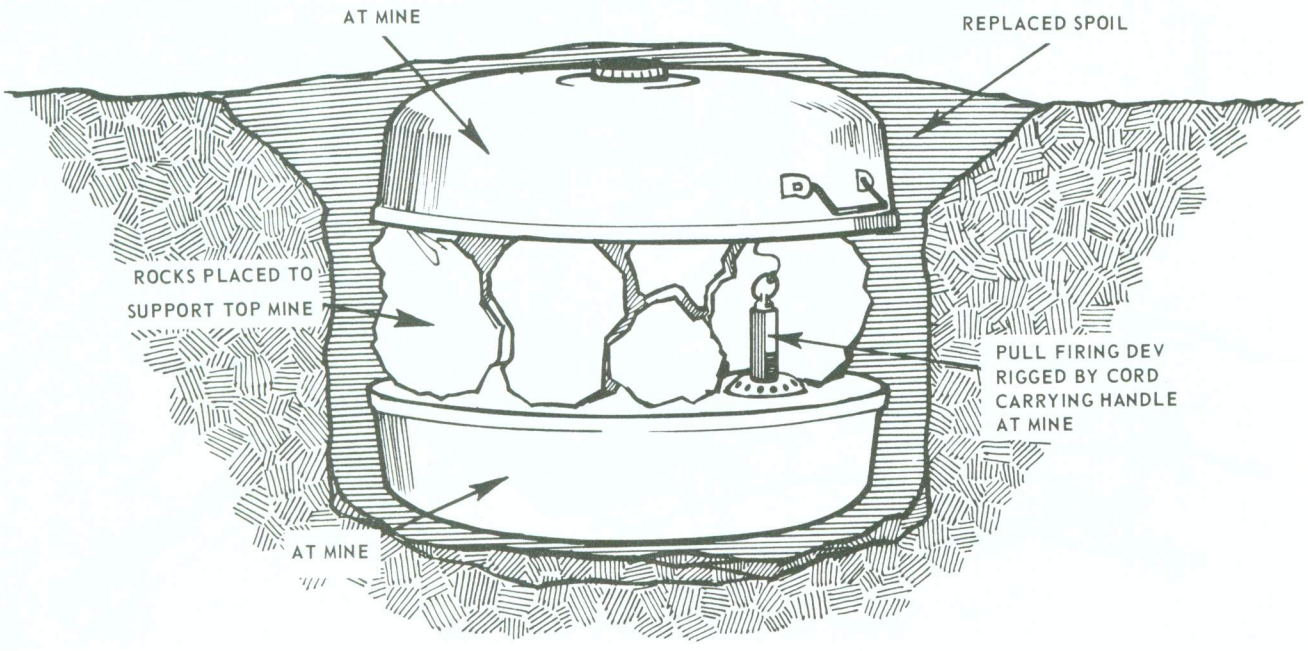


Figure 17. Boobytrapped mine.

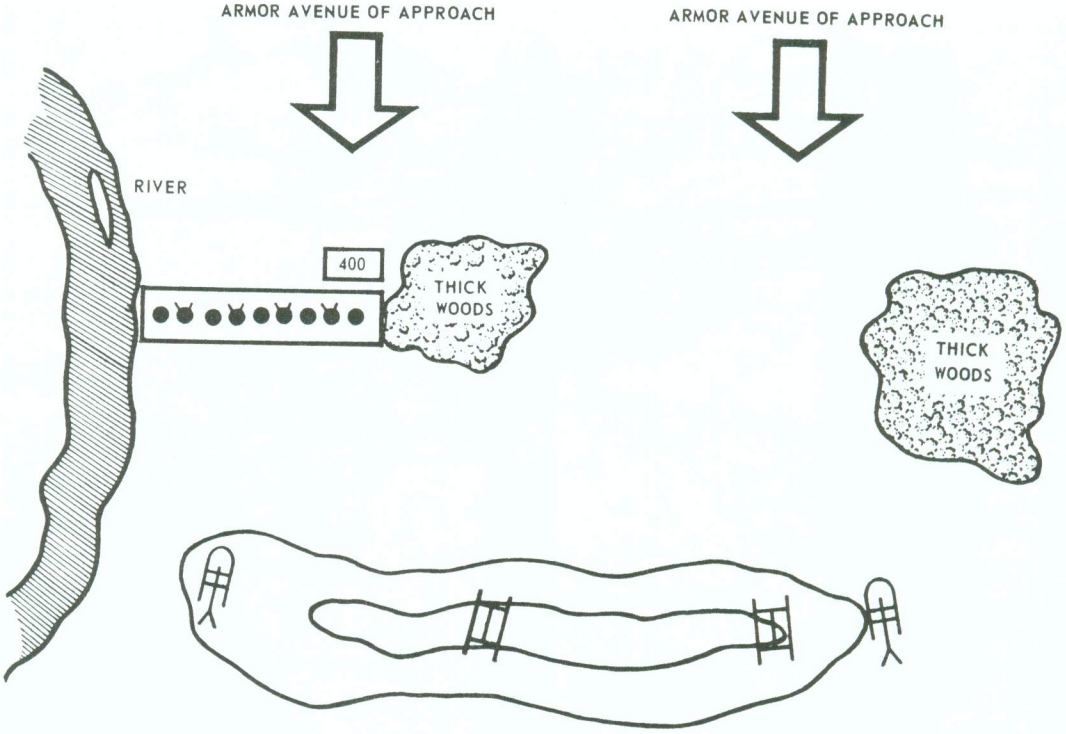


Figure 18. Mining one approach.

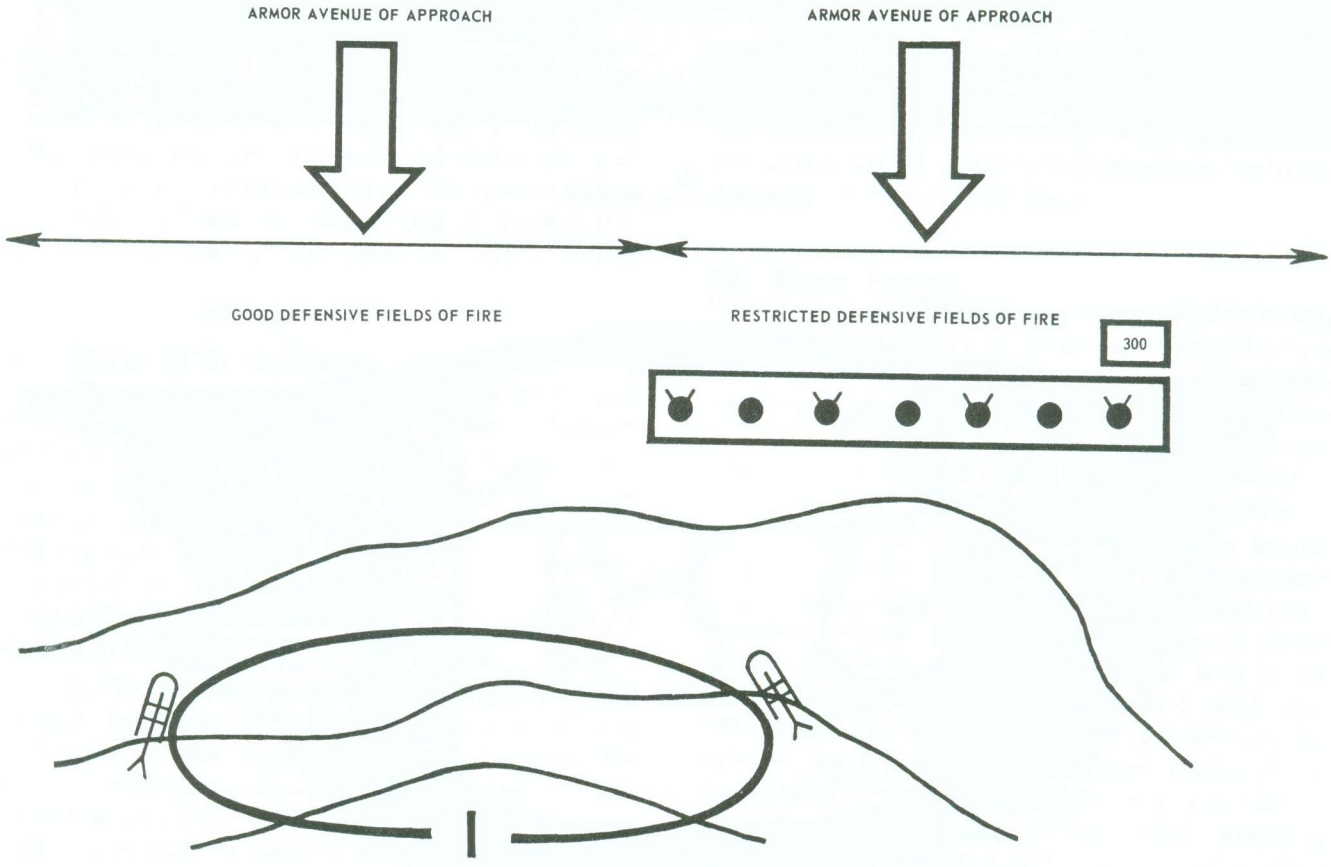


Figure 19. Mining a restricted approach.

being stopped when the leading vehicle is damaged. Regular intervals should be avoided in route mining. Occasionally, it may be desirable to place one mine (not too well concealed) on top of

another well-covered mine with the idea that the enemy will remove the top mine; subsequent traffic will eventually detonate the lower mine.

29. Stream Mining

Stream mining is considered a form of nonstandard pattern mining where mines are used on bypasses or fordable streams. If possible, antitank mines should be anchored to some permanent object; if not, then the mines should be fitted with outriggers (fig 20). Outriggers can be constructed using 3 foot long, 1- by 4-inch boards, or any material, of similar dimensions, such as engineer pickets. When mining in deep snow, mines should also be fitted with outriggers to insure that the mines will not be upset if the snow melts, or when run over by a vehicle.

30. Scatter Mining

Scatter mining is a method in which no organized system in the placement of mines can be recognized. It does not invalidate conventional mine laying techniques, rather it supplements and reinforces the conventional doctrine of laying mines. Properly employed, scatterable antitank mines provide a rapid, flexible, and effective means for delaying, harassing, containing, or canalizing the movement of enemy ground forces while simultaneously reducing the significant manpower and material requirements previously associated with the employment of landmines. In addition, scatterable antitank mines not only permit some control over the enemy's forward movement, but they allow lateral and rearward control as well. Scatterable antitank mines usually have a built-in self-destruct feature which will cause the mine to explode after a certain period. Many scatterable mines also have built-in antidisturbance devices.

a. There are four types of minefields which can be created by scatter mining. (See FM 20–32A for detailed information.)

(1) Obstacle—used in the defense and employed in front of an attacking enemy; mines have short self-destruct periods.

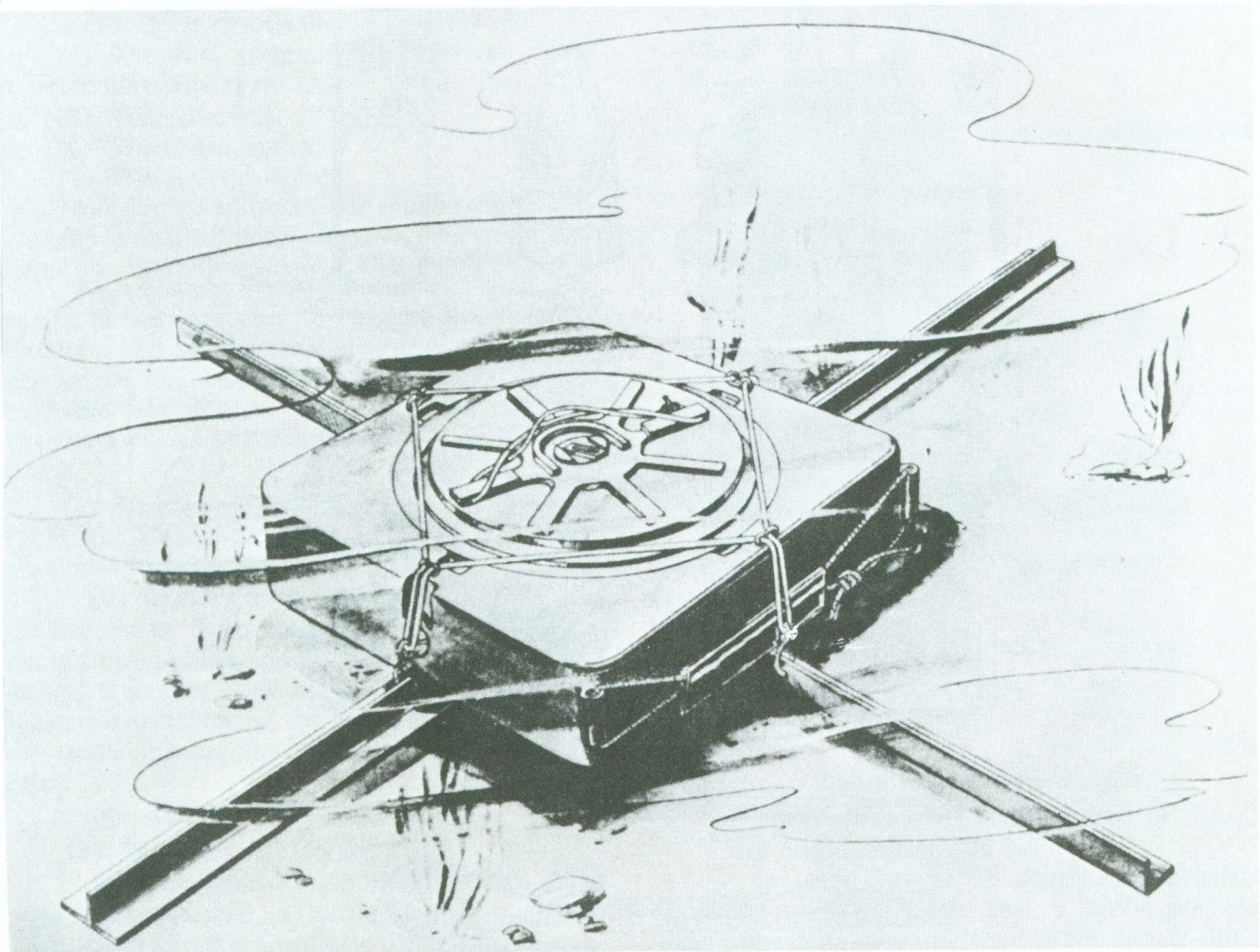


Figure 20. Mine with outrigger.

(2) Retrograde—used in the withdrawal and to cover the vacated withdrawal route and gaps in other minefields; mines have self-destruct period in excess of 24 hours.

(3) Anvil—used in the offense and employed to contain enemy forces and to prevent their withdrawal and/or reinforcement; self-destruct periods should coincide with the time friendly troops will overrun the area.

(4) Interdiction—used to disrupt, delay, and disorganize enemy tactical and logistical movement and activity; mines used should have long self-destruct periods.

b. The type minefield that is to be employed dictates the technique for laying scatterable antitank mines.

(1) Manual emplacement—not recommended due to slowness.

(2) Machine emplacement—a good method which speeds up the process of creating a small (protective or defensive) minefield over manual emplacement.

(3) Helicopter emplacement—a faster means of delivering antitank mines when a good degree of accuracy is required; normally, they are employed only in areas occupied by, or near, friendly forces—such as obstacle or retrograde minefields.

(4) Fixed wing emplacement—a rapid means of emplacing antitank mines in extensive amounts and in enemy held areas (obstacle or interdiction).

Section IV. FIELD EXPEDIENTS

31. Field Expedient Devices

a. General. Improvised antiarmor weapons are close-in weapons used by the armor-killer team or individual soldier, and, whenever possible, employed in conjuction with other antiarmor defenses. Generally, the armor-killer team will need to

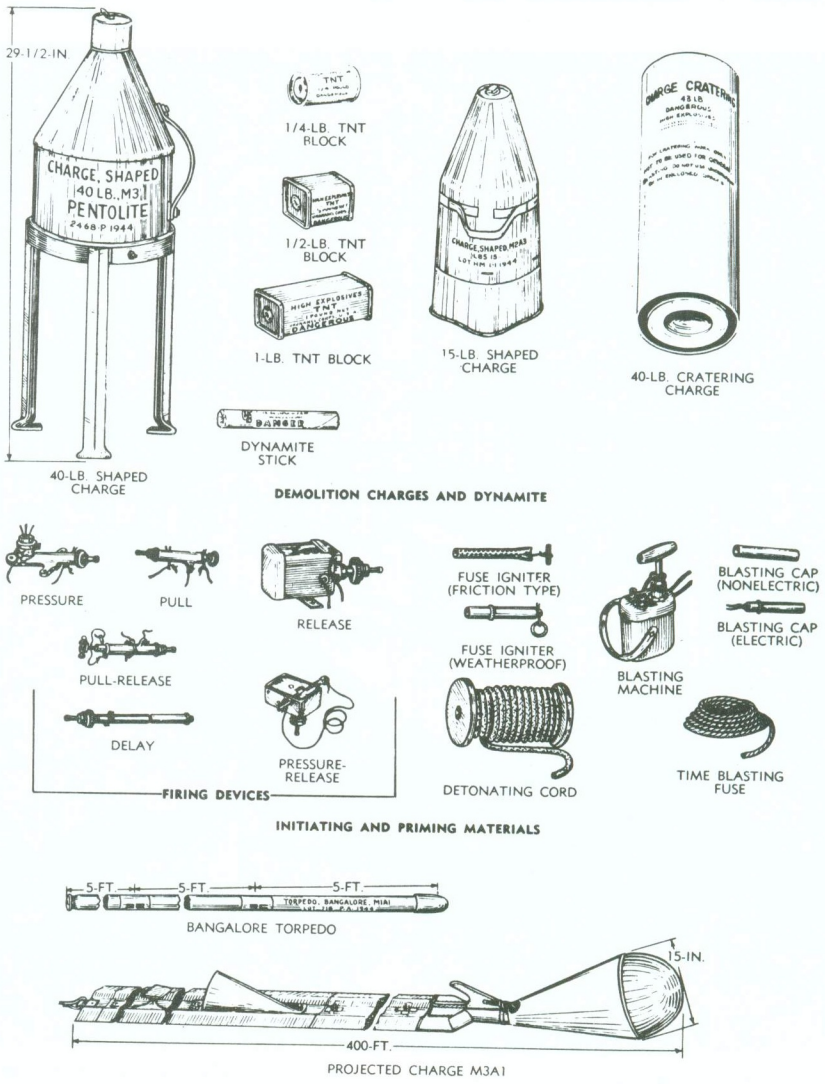


Figure 21. Representative types of demolition materials.

separate the tank from other tanks and its accompanying infantry, stop the tank, and finally, destroy the tank and its crew. To construct expedients, troops must know how to prime charges electrically and nonelectrically. There are many improvisations which can be fabricated to accomplish the tank killer mission. Listed in figure 21 are representative types of demolition materials available to fabricate antiarmor devices. To more effectively employ the field expedient weapons, soldiers must be familiar with the weak points and limitations of armored vehicles. Even with its great weight and size the tank has many vulnerable areas or weak spots. (See paragraphs 84 through 88 for more information.) These areas can generally be placed in the following categories:

(1) Armor protection. Sides and rear of turret and hull.
(2) The engine compartment.
(3) The suspension system:
  (*a*) Track.
  (*b*) Road wheels.
  (*c*) Support wheels.
  (*d*) Drive sprockets.
(4) The fuel system. Many foreign tanks have auxiliary fuel tanks.
(5) Vision devices.
(6) Visual deadspace.
(7) Weapons deadspace.
(8) Slow speed in thick or rough terrain.
(9) Preparation necessary to ford streams.

b. Flame and Smoke Devices. Flame and smoke devices are used to obscure the vision of the crew and set the tank afire thereby generating smoke and heat which will asphyxiate and burn the crew if they do not abandon the tank. (See paragraphs 84 through 88 for more information.)

(1) Molotov cocktail (fig 22):

(*a*) *Components:* Breakable container, gasoline, oil, and wick.

(*b*) *Construction:* Molotov Cocktails are constructed by filling the container, usually a bottle, with a gasoline and oil mixture, and then inserting a porous cloth wick. The wick is ignited just prior to throwing the bottle at a tank; when the bottle breaks, the combustible liquid is ignited.

(*c*) *Employment:* Hand thrown.

(2) Eagle fire ball (fig 23):

(*a*) *Components:* Ammunition can filled with thickened fuel, a white phosphorous grenade wrapped with detonating cord, tape, a nonelectric blasting cap, fuze lighter, and grapnel (rope and bent nails).

(*b*) *Construction:* The ammunition can is filled with thickened napalm. The white phosphorous grenade is partially wrapped with detonating cord and taped, while the nonelectric blasting cap, 6-inch time fuze, and fuze ligher are connected to the detonating cord. The grenade with fuze assembly is inserted into the can of napalm and the fuze let out through a channel in the lid of the can made with a pair of pliers. If available, short pieces of rope and bent nails can be used to construct a grapnel, which will insure that the fire ball remains on the tank until detonated. The hooks of the grapnel will catch on protruding assemblies on the tank. The fuze lighter is activated just prior to placing the Eagle fire ball on the tank.

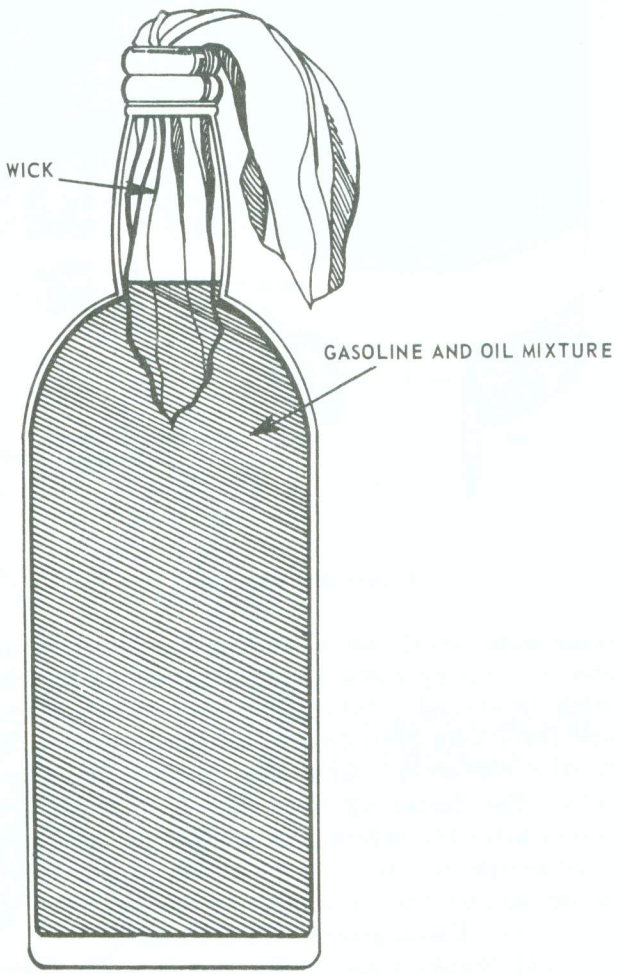


Figure 22. Molotov cocktail.

(*c*) *Employment:* Hand thrown or placed.

(3) Eagle cocktail (fig 24).

(*a*) *Components:* A plastic or rubberized bag filled with thickened fuel, a smoke grenade, and a thermite grenade taped to the bag of thickened fuel.

(*b*) *Construction:* The container (an

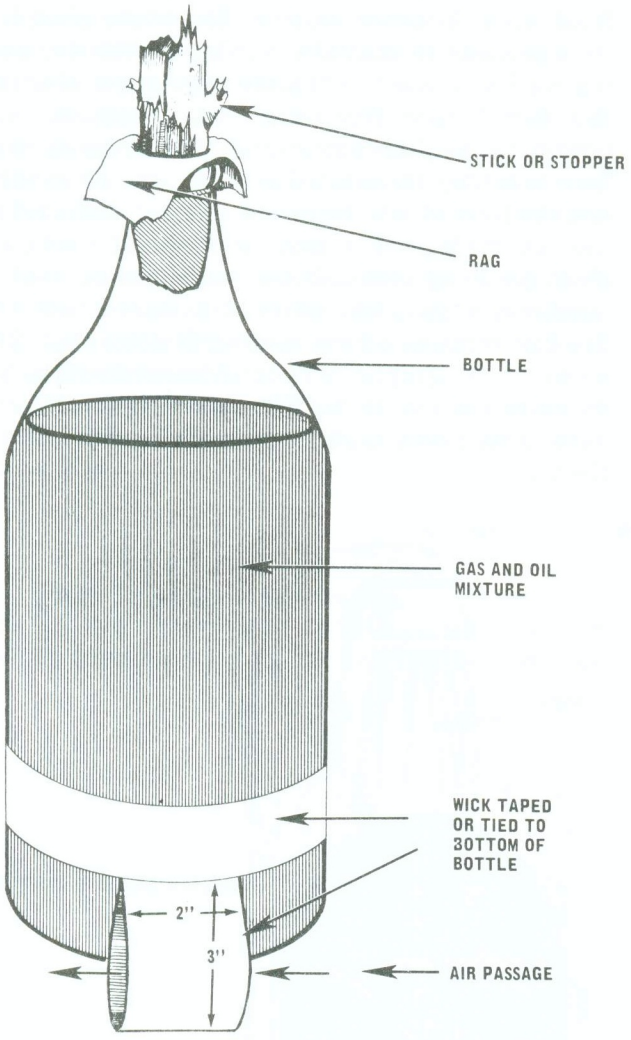


Figure 22—Continued.

issue waterproof bag, a sandbag lined with a poncho, or battery cases inside a sandbag) is filled with thickened mixture. The thermite grenade and the smoke grenade are then securely fastened to the container using tape or communication wire. The fastening must not bind the safety levers after the safety pins are pulled. A piece of cord should be tired to both safety pins that will be pulled just prior to employing the cocktail.

(*c*) *Employment:* Hand thrown.

(4) Smoke pots, smoke and incendiary grenades, and flares:

(*a*) *Components:* Issue items.

(*b*) *Construction:* None.

(*c*) *Employment:* Hand thrown or placed to obscure the vision of the tank crew.

(5) Forest and grass fires should be considered as a means of delaying or diverting an armor attack.

c. Explosive Devices. Explosive devices are placed at vulnerable points to destroy components of the tank. Desirably, they are rectangular in shape so they can remain on the tank until detonated.

(1) Towed charges.

(*a*) *Components:* Rope, mines or blocks of primed explosives.

(*b*) *Construction:* A Daisy chain (① fig 25) is constructed by connecting a series of armed antitank mines with rope or communication wire. One end of the rope is anchored on one side of the road, and each mine is connected so that when the rope is pulled across the road, the mines are spaced across the roadway so the tank's tracks cannot pass between any two. A sled charge (② fig 25) can be constructed by fastening 25 to 50 pounds of TNT to a board and anchoring one end of the rope to the other side of the road. Almost any type firing device may be used to detonate the charge. As many as five M–1 firing devices may be used, or if desired, electric blasting caps with a power source. A towed charge is employed by an observer who pulls the charge across the road when he feels the tank is in the right position to detonate the charge. Proper timing of this maneuver is critical.

(*c*) *Employment:* The charge is pulled across a road or similar surface in the path of a tank.

(*d*) *Effect:* Stops the tank by breaking its tracks.

(2) Command detonated charges.

(*a*) *Components:* Shaped charges, demolition charges, artillery shells, mines and bombs, electric blasting caps, communication wire, power source (blasting machine), and composition C–4.

(*b*) *Construction:* Command detonated charges are constructed using a primer with electric blasting caps. When using artillery shells or bombs, the well should be primed with an M–10 universal destructor and blasting cap from the demolition kit. Bombs and shells should be buried under the surface of the roadway the tank is expected to travel and detonated by a concealed, protected observer. Issued 40-pound shaped charges may be placed along a roadway with the charge aimed at the tank's center of mass. The charge is detonated by an electric blasting cap inserted into the well. The 40-pound shaped charge may be placed up to 14 feet from the target, and still penetrate four inches of armor plate. Charges may be emplaced in series spaced to inflict great damage on an armored column. If possible, two parallel circuits should be used to insure positive detonation. Mines may also be fired electrically by inserting electric blasting caps

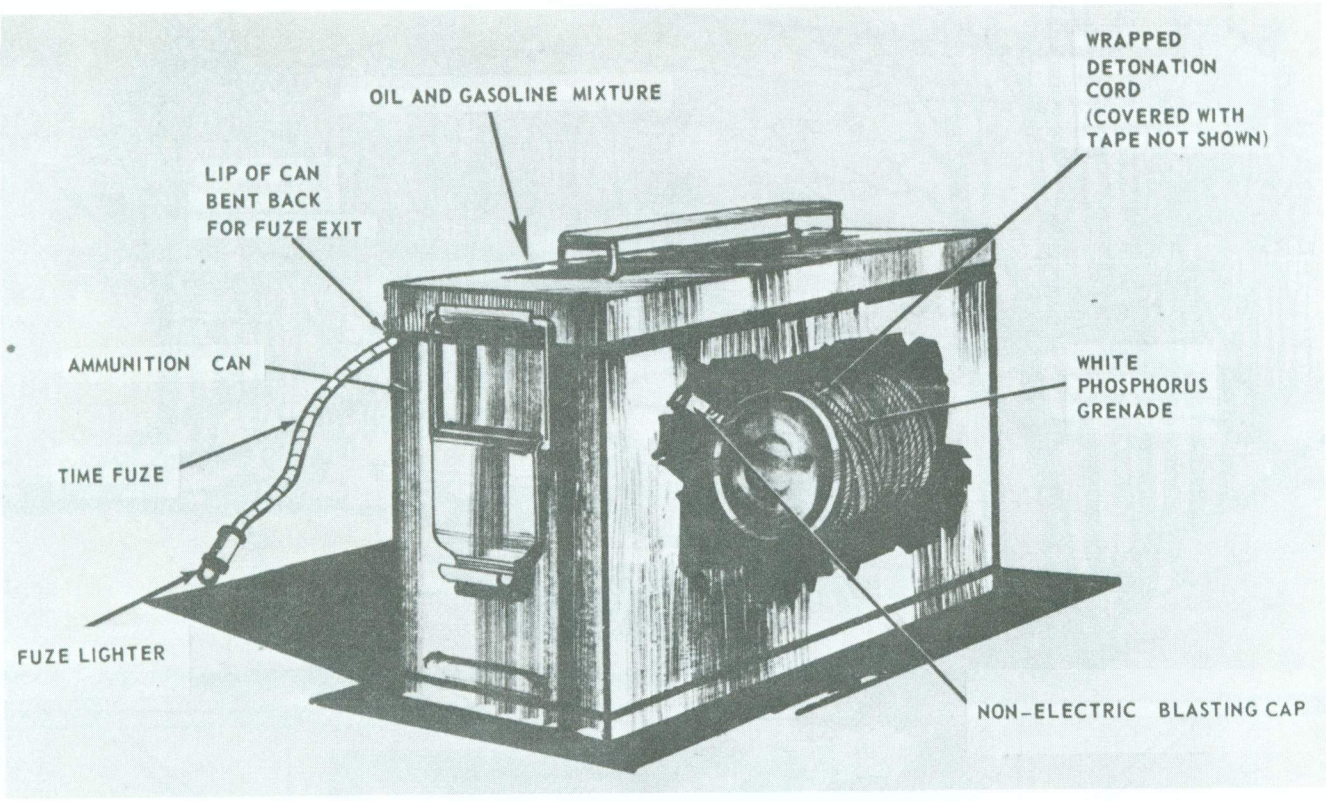


Figure 23. Eagle fire ball.

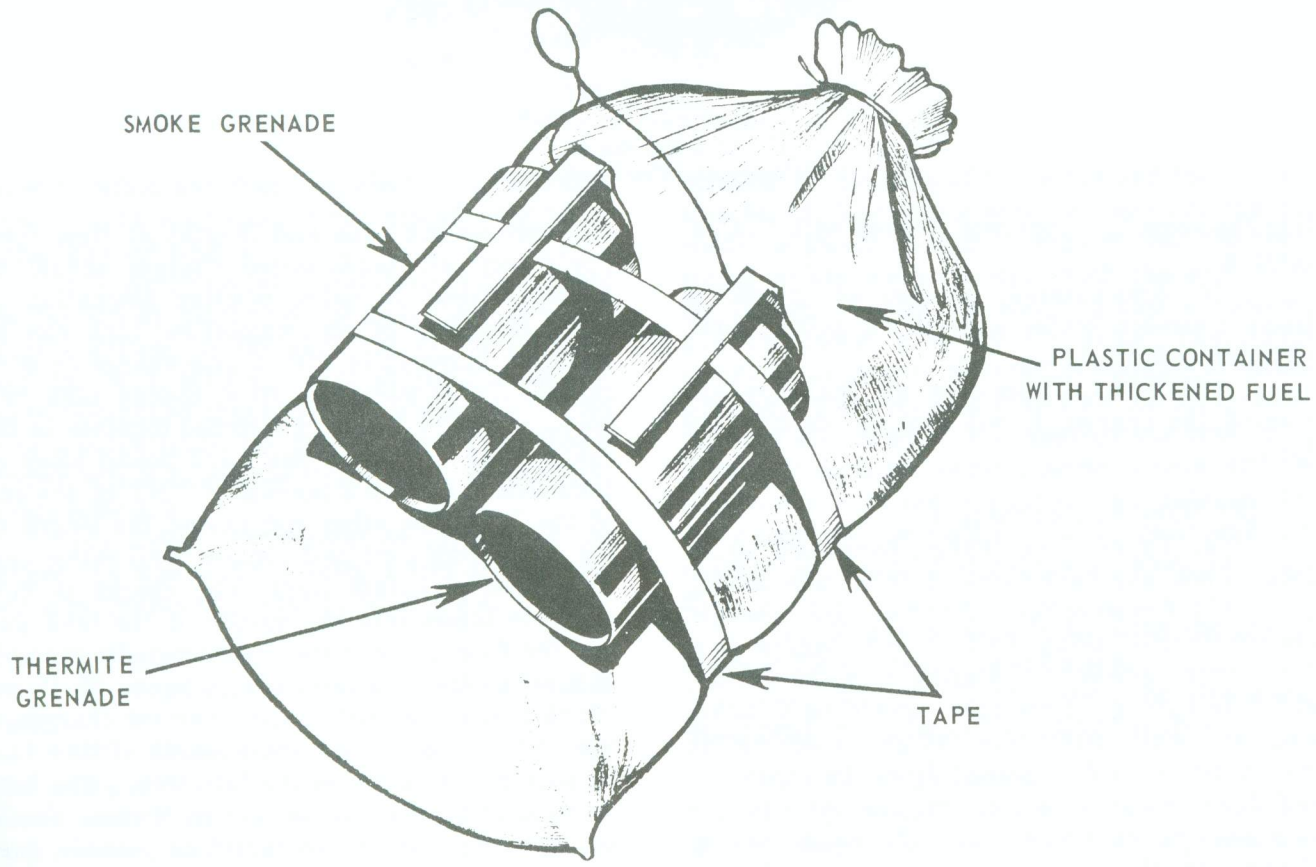


Figure 24. Eagle cocktail.

① Daisy chain.
Figure 25. Towed charges.

into the secondary fuze well primed with C–4 explosive.

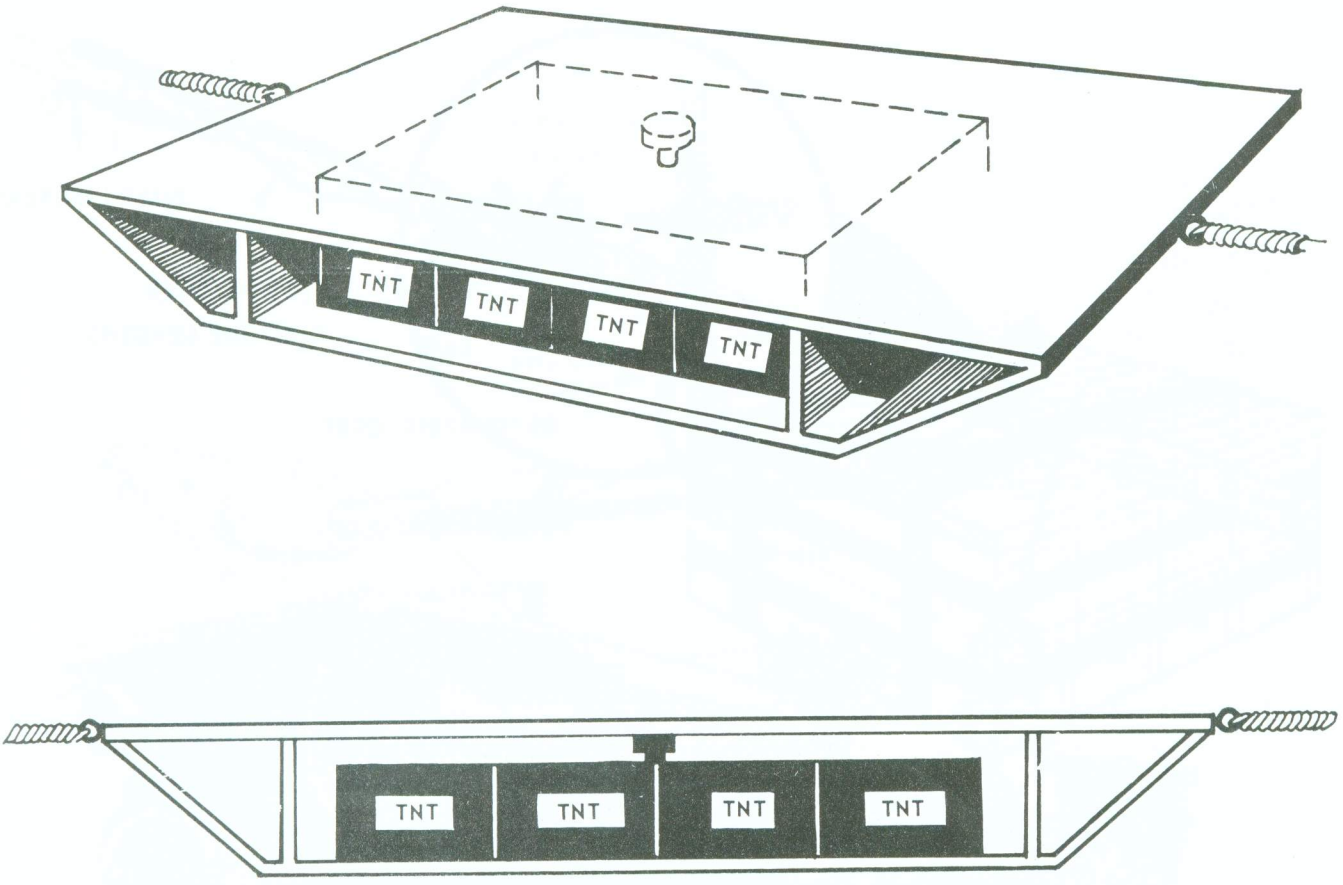
(*c*) *Employment:* Charges are placed in likely approach routes and, at the proper time, electrically detonated.

(*d*) *Effect:* Depending on the type and size of the charge, it will stop or destroy the tank.

(3) Hand-carried charges:

(*a*) *Types:* Pole charge, bangalore torpedoes, mines, and haversacks of demolition blocks.

(*b*) *Construction:* Hand-carried charges are constructed using TNT or composition C–4, fuzed with nonelectric blasting caps, time fuze, and fuze lighters. Time fuzes should be 6 inches long, and when using pole charges, a detonating cord must be used to extend from the charge itself down to the handle of the pole. An example of a pole charge is shown in ① figure 26. Satchel charges (packs filled with explosives or boards fitted with handles and explosives) may be used with nonelectric caps and lengths of time fuze. Preferably, all hand-carried charges should be double primed to insure positive detonation. A firing tank gun of an immobilized tank can be rendered inoperative with a pole charge or stick charge. To construct a stick charge take two poles, at least 4 feet long fastened together in the shape of an L. Fasten one 2 1/2 pound block of composition C–4 or 3 pounds of TNT to one end of the L. At the other end extend the length of the detonating cord and connect nonelectric cap, time fuze, and fuze light. The charge is now ready to insert into the muzzle of the tank gun and the fuze is ready for activating. An example of a stick charge is shown in ② figure 26. If antitank mines are used as hand-carried charges, a nonelectric blasting cap and a length of time fuze is inserted into a secondary fuze well, using tape or an adapter plug. Hand-carried charges should be placed as close to the turret as possible, preferably under the rear turret overhang or over the engine. Two sections of bangalore torpedo



SLED CHARGE WITH PRESSURE IGNITER

② Sled charge.
Figure 25—Continued.

taped together and fuzed nonelectrically will destroy a tank's suspension when placed lengthwise along the road wheels.

(*c*) *Employment:* Hand-carried charges are thrown or placed on the rear deck, the suspension system, or the gun tube of the tank. In fact, the M15, M19 and M21 antitank mines already mentioned should not be neglected as they have a potential in the hand-thrown role. Hand-thrown mines should be wrapped in sandbags to insure adhesion.

(*d*) *Effect:* Depending on the size of the charge and where it is placed, it will destroy certain components of the tank and its crew.

(4) Projected charge:

(*a*) *Components:* 3.5-inch rocket, wooden trough.

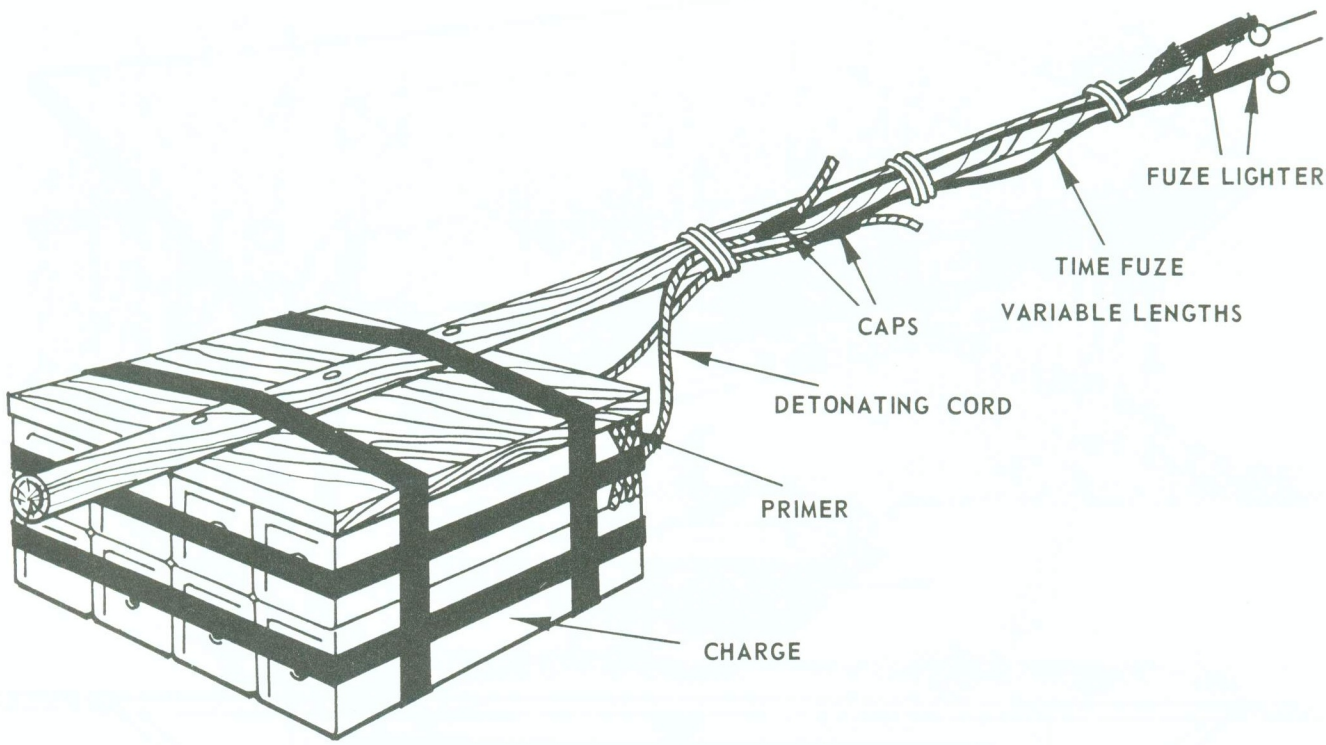
(*b*) *Construction:* Any 3- to 4-foot trough that will provide launch stability for the rocket can be used. Firing wires are spliced to the two clear plastic coated wires in the nozzle of the rocket. The red and green wires are not used. To provide good contact, the insulation should be scraped off the ends of the wires and the connection taped. The safety band is removed, and the rocket is placed into the trough so that the bore-riding safety makes contact with the surface of the trough. Finally, the shorting clip is removed and the rocket is ready for firing. The rocket should be as close to the trail as possible to insure accuracy. The rocket is aimed at the tank center of mass and fired at the appropriate time by a concealed observer using a power source. If time or equipment is not available, the container for the rocket may be used in lieu of the trough. An example of a projected charge is shown in figure 27.

(*c*) *Employment:* Placed along the side of roads or likely avenues of approach.

(*d*) *Effects:* Stops armor by damaging equipment or killing or wounding the crew.

d. Miscellaneous Methods.

(1) The use of vast quantities of oil or other slippery substances, poured on critical portions or roads, should be considered. It is entirely possible that one wheeled vehicle may slide off a high



① Pole charge.
Figure 26. Hand-carried charges.

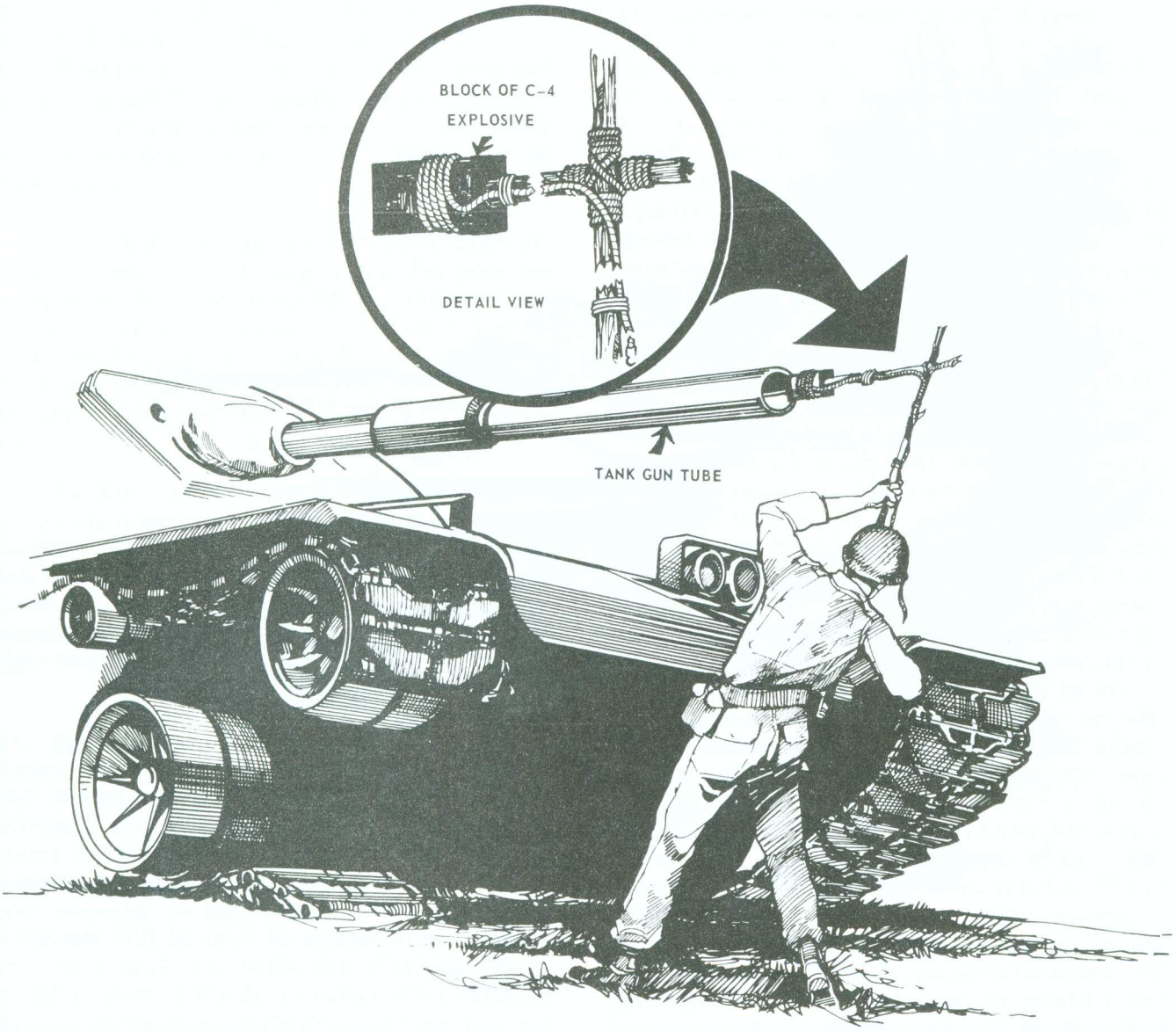
crowned road at this point, or lose control and crash, causing an obstacle to the passage of subsequent vehicles.

(2) The use of civilian vehicles to hinder the advance of enemy vehicular columns along major road networks should not be neglected. They can be used to create temporary obstacles at critical locations simply by stopping them lengthwise across a narrow road and setting fire to them, or large numbers of automobiles manned by fleeing refugees can be taken advantage of to create massive road traffic jams, forcing the enemy to move cross-country.

(3) The flooding of large areas of low countryside can serve to restrict enemy movement.

32. Employment

Field expedient devices may be used in conjunction with other antiarmor weapons or used alone when no organic weapons are available. Since most field expedient weapons must be placed in contact with the tank, it is necessary to slow down or stop the tank. Mines or controlled charges placed in the path of the tank will stop it; and depending on the size of the mines or controlled charges and their location, they will break a track or penetrate the hull. A tank must be separated from other tanks and accompanying infantry to enable dismounted infantrymen to get close enough to employ incendiary and explosive devices. Carefully placed smoke pots and smoke grenades may be set off electrically to provide concealment for dismounted elements, allowing them to approach the flanks or rear of the tank with explosive devices. If the tank has not been stopped, smoke causes it to slow down, thus permitting the placement of a charge to stop it. At night, hand-held and/or trip flares fired manually can be used to temporarily blind a tank crew. Handcarried charges are then placed alongside of the turret, or under the turret overhang, depending on the device used. Projected charges or controlled charges may be used by security personnel to provide early warning and disorganize attacking mounted formations. Controlled charges may also be used to initiate ambushes or drive armored vehicles into minefields.



② Stick charge.
Figure 26—Continued.

Section V. ARTILLERY, AIRCRAFT AND CHEMICAL AGENTS

33. Artillery

a. Artillery can be used effectively to engage enemy armored units with long range indirect fires. Assembly areas, headquarters, and supply/refueling points would be primary targets. Improved conventional munitions, HE, and WP projectiles can be used with effective results against both personnel and vehicles. Indirect artillery fire is effective in the attack of moving tanks and other armored vehicles by causing them to "button up." This decreases the effectiveness of the tank and increases its vulnerability to other armor defeating means; further, fires of sufficient intensity may demoralize and break up an armor attack. The use of indirect fire is effective in separating accompanying infantry from tanks, thereby increasing the vulnerability of the tanks. High explosive shells are usually employed in indirect fire. The use of shells, smoke, and WP may blind vehicle drivers or cause fires on equipment attached to the tanks. All nuclear-capable artillery is effective against vehicles when employed in that capacity. Some artillery pieces in the future will be capable of delivering scatterable mines, including antitank mines.

b. Artillery cannons also have a direct fire capability which can defeat enemy armor; however, it must be recognized that the direct fire capability of field artillery cannons is considered a de-

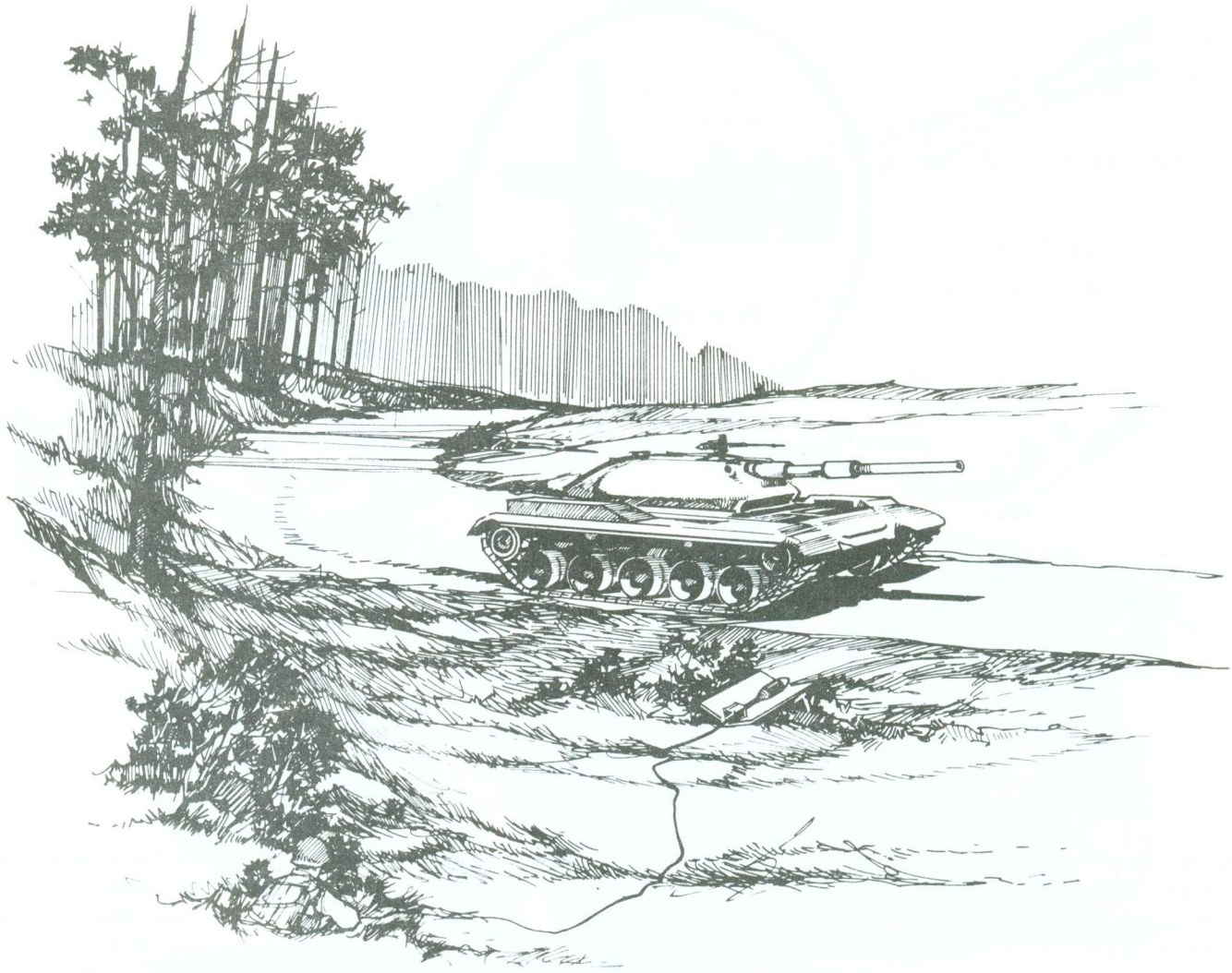


Figure 27. Projected charge.

fensive measure, not an offensive tactic to be considered in the scheme of fire and maneuver. HEAT and HEP–T ammunition are available for light howitzers. The maximum effective range of this ammunition is 2,200 meters; and the rounds penetrate, spall, or chip the interiors of armored vehicles. Medium and heavy artillery weapons are effective against armor in the direct fire role because of the size and explosive power of the projectile.

34. Fixed-Wing Aircraft

It is beyond the scope of this publication to deal with the weapons used by the Air Force to destroy armor. Tactical air support can be obtained through the Forward Air Controller (FAC) at battalion or brigade level. USAF tactical air forces are an effective means of defeating enemy armor. They are particularly effective in the engagement of fast-moving tanks in open terrain. Army aircraft are used for providing early warning and monitoring of enemy tank movements and for the deployment of scatter mines.

35. Helicopters

The use of Army rotary wing aircraft, however, is contingent upon the development of antiarmor weapons systems in progress at present. Helicopter capabilities are being improved by the addition of 20-mm or 30-mm turrets, tube launched, optically-tracked, wire command link (TOW) guided missile system installations, and improved fire control systems. For example, the following modifications are being adapted to the AH–1G Cobra:

a. A single gun (Vulcan Type) 20-mm or 30-mm turret would replace the present dual-gun 7.62-mm/40-mm turret. The cannon provides long-range accuracy and armor piercing ammunition for use against lightly armored vehicles. Turret coverage would be approximately 210° to

230° of azimuth, 20° to 25° of elevation and 45° to 50° of depression. Rate of fire for both 20-mm and 30-mm guns would be 750 to 800 shots per minute. Ammunition capacity would be 750 rounds of 20-mm or 500 rounds of 30-mm. These weapons are effective against light armor such as found on APC's.

b. The TOW missiles are carried in pods attached to the outboard wing pylons. The pods are designed to fit the existing 14-inch shackles. Six or eight missiles can be easily carried in four 2-round modular pods or two 3-round pods. The TOW missile has been successfully fired from the air and has demonstrated a high degree of accuracy.

c. The fire control system is built around a periscopic sight mounted in the nose and a computer installed in the fuselage. The sight head would include stabilized optics with magnification, and a Laser for ranging. Sight coverage would be approximately the same as turret coverage. The sight would control turret and missile systems.

36. Employment

Attack helicopters may provide both offensive and defensive fires. Examples of offensive employment are reconnaissance by fire, attack on enemy security operations, and attacks on stationary as well as moving targets during fire support missions. In the defensive role, the attack helicopter will be used to protect other aircraft or to provide close-in protection of troops. Designated aircraft of the divisional aviation battalion have an antiarmor capability, and they will engage armor through their normal assigned mission, or on request through command channels.

37. Chemical and Riot Control Agents

The decision to employ lethal or incapacitating chemical agents, or riot control agents is a matter of national policy. Commanders will receive through command channels the authority to use specific agents and guidance for their use.

a. When authorized, nonpersistent lethal or incapacitating chemical agents may be employed against armored units to obtain either immediate casualties or a delayed, relatively long term, neutralization of personnel. Nonpersistent chemical agents will not affect armored vehicles and require minimal decontamination.

b. Persistent chemical agents can be employed against armored units to produce delayed casualties among unprotected personnel and contaminate vehicles and equipment. Personnel wearing protective masks and buttoned-up in the armored vehicle at the time of the attack will have complete protection and will become casualties only when direct contact is made with the agent. Contamination of the armored vehicle with a persistent chemical agent does not seriously impair its employment or use by the enemy. However, maintenance is seriously impaired by contamination.

c. Further doctrinal guidance on the employment of lethal and incapacitating chemical agents against personnel occupying hard targets (e.g., armored vehicles) is contained in FM 3–10-series.

d. Riot control agent CS produces temporary irritating or disabling physiological effects when in contact with the eyes or when inhaled. If riot control agent CS penetrates the compartment of an armored vehicle, prolonged exposure of unmasked personnel to high concentrations can render them ineffective for several hours and result in serious physiological reactions. Further doctrinal guidance on the tactical employment of riot control agent CS is contained in FM 3–2.

CHAPTER 3

EMPLOYMENT OF ANTIARMOR WEAPONS

Section I. INTRODUCTION

38. General

This chapter provides doctrine, tactics, and techniques for the employment of both organic and attached antiarmor weapons in offense, defense, and retrograde operations. The employment of improvised and field expedient antiarmor weapons is covered in chapter 2.

39. Command Responsibilities

a. Battalion Commander. The battalion commander is responsible for the overall employment of all organic and attached antiarmor weapons in his task force. In employing these weapons, he considers recommendations from members of his staff, subordinate unit commanders, and attached unit commanders, as well as the planned employment of minefields and other obstacles directed by higher headquarters. The battalion commander may retain control over the organic antiarmor platoon and any attached tanks, or he may attach all or elements of these units to his subordinate units. An example would be the attachment of one tank platoon from the attached tank company to a rifle company while retaining the tank company minus under battalion control.

b. Rifle Company Commander. The rifle company commander is responsible for the employment of all antiarmor weapons assigned or attached to his company. He may retain control of any attached antiarmor elements or he may further attach these elements to subordinate platoons.

c. Combat Support Company Commander. The combat support company commander is responsible for making recommendations to the battalion CO and commanders of subordinate units on the employment of his company.

d. Attached Tank Company Commander. The attached tank company commander is responsible for making recommendations to the battalion commander on the employment of his company. He advises the battalion commander on the employment of all antiarmor resources within the battalion. He commands and controls his company as directed by the battalion commander and coordinates the deployment of his platoons with the rifle company commander(s) in whose area(s) they operate.

e. Rifle Platoon Leader. The rifle platoon leader is responsible for the employment of those antiarmor weapons organic and attached to his platoon. He designates general firing positions and direction of fire for those weapons and provides security for all antiarmor weapons positioned in his area of operation.

f. Antiarmor Platoon Leader. The antiarmor platoon leader is responsible for recommendations on the employment of his platoon. When not attached, he is responsible for coordination with the rifle company commander(s) in whose area(s) his elements may operate. Dependent upon his mission, he receives his orders from the battalion commander, the combat support company commander, or the commander of the unit to which attached. He is responsible for designating firing positions and areas for squads of the platoon which are not attached. He may be directed to prepare the antiarmor portion of the battalion defense plan. He is responsible for the training, control, tactical employment, and supply of the platoon.

g. Rifle Squad Leader. The rifle squad leader is responsible for the employment of those antiarmor weapons normally carried by members of his squad. He provides security for those antiarmor weapons positioned in his area of operations.

h. Antiarmor Squad Leader. The antiarmor squad leader controls the actions of his squad to accomplish his assigned mission. He selects the exact position for the emplacement of the antiarmor weapons and is responsible for positioning crew personnel. He controls the fire of his squad, establishes local security, supervises organizational maintenance, and coordinates resupply and other administrative matters.

40. Planning Considerations

Commanders continuously plan for the employment of antiarmor weapons in all types of tactical operations. This planning follows normal troop leading procedures, such as reconnaissance and selection of positions, coordination and fire planning, and movement to and occupation of positions.

a. Nature of Armor Threat. The nature of the armor threat has a direct influence on the employment of antiarmor weapons. For instance, if the chances of encountering enemy armor are remote, antiarmor weapons are usually employed in their secondary role of providing fire support on point targets such as reinforced positions and crew-served weapons. If the chances of encountering armor are imminent, antiarmor weapons are employed in their primary role. In assessing the armor threat, due consideration must be given to enemy armor's ability to move rapidly over long distances and to negotiate many types of obstacles such as ravines, streams, and wooded areas. To insure proper implementation of antiarmor plans, commanders must insure that all antiarmor elements are rapidly notified of a pending armor contact. To accomplish this, a standard armor warning system should be developed. This system should incorporate existing intelligence and reconnaissance sources, communications nets, mechanical sensor devices, and voice communications. Initial information disseminated should include the number and type(s) of enemy vehicles, direction of movement, and estimated speed. Other information should be disseminated as obtained.

b. Tactical SOP's. Tactical SOP's expedite the employment of antiarmor weapons. They may be used to establish procedures for recurring requirements such as the role of antiarmor weapons in given situations, coordination procedures when antiarmor weapons are attached, work priorities in establishing positions, resupply of ammunition, and loading plans. At the squad level, SOP's can be used to establish procedures for the occupation of positions and the assignment of crew duties. SOP's should be written and they should be developed and refined through training and practice. (See appendix B for a sample antiarmor SOP.)

c. Armor Warning. To assure that all antiarmor elements are notified of impending armor attacks, antiarmor plans are prepared and coordinated with surveillance target acquisition and night observation (STANO) plans. Provisions are made for the use of STANO resources which includes visual observation, ground surveillance radars, unattended ground sensors, thermal imaging, infrared, image intensification, photography and special devices to be in support of and integrated with the units antiarmor plans. To rapidly disseminate pertinent early warning information to the antiarmor elements, commanders must devise, refine, and standardize an enemy armor warning system.

d. Nuclear Weapons. The employment of artillery and air delivered tactical nuclear weapons can produce widespread casualties, damage, and destruction. The threat of tactical nuclear weapons employment can force armored units to disperse thereby causing planning and coordination problems for both friendly and enemy forces. Indirect weapons effects resulting from blast, thermal, and nuclear radiation such as tree blowdown, craters, fires, and fallout may also produce obstacles to the movement of armored units. Further doctrinal guidance concerning the employment of tactical nuclear weapons may be found in FM 101–31–1 and FM 101–31–2.

Section II. OFFENSE

41. Reconnaissance

Prior to the attack, a map and ground reconnaissance is made by all commanders and leaders over as large an area as possible. If feasible, an aerial reconnaissance is made by key commanders and leaders. Reconnaissance aids in determining likely avenues of enemy armor attack along the route to the objective, on the objective, and likely positions for the employment of antiarmor weapons to support the attack. It also aids in selecting concealed and covered routes for the displacement forward of antiarmor weapons supporting the attack.

42. Terrain Evaluation

Beginning at the assembly area, the terrain to the objective and on the objective itself is evaluated to determine the best positions for the emplacement of antiarmor weapons in support of the scheme of maneuver. The objective is evaluated to determine firing positions which best support consolidation on the objective and defense against a counterattack. Terrain is also evaluated to determine covered and concealed routes to be used in occupying the positions selected. An important function of terrain evaluation is to determine the most likely positions and routes of enemy armor.

43. Selection of Positions

a. The platoon leader or supported unit commander designates general firing position areas, and the squad leader selects the exact location for the weapon. Where possible, positions are selected which allow mutual support between antiarmor weapons; that is, at least two antiarmor weapons are emplaced so that they can cover the same sector. If antiarmor weapons are to support the attack by fire only, positions along or forward of the LD are selected. If antiarmor weapons are to accompany the attacking elements, positions are selected from the assembly area to the objective, and on the objective, to repel armor from likely positions or approaches. Ideally, positions are selected which allow antiarmor weapons to perform both their primary and secondary mission. If this is not possible, positions covering the most dangerous avenue(s) of armor approach take priority. Alternate and supplementary positions are also selected. The characteristics of a good position are described in paragraphs 51 through 65.

44. Occupation of Positions

The antiarmor platoon leader or the supported unit commander designates when and how the squads move into position. Examples of how they move are: the squad members infiltrate in groups of one or two, or the entire squad moves simultaneously. Once positions are occupied, security is posted and weapons are prepared for action covering predesignated sectors.

45. Preparation of Positions

In the attack, time available for the preparation and camouflage of positions may be minimal. In some instances it may only permit the clearance of fields of fire and backblast areas. At other times, it may permit the digging in of weapons and the construction of overhead cover. Squad leaders use available time to improve positions once they are occupied. Both natural and artificial camouflage materials are used to break up the outline of weapons to prevent detection by enemy observers.

46. Fire Planning

Fire planning for antiarmor weapons in the attack provides for continuous antiarmor protection during occupation of the assembly area, along the route to the objective, fires on the objective, and fires to repel a counterattack after consolidation. Fires are planned to the front, both flanks, as well as to the rear during movement to the objective. Self-destructing, scatterable minefields should be preplanned to interdict and contain retreating enemy forces or reinforcements. Fires are planned to provide overlapping fires between antiarmor weapons to eliminate gaps in the event a weapons crew becomes a casualty. Fires are planned to provide continuous protection along both flanks during movement to the objective because of the vulnerability of these areas to armor thrusts.

47. Attached Armor

When tanks are attached to attacking units they become the primary antiarmor weapons of the attacking unit. Organic antiarmor weapons may then be employed so as to best augment the firepower of the tanks, and in their secondary role of providing fire support on point targets. In these roles, organic antiarmor weapons could be employed along the flanks of attacking units or accompany assault elements and provide fire support on such point targets as crew-served weapons positions and bunkers.

48. Actions During the Attack

After occupying positions, antiarmor weapons engage targets within their designated sector of fire. Enemy armor is their first priority target, but when no enemy armor exists they may engage known or suspected point targets along the route to or on the objective. After clearing their assigned sectors, antiarmor weapons may engage targets in other sectors. Fires are controlled by the squad leader who determines which targets will be engaged. When their fires are masked, or on a designated signal, antiarmor weapons are displaced to other positions along the route to the objective or on to the objective itself. When possible, antiarmor weapons are displaced by echelon to insure that continuous antiarmor fire support is maintained. Signals used to begin displacement may be visual, pyrotechnic, or radio. Upon reaching the objective, antiarmor weapons are immediately prepared to repel a counterattack.

49. Attack Helicopters in Offensive Operations

a. The employment of attack helicopters in antiarmor operations should be in conjunction with all supporting fires; i.e., tanks, mortars, artillery, tactical air, and naval gunfire. Using all available fire support in conjunction with attack helicopters minimizes the helicopters' vulnerability by forcing enemy armor to "button up." This decreases the effectiveness of the tank and increases its vulnerability to the direct fire capability of the attack helicopter equipped with HAW. It is also desirable to engage enemy armor before they de-

ploy, taking advantage of the element of surprise. A method of attacking enemy armor with attack helicopters is to mount a multidirectional attack to further lessen the vulnerability of the helicopters to enemy fire. Helicopters should fly nap-of-the-earth, attack the target from different directions, and return to friendly lines by different flight routes in order to reduce exposure time and to confuse the enemy.

b. When attacking enemy armor forward of the FEBA, supporting fires should be employed to suppress the enemy antiaircraft capability in order to minimize their threat to attack helicopters. Attack helicopters operating in marginal weather have some degree of protection because enemy tactical air has a difficult time locating the helicopter force under such conditions. Also, weather conditions may be such that enemy tactical air is unable to fly even though helicopters are still able to operate.

c. Attack helicopters armed with TOW and area fire antitank rockets will be used in the attack role. Typical missions are:

(1) Destroy known enemy armor ahead of advancing friendly forces.

(2) Cover likely enemy armor approaches in order to provide flank security for attacking forces.

(3) Augment antiarmor protection during the attack and during consolidation.

50. Reorganization

During consolidation on the objective, antiarmor weapons are emplaced in predesignated positions, or in better positions if they exist. All-round defense is particularly important at this time, since the enemy sometimes has the capability to counterattack from any direction. Redistribution and resupply are accomplished and positions are improved rapidly.

Section III. DEFENSE

51. General

Defense against enemy armor is part of a unit's overall defense plan. Antiarmor defenses are disposed both laterally and in depth, and are designed to destroy enemy armor forward of the battle area. Antiarmor weapons are integrated into the defense of the units along the FEBA and into the FDA reserve force. If the enemy armor succeeds in penetrating the FEBA, antiarmor weapons are in position to assist in repelling the attack. Should this fail, the forward defense forces attempt to slow or stop the enemy to permit the reserve to execute a counterattack. In addition to the utilization of organic, attached, and supporting weapons, maximum advantage is taken of obstacles and barriers in planning antiarmor defenses. Figure 28 shows antiarmor weapons incorporated into a company defense plan.

52. Reconnaissance

The extent of the reconnaissance made commanders and leaders depends on the time available. At times, it may be limited to a map reconnaissance; however, if time permits, it includes both aerial and ground reconnaissance well forward of the defense position. Of utmost concern during reconnaissance is the identification of likely armor approaches into the unit's position, not only from the front, but also from the flanks and rear. Based on the reconnaissance, positions for the location and construction of barriers and obstacles are selected in order that these may be incorporated into the overall defense plan.

53. Terrain Evaluation

In the defense, terrain is evaluated both from the friendly and from the enemy's point of view. Care must be taken not to overlook or rule out armor's ability to negotiate many types of obstacles and its ability to take maximum advantage of concealed approaches into the defense area. Through terrain evaluation, commanders and leaders determine how best to position antiarmor weapons to make maximum use of whatever advantages are offered by the terrain.

54. Selection of Positions

a. The platoon leader or supported unit commander designates general firing position areas, and the squad leader selects the exact location for the antiarmor weapon. The characteristics of a firing position are:

(1) Gunner observation of assigned sector.

(2) Adequate observation and fields of fire.

(3) Cover for the weapons system.

(4) Mask clearance.

(5) Security (by being near friendly troops).

(6) Good concealed routes into and out of the position.

(7) Concealment from ground and aerial observation.

(8) Capability to employ flanking or oblique fire.

(9) Backblast area.

b. Ideally, positions are selected from which squads can perform both their primary and sec-

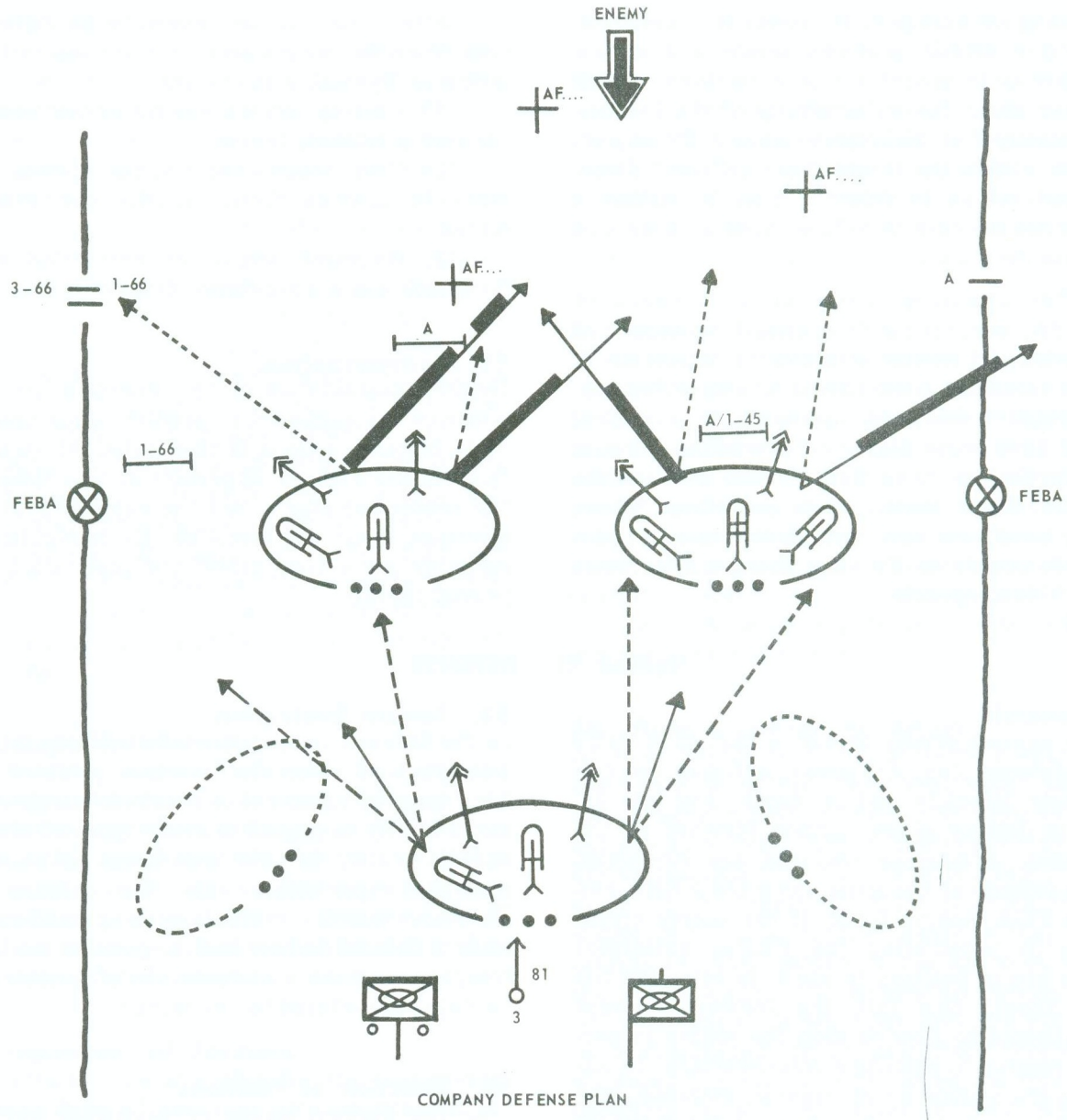


Figure 28. Company defense plan with attached HAW.

ondary missions. If this is not possible, positions which permit the weapon to perform its primary position take priority. Alternate and supplementary positions are also selected and prepared. Both primary and alternate positions should provide for mutual support between antiarmor weapons. In selecting positions, avoid isolated terrain features which may be used by the enemy to register indirect fires. Examples of antiarmor positions are shown in figure 29.

55. Alternate and Supplementary Positions

In additon to selecting primary positions, alternate and supplementary positions should be selected so as to provide all-round antiarmor defense and defense in depth. In addition, the signature effects such as dust from backblast, flash, and noise of many antiarmor weapons dictate that they be displaced frequently. Alternate positions allow for the coverage of the same sector of fire, while supplementary positions allow for the coverage of different sectors of fire, such as to the flank or rear. The same care and attention should be given to the selection of alternate and supplementary positions as is given to the selection of primary positions to prevent the creation of gaps in the antiarmor defense plan. Good concealed and covered routes between positions are essential to insure rapid displacement and to prevent detection of movement. An example of primary, alternate, and supplementary positions is shown in figure 30.

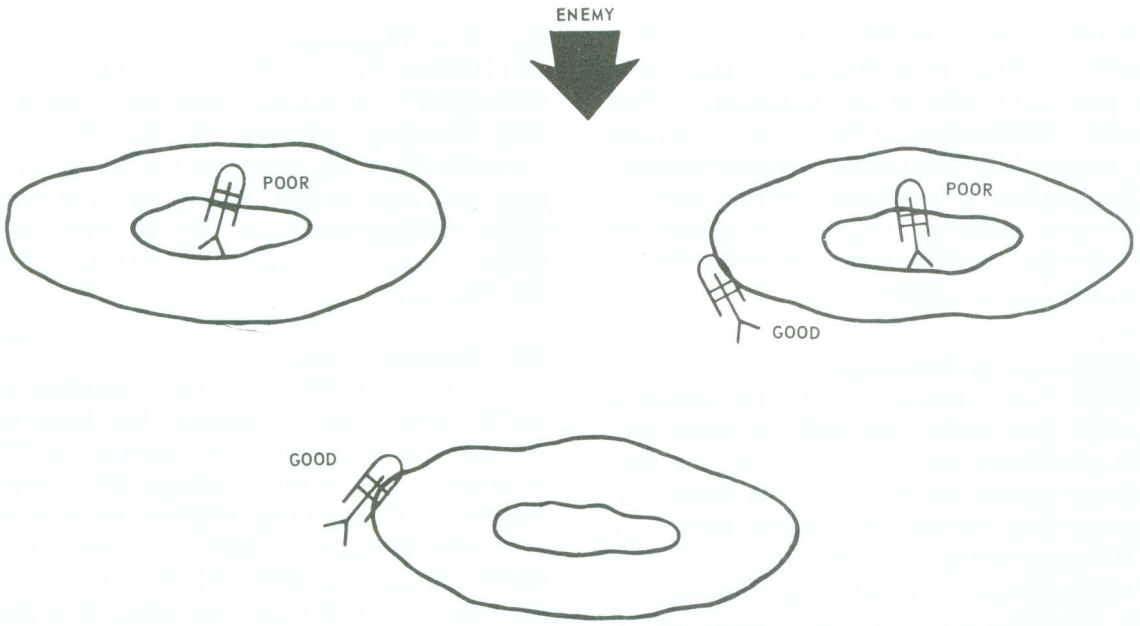


Figure 29. Antiarmor positions.

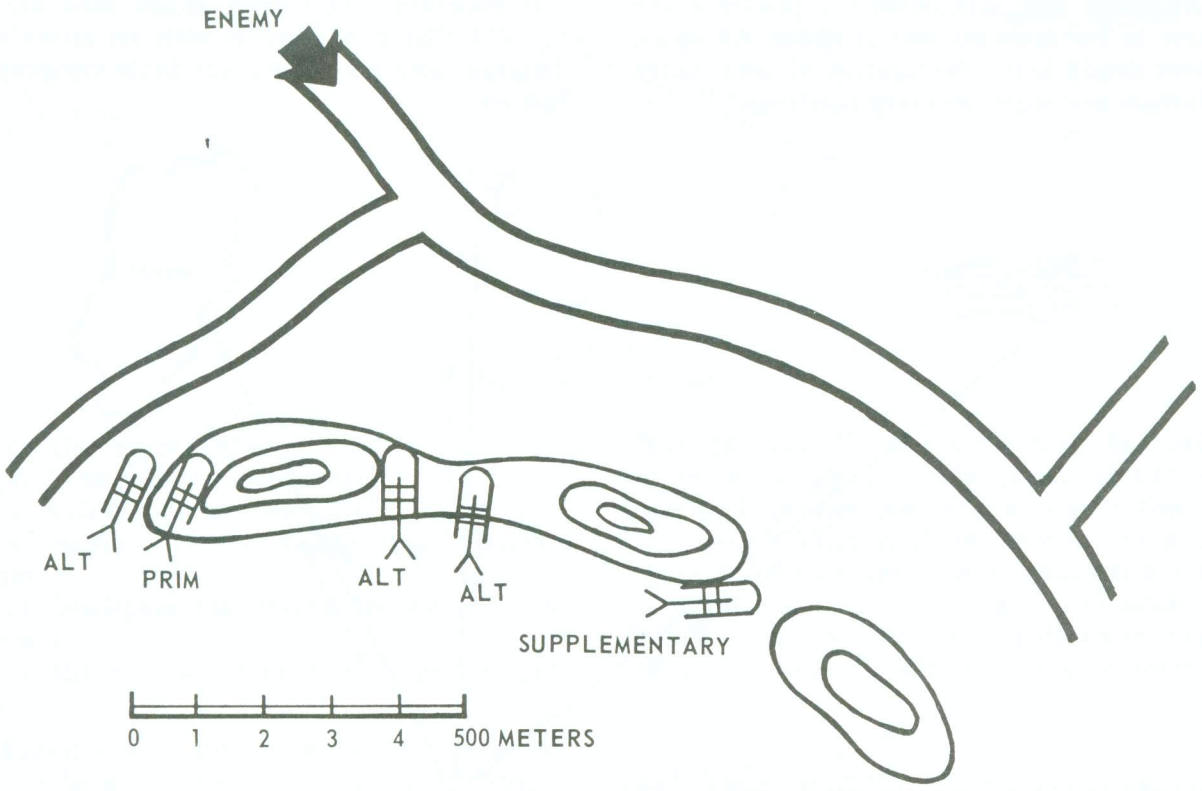


Figure 30. Primary alternate, and supplementary positions.

56. Occupation of Positions

a. The movement to, and occupation of, positions is preferably done during periods of reduced visibility. Noise and light discipline must be strictly enforced. Where needed, guides familiar with the area are used to insure the use of routes that avoid enemy observation. Unless antiarmor squad leaders are sure of the exact firing positions for weapons systems, squads are halted in defilade until the exact location is selected. When conducting a relief in place, an exchange of range cards and intelligence information is made.

b. When positions are occupied, the weapon is initially sited on its principal direction of fire. Local security is next placed out and work is commenced in the priorities established by the

defense order, or as outlined in tactical SOP's. Range cards are prepared as soon as possible, and positions are improved as time permits. The squad leader coordinates with adjacent squad leaders to insure that fires between weapons overlap and that the fires of each weapon complement other antiarmor defenses. Gaps that cannot be corrected through coordination are reported to the next higher headquarters.

57. Construction of Positions

a. Initially, hasty positions for the weapons and the crew are constructed and, as time permits, they are improved. Depending on the terrain, weapons are either dug in or bunkered in. For tube launched weapons, a muzzle trench for the tube is dug or constructed. Positions are camouflaged using natural vegetation and/or camouflage nets. Positions are continually improved, to include the construction of overhead cover, for the duration of occupancy.

b. Alternate and supplementary positions are prepared in the same manner as above. All squad members should know the location of, and routes to, alternate and supplementary positions.

58. Fire Planning

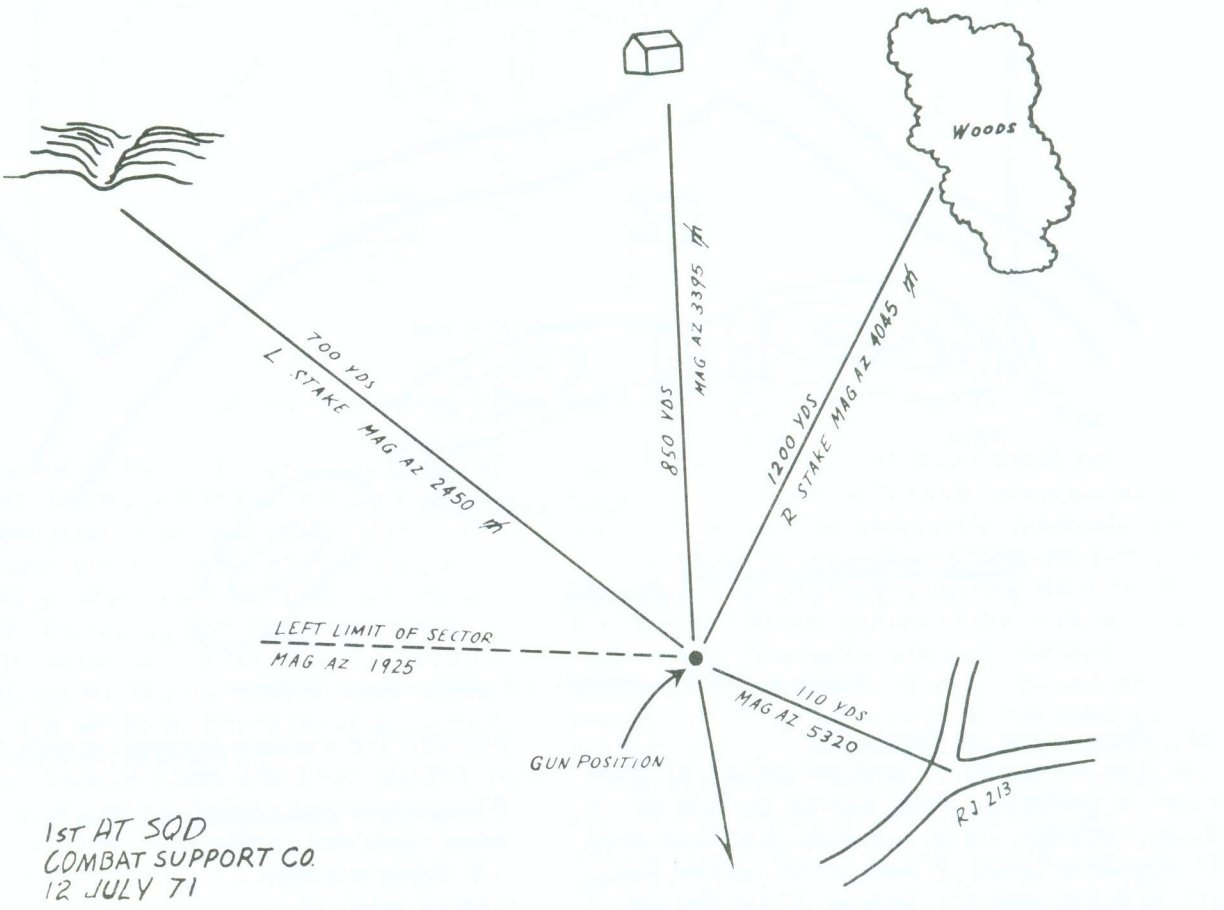
In planning the fires for the defense of an area, antiarmor weapons are assigned a sector of fire and principal direction of fire. Fire planning provides for close coordination of all antiarmor fires and insures that these fires are responsive when needed. Obstacles and barriers, if authorized, are also incorporated into the antiarmor defense plan.

59. Range Cards

a. The antiarmor gunner constructs range cards as soon as the weapon has been prepared for firing. Range cards are essential for the rapid engagement of targets during all conditions of visibility and for rapid resumption of mission in the event the gunner becomes a casualty. Range cards are usually prepared in two copies; one is kept at the position and the other is given to the platoon leader for plotting on the unit's fire plan. Range cards are also prepared for alternate and supplementary positions.

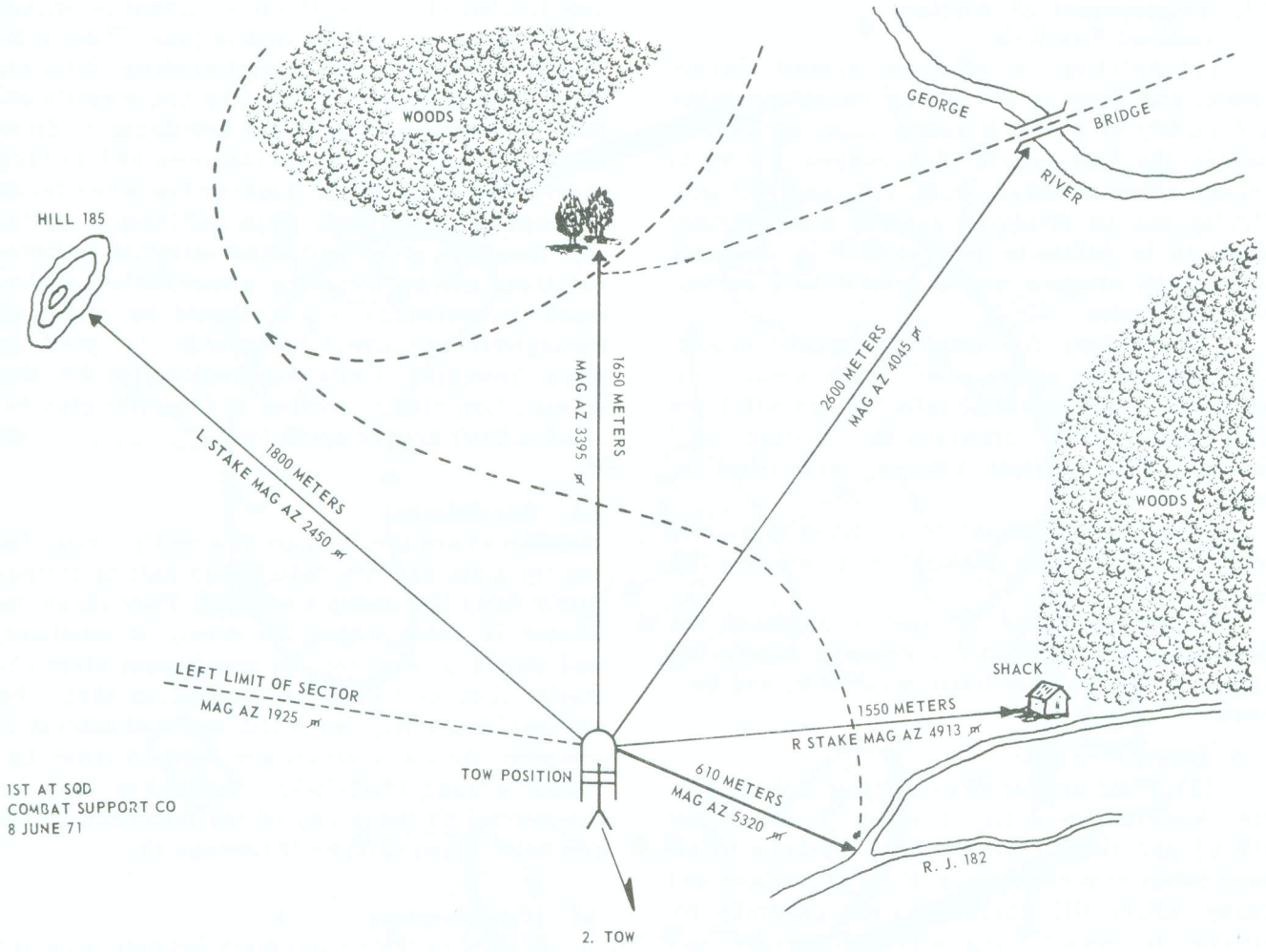
b. Essential items on a range card are:

(1) The gun position with an azimuth and distance from a readily identifiable topographical feature.



① 106-mm recoilless rifle.

Figure 31. Range card.



② TOW

Figure 31—Continued.

(2) Unit's designation.

(3) Time and date of preparation.

(4) Principal direction of fire.

(5) Sector of fire with azimuths to known features.

(6) Deadspace (or ground the weapon cannot cover).

(7) Minimum and maximum ranges, if applicable.

c. Examples of range cards for the 106-mm recoilless rifle and TOW are shown in ① and ② figure 31.

60. Attached Tanks

When tanks are attached, they may be employed on the FEBA, throughout the defense area to provide defense in depth, with the reserve, or in combinations thereof. Tanks are an effective antiarmor weapon. When employed on the FEBA, they should be positioned to cover the most dangerous avenue(s) of armor approach into the defense position. Tanks are placed in hull defilade, turret defilade, or concealed positions, and moved into hull defilade positions whenever their fires are needed. Usually, all or some of the attached tanks will be employed as a counterattack force. If tanks are employed in a counterattack role, the bulk of the battalion's antiarmor weapons should be employed with the forward companies.

61. Attack Helicopters in Defensive Operations

Attack helicopters will be given the mission of augmenting the ground commander's antiarmor assets by covering likely avenues of approach. This would provide the commander with some assurance that he has mutually supporting antiarmor defenses. The attack helicopter also gives the commander the ability to augment his antiarmor defense in the security echelon (GOP, COP), provide defense in depth, or act as part of the reserve.

62. Employment of Artillery

a. Indirect Fire Role.

(1) Artillery is effective against enemy armor, and because of its long range capability and variety of available ammunition, artillery is usually the first indirect fire weapon system to engage armor elements. ICM, HE, and WP projectiles can be employed against enemy armor elements in defensive positions or in assembly areas, with effective results against both personnel and vehicles.

(2) Artillery fire employed against attacking enemy armor elements will cause casualties to accompanying dismounted infantry and will force the enemy armor crewmen to "button up," thereby reducing their visibility and effectiveness.

(3) Artillery fire can be employed effectively with both helicopter and infantry armor-killer teams.

(4) Artillery can be used to augment the fires of antiarmor direct fire weapons in covering obstacles such as tank traps, minefields, and barriers.

b. Direct Fire Role.

(1) Field artillery has a direct fire capability; however, only the 105-mm Howitzer has HEAT and HEP–T ammunition available to assure defeat of enemy armor. Fires of medium and heavy caliber HE ammunition are generally restricted to immobilizing armored vehicles and damaging vehicle mounted communication and fire control equipment. The immobilized vehicle can then be destroyed with subsequent destruction fire.

(2) When field artillery is used in an antiarmor direct fire role, a degradation of its indirect fire capability to support the force as a whole will result. Furthermore, differences between armor and artillery weapons in weapon muzzle velocity, armor protection and speed of employment place the latter at a disadvantage unless surprise can be obtained.

63. Obstacles

Man-made obstacles are constructed in accordance with higher headquarters' overall barrier plan. Man-made obstacles are sited to take maximum advantage of, or to complement, any natural obstacles located in the area. Preplanned and coordinated on-call scatterable minefields should be integrated into the defensive plan. These self-destructing mines can augment existing obstacles, close gaps, and lanes created by the enemy's attack. Antiarmor weapons are positioned to drive attacking tanks into these obstacles and to take maximum advantage of flanking fire when tanks attempt to bypass them. Gaps and lanes in obstacles should be given particular attention to prevent their use by attacking armor. When authorized, antipersonnel mines should be dispersed throughout antiarmor minefields to preclude rapid breeching. Units are responsible for the construction of that portion of a barrier plan located in their area of operation.

64. Roadblocks

Roadblocks are used as part of a unit's overall defensive plan, and are designed to halt or temporarily delay the enemy's advance. They should be located in areas where the enemy is canalized, and should be employed to complement other obstacles such as minefields. Roadblocks should be covered by artillery fire, antiarmor and automatic weapons. Antitank mines are used to cover bypasses around roadblocks. Roadblocks may be constructed by using any of the manmade obstacles listed in paragraphs 15 through 17.

65. Coordination

In addition to the coordination between adjacent weapons, other measures coordinated are communications, security, mission (particularly of attached weapons), emergency signals, illumination, and rules of engagement. Antiarmor squad leaders should attempt to learn as much as possible about the mission, sector, and capabilities of adjacent weapons in order to plan their own actions when engaged. If adjacent weapons are scheduled to displace, are destroyed, or receive another mission, adjustments must be made to cover any gaps created. Coordination between adjacent weapons insures that alternate positions too close to each other will not be selected. The coordination and integration of STANO plans with those for supporting fires are necessary for both timely and effective fire support. The need for battlefield illumination, pyrotechnic or searchlight, infrared or visible light, is anticipated and coordinated in advance.

Section IV. PERIMETER DEFENSE

66. General

Perimeter defense is a method of defending against an attack from any direction. Units may establish a perimeter defense when operating on a separate mission or when unable to tie in flanks with friendly forces.

67. Organization of the Defense

a. Areas. The perimeter defense consists of a security area, forward defense area (perimeter)

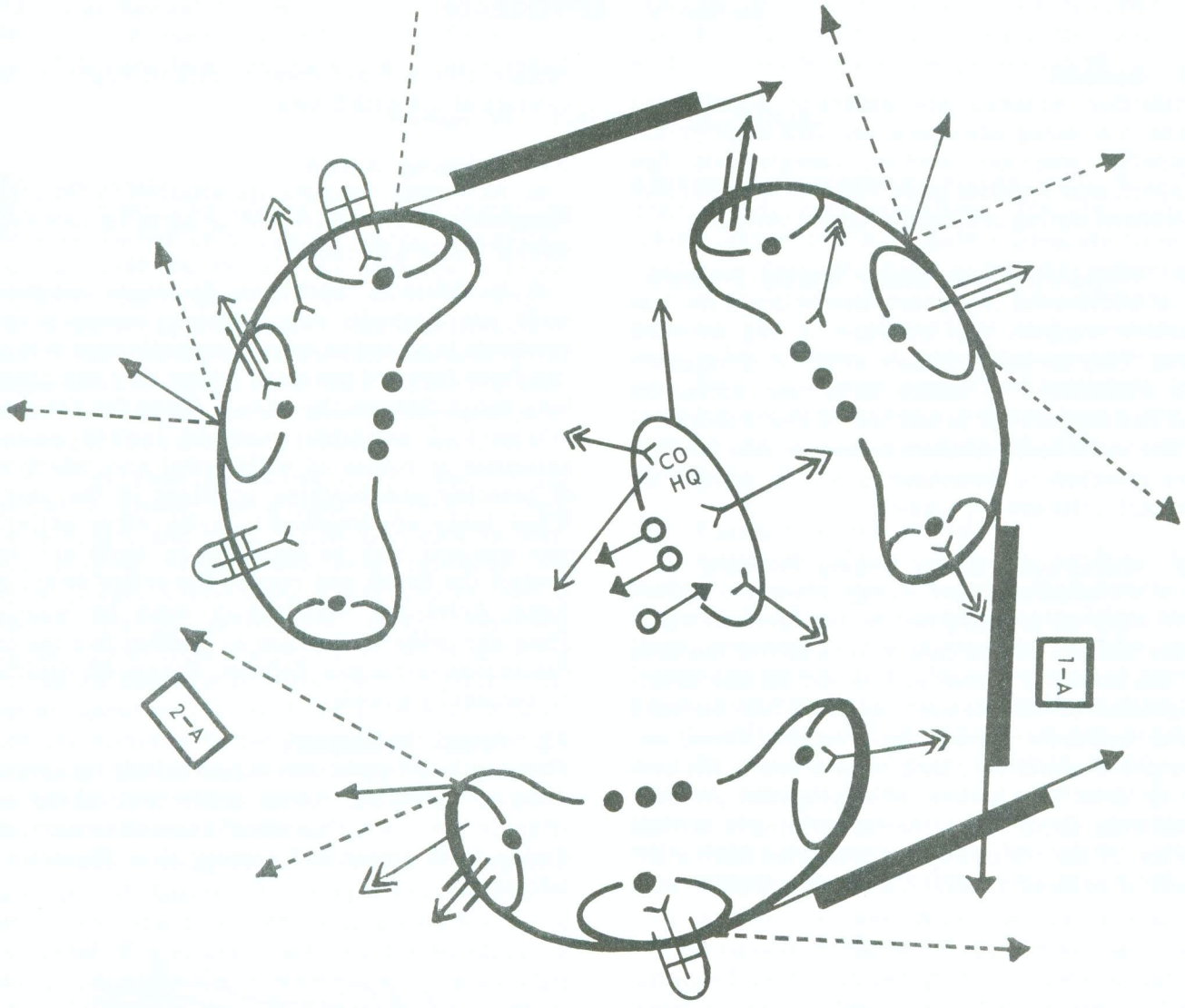


Figure 32. Rifle company in perimeter defense.

and a reserve area. Organic and attached antiarmor weapons and tanks may be employed in all areas as described in *b* and *c* below. Figure 32 depicts antiarmor weapons employed in the perimeter defense.

b. Antiarmor Weapons. In the perimeter defense, antiarmor weapons may be employed in the security area and the FEBA to provide close-in protection against tanks, to provide fire support against point targets, and to augment the fires of other organic weapons. They are assigned primary, alternate, and supplementary positions in order to provide all-round antiarmor protection. Where possible, positions are selected which permit flanking or oblique fire on armor approaches into the perimeter. Positions are selected and prepared as described in paragraphs 54 and 55.

c. Attached Armor. In the perimeter defense, attached armor may be employed in the security area, reserve force, or placed in firing positions on the FEBA. If employed with the security area, they provide long range antiarmor fires in an attempt to break up or delay armor formations. If held in reserve, positions on the FEBA and routes to these positions, are selected and prepared in advance. Supplementary positions to cover all avenues of approach are selected and the armor should be prepared for rapid employment in counterattack plans.

Section V. RETROGRADE

68. General
Antiarmor weapons are generally attached to units in a retrograde operation. This employment simplifies command control, decentralizes fire support, and provides more responsive antiarmor protection during critical movement periods.

69. Withdrawal not Under Enemy Pressure
In a withdrawal not under enemy pressure, antiarmor weapons are attached to the forward units. They normally remain attached throughout the withdrawal to insure antiarmor protection and fire support for protection of the withdrawal of the main body. Antiarmor squads may be further attached to detachments left in contact as forward units are withdrawn.

70. Withdrawal Under Enemy Pressure
In a withdrawal under enemy pressure, antiarmor weapons are attached to the forward units. Their mission in this case is to reinforce the fires of the covering forces and to aid in the disengagement of the forward units. When forward units withdraw through the covering force, antiarmor weapons may then be attached to the covering force. This manner of employment provides maximum antiarmor protection during a critical period. If the withdrawal is conducted during periods of reduced visibility, antiarmor squads may remain attached to forward units throughout the conduct of the withdrawal.

71. Delaying Action
a. Antiarmor weapons are attached to forward elements and are positioned so as to be oriented astride armor approaches.

b. In delaying operations, frontages assigned units are normally much wider; consequently, emphasis is placed on employing antiarmor weapons from forward positions where they can place long range fires on the enemy. Plans for the employment of antiarmor weapons include reconnaissance of routes of withdrawal and selection of covering and blocking positions in the rear. When tanks are attached to units, other antiarmor weapons may be employed in depth and to protect the flanks and rear of the entire delaying force. Antiarmor squads may move by bounds from one delaying position to another to provide continuous antiarmor defense. Figure 33 depicts movement by bounds.

72. Attack Helicopters
The attack helicopter can support delaying operations by attacking enemy armor well ahead of friendly positions. This would cause the enemy to deploy their armor and thereby slow the enemy advance.

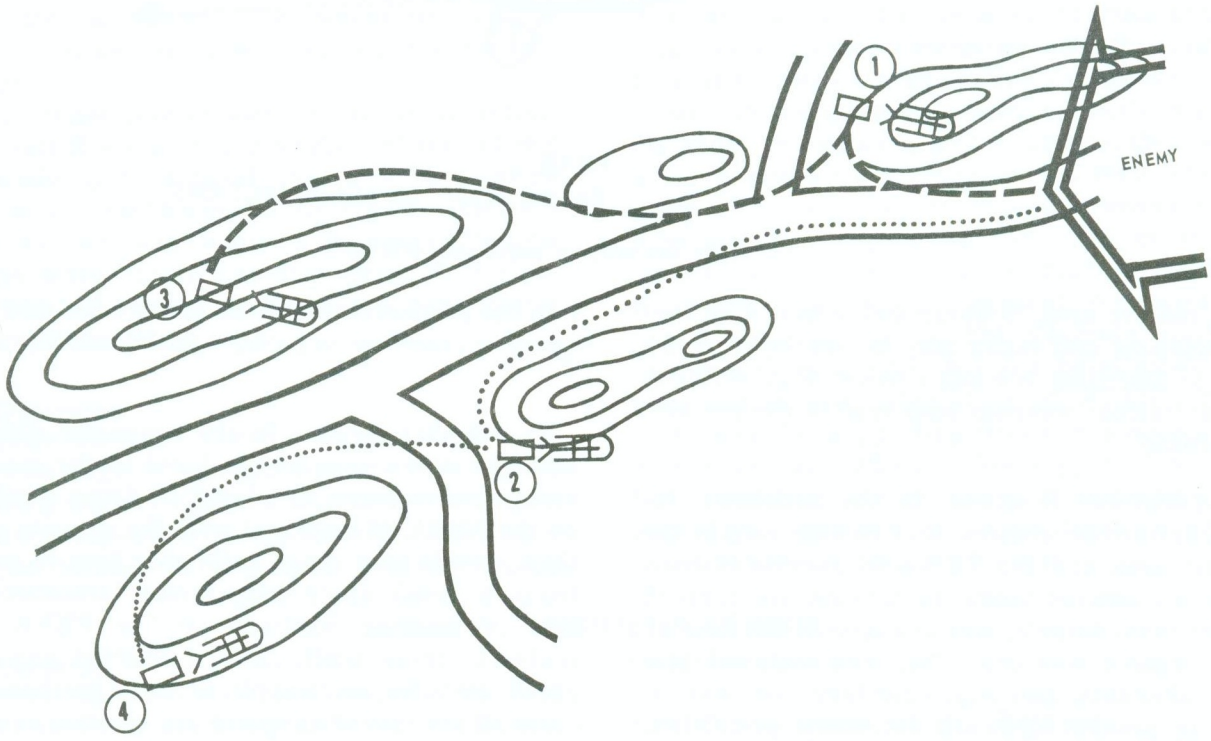


Figure 33. Movement by bounds.

73. Stay-Behind Forces

In retrograde operations, stay-behind forces may be established as a directed action or as a result of all or part of a unit being cut off by enemy action. For the employment of antiarmor weapons with stay-behind forces, see paragraph 93.

Section VI. NIGHT OPERATIONS

74. General

Night combat is an integral part of all operations because combat units operate under all environmental conditions in daylight or darkness to accomplish their missions. At night, combat is characterized by a decrease in the effectiveness of aimed fire and the corresponding increase in the importance of close combat and supporting fires. Also, the difficulty of movement, maintenance of direction, and control is increased in darkness.

a. To enhance the chances of a successful night operation, greater use is made of ground surveillance radars and night vision aids such as thermal imaging, infrared, and image intensified devices. Ground surveillance radars may be used to vector friendly movements along prescribed routes to and from the objective. While assisting in the maintenance of direction and control, the radar operators also perform a security mission for the vectored forces by maintaining surveillance in the areas surrounding the route of march and reporting timely information regarding nearby enemy activities.

b. When thoroughly planned and coordinated, the use of battlefield illumination techniques will enable the effectiveness of aimed fire to be improved. For example, active infrared illumination provided by Xenon searchlights increases the capabilities of night vision devices, and concurrently, the effectiveness of those weapons equipped with night sighting devices. Visible light provided by flares, pyrotechnics, and unfiltered searchlights improves unaided vision and the effectiveness of optically sighted weapons. It should be realized, however, that the use of visible light should be closely regulated to prevent it from blanking out the operation of image intensifier devices.

c. If natural illumination levels will suffice, night operations should be conducted without the aid of illumination. Night vision devices which do not need artificial illumination (passive devices) permit improved night vision without disclosing their use to an enemy equipped with infrared devices. At the same time, these night vision devices may be used to detect and monitor the use of enemy infrared and pink light systems, (FM 31–100 (test)).

75. Planning

Troop leading procedures and techniques for planning night operations are similar to those for planning daylight operations. Planning should allow commanders and leaders adequate time to conduct a daylight, dusk, and night reconnaissance of the operational area. The use of night vision equipment is planned by each commander and leader to assist in accomplishing their mission. Plans for the employment of battlefield illumination are extensive and they are drawn up for possible use in both offensive and defensive type operations.

76. Conduct of the Attack

a. Antiarmor Weapons. In the conduct of a night attack, antiarmor weapons may remain in the vicinity of the LD in preselected firing positions, prepared to fire or displace on order. Antiarmor squads may be attached to units in whose areas enemy tank threats are likely to develop. Light, medium, and heavy antiarmor weapons are used by attacking infantry elements to provide support against enemy armor encountered at close range. Those antiarmor weapons equipped with night sighting devices and sufficiently protable normally accompany the attacking infantry.

b. Attached Armor. When secrecy is desired, armor usually remains in supporting positions, prepared to fire at designated targets or target areas on call. After intermediate enemy antiarmor resistance has been eliminated, attached tanks may be used to exploit through attacking infantry.

77. Conduct of the Defense

a. On the defense it is possible to maintain a more thorough suveillance over the battlefield than is possible in the offense. Generally, the defender has the opportunity to organize the area and emplace his weapons systems and STANO equipment on the most favorable terrain. In organizing the area, consideration is given to selecting locations for the thermal imaging, infrared, and image intensifier devices, ground surveillance radars, and searchlights that will afford maximum assistance to the weapons systems that guard the probable avenues of approach into the defended area. Consideration is given to using unattended ground sensors to monitor defiles and likely approaches in front of the forward defensive positions, (FM 31–100 (test)).

b. Antiarmor weapons may be attached to ele-

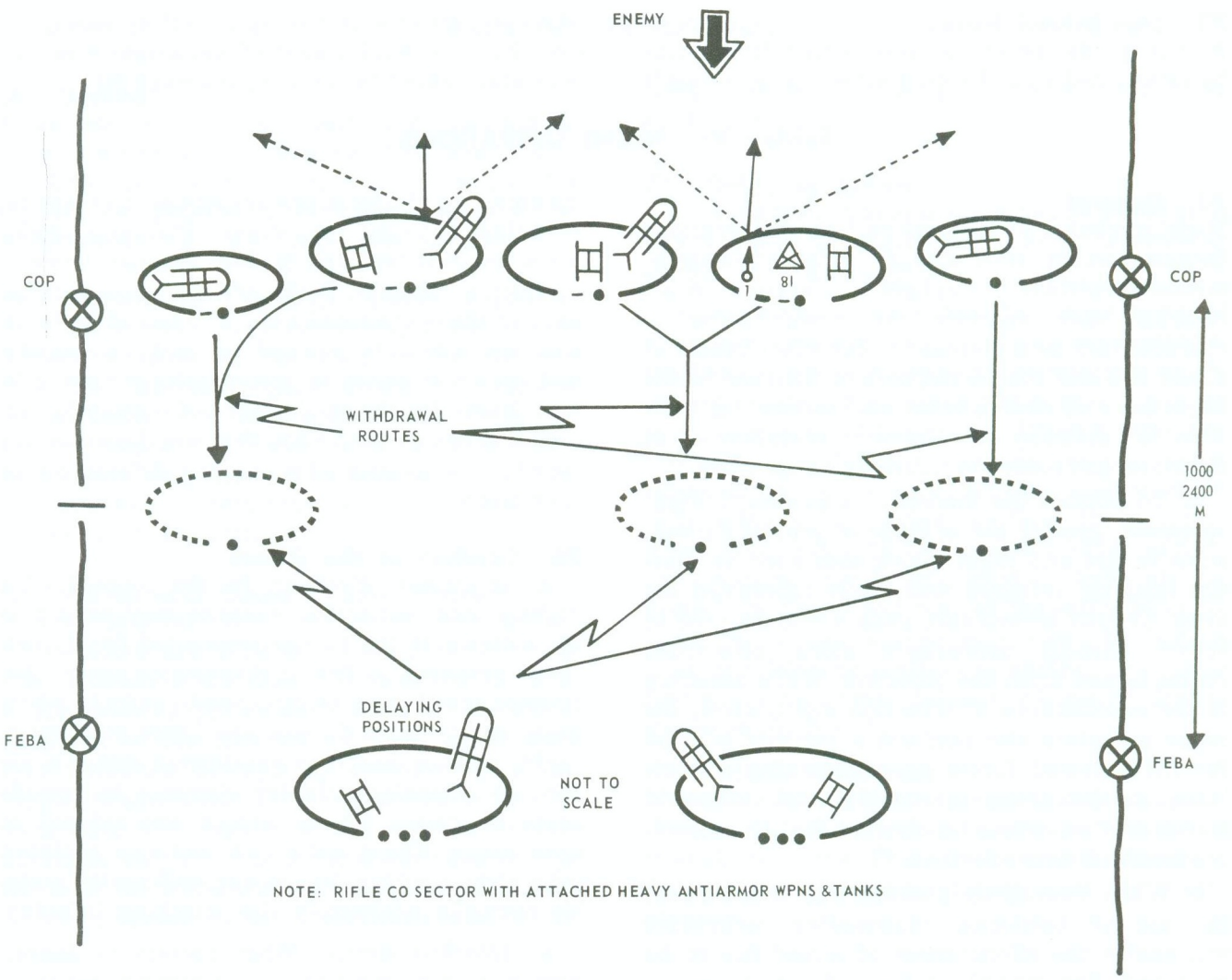


Figure 34. Combat outpost.

ments of the COP, emplaced on the FEBA, emplaced in depth in the defense area, or a combination of all. When attached to elements of the COP, antoarmor weapons will withdraw with the COP to prepared positions in the battle area. The effectiveness of antiarmor weapons may be increased through use of night sighting devices or through the use of artificial illumination.

c. Attached armor may be employed with the COP, along the FEBA, in depth throughout the defense area, or with the counterattack force. (See FM 17–1 for armor night combat techniques.) Tank Xenon searchlights can be used to illuminate targets out to 1000 meters in the infrared mode, and out to 1500 meters under ideal conditions. With the white light, the planning range is 1500 meters; and under these same ideal conditions, the searchlight will illuminate targets out to 5000 meters. Reconnaissance of routes of withdrawal from the COP and routes to be used by the counterattack force should be conducted during daylight hours. See figure 34 for the employment of antiarmor weapons with the COP. Night vision periscopes and other night vision aids which are integral to the armored vehicle and its fire control system are used during the exploitation on the objective and during the consolidation and reorganization phase after the objective is taken. The inherent capabilities of these devices enable the crews of armored vehicles to establish surveillance of likely enemy avenues of approach with minimum delay while the objective is being organized, (FM 31–100 (test)).

Section VII. TARGET ENGAGEMENT

78. General

The timing of target engagement by antiarmor weapons is critical to the effectiveness of fires placed against the targets and to the success or failure of operations themselves.

79. Fire Discipline

Fire discipline is directly related to the state of training and mental conditioning of antiarmor weapons crews. Many good antiarmor positions have been jeopardized by premature target engagement in which either the range was excessive or the target was not in position to insure a high probability of a first round kill. Fire discipline insures that antiarmor weapons engage targets at optimum times and that only the best sited weapon in relation to the target opens fire. Random firing at antiarmor targets, especially tanks, decreases the effectiveness of the unit's overall antiarmor defense. If minefields are being used, antiarmor fires should normally be withheld until the tanks are in the close vicinity of the mined areas. However, if the mission, terrain, and enemy situation dictate, antiarmor weapons will be most effective if fired as soon as the tanks come into range, causing the enemy to deploy and rapidly enter the minefield at multiple points. Each case has inherent advantages and disadvantages, the commander's decision to engage should be governed by the situation.

80. Effects of Range

a. HEAT ammunition, the type fired by most antiarmor weapons, retains its penetrating capability regardless of range; however, the angle at which this round impacts on the target, for many antiarmor weapons, is influenced by the range to the target. Angle of impact on heavily armored targets has a significant bearing on the effects obtained. Range to targets must be accurately determined and gunners must hold their fire until targets are within effective range of weapons. Range can be determined by estimate, tank range finder, mil relationship using binoculars, maps and aerial photographs, radar, or by information received from friendly troops. The effect of HEAT ammunition is also influenced by stand-off distance. Sandbags or a stand-off shield may neutralize or minimize the effect of the HEAT round.

b. In addition to establishing the range to the target, the speed of moving targets must also be determined. These two factors, range and speed, enable the gunner to place the correct sight picture on the sight reticle. Once this is done, gunners should track moving targets until their most vulnerable spot is exposed, and until at that range which insures a high probability of a first round hit fire.

81. Target Effects

a. The equivalent thickness of armor is determined by the range, actual thickness, slope of armor, and the angle at which the projectile strikes. For this reason, a strike perpendicular to the side of a tank is most desirable. As indicated in figure 44, tank vulnerability, a flank or rear strike is the most effective and desirable because of the relative thinness of the armor as compared to the front. If you must hit a tank from the front, a weapon is most effective when fired from a position that is higher than the tank, in order to improve the angle of hit on the front slope of most tanks.

b. Since the effectiveness of a hit on a tank is dependent upon the equivalent thickness of the armor, range, and the caliber of the round, certain generalizations can be made.

(1) If a HEAT round strikes above the center of mass on the side of a tank, it normally will penetrate the fighting compartment, creating casualties and possibly igniting the major caliber ammunition stored therein. It may also render the tank's turret inoperable by jamming it in position.

(2) If a flanking shot strikes below the center of mass, it will probably damage the suspension system, but the tank's turret will still be operational.

(3) A strike below the center of mass on the front of the tank normally will make the driver a casualty and damage the driving controls; it may also ignite major caliber ammunition in the stowage rack.

(4) A hit above the center of mass in front may or may not penetrate the crew compartment.

c. Disabled tanks may still be effective as stationary pilboxes; therefore, gunners should continue to fire until the vehicle is destroyed. A tank is considered destroyed when it has lost both its mobility and firing capability.

82. Separating Tanks From Accompanying Infantry

Attacking enemy tanks are usually accompanied by supporting infantry, either riding on the tanks, in armored personnel carriers, or dismounted. Action is taken to drive off or destroy this infantry through the use of all available fire support as soon as it comes within range. Indirect

fire weapons employ both point detonating and time fuzes in an effort to destroy both vehicles and to create casualties among exposed personnel. If enemy infantry approaches within small arms range, exposed personnel are taken under fire by automatic small arms and individual weapons. Throughout approach, priority should be given to destruction of enemy armored personnel carriers as long as enemy infantry are mounted. The intention is not to ignore tanks. On the contrary, antiarmor weapons should engage tanks when the opportunity exists. However, unless a tank presents a more immediate threat, the antiarmor weapon should be used to destroy mounted infantry squads.

83. Multiple Targets

Normally, tanks operate using the principles of mass and maneuver; therefore, troops must be conditioned to expect tanks to appear in numbers. Fire discipline must be observed until optimum hits can be scored on those vehicles most dangerous to antiarmor weapons positions. Since tank forces also employ fire and manuever, it may be necessary to allow advancing tanks to bypass some antiarmor positions before taking them under fire. Bypassed weapons then engage either the advancing tanks or those following. This method should only be employed when follow-on tanks pose a greater threat to antiarmor weapons than the lead tanks of an attacking formation.

CHAPTER 4

INDIVIDUAL AND SMALL UNIT ANTIARMOR OPERATIONS

Section I. INDIVIDUAL OPERATIONS

84. General

Future operations against hostile forces may be characterized by the enemy's ability to mass large tank forces throughout the battle area. His tactics of employing tanks in echelon in the attack and exploitation of breakthroughs dictate that antiarmor defenses be disposed in depth. The individual must be prepared to use whatever means are available to destroy hostile mechanized forces. Ingenuity, courage, and intensive training of the individual soldier can make him equal to this task. This section discusses the antiarmor means employed by the individual soldier and the techniques he uses to engage tanks singlehandedly.

85. Psychological Aspects of Individual Operations

a. Killing tanks in future operations involves both effective weapons systems and highly-trained, disciplined, and self-confident soldiers. In particular, it will require soldiers who are psychologically conditioned to accept the fact that no matter how terrifying armor attacks may be, the best protection against them is to stay and fight. Such an attitude can only be instilled through a sound training program which builds skill and confidence.

b. Every soldier must be made aware that, although a formidable weapon, tanks have many weaknesses which can be exploited by the individual soldier. Some of these weakness are:

(1) Tanks are a big target which can easily be heard, seen, and fired upon.

(2) The armor body of a tank is not equally strong in all places. Tanks can be disabled and casualties among crew members can be caused by attacking these weak points with many types of conventional and field expedient weapons.

(3) Tank crews are isolated from much of the battle area when buttoned up. This isolation creates psychological problems among crew members which can be exploited by the individual soldier.

(4) The limited visibility of buttoned up tank crew members is another weakness that can be exploited. A, figure 43 depicts vision deadspaces of buttoned up tanks. By allowing tanks to approach until vulnerable because of this deadspace, individual soldiers can destroy or damage them unobserved. For instance, damage to tracks can be caused by metal or wood objects placed in drive sprocket.

(5) Weapons deadspace is even greater than vision deadspace. Once within the weapons deadspace of a tank, individuals are immune from the effects of its armament. Because of the overwatch techniques employed by tanks, individuals must exercise care in exposing themselves in these instances. B, figure 43 depicts the weapons deadspace of a tank.

(6) In some areas, men can negotiate terrain better than tanks. The mobility of a tank may be restricted by the terrain over which it operates.

(7) Tanks can be set on fire with standard flame weapons, gasoline bombs, and incendiary grenades. A fire in a tank engine compartment will cause the fuel tanks to explode. A fire can also explode ammunition stored inside a tank.

86. Individual Antiarmor Operations

Individual operations against tanks employ organic weapons such as grenades, rocket launchers, and light antiarmor weapons such as the M72, in addition to those field expedient devices listed in chapter 2. These operations are launched from covered and concealed positions which may or may not be mutually supported by are disposed laterally and in depth. The key to the success of such operations is to wait until tanks approach to a sure kill range. Positions are not abandoned when overrun; instead, individuals permit tanks to clear their positions and then engage them with whatever weapons are available. When enemy tanks are unsupported or become isolated from one another, they become prey to individual operations.

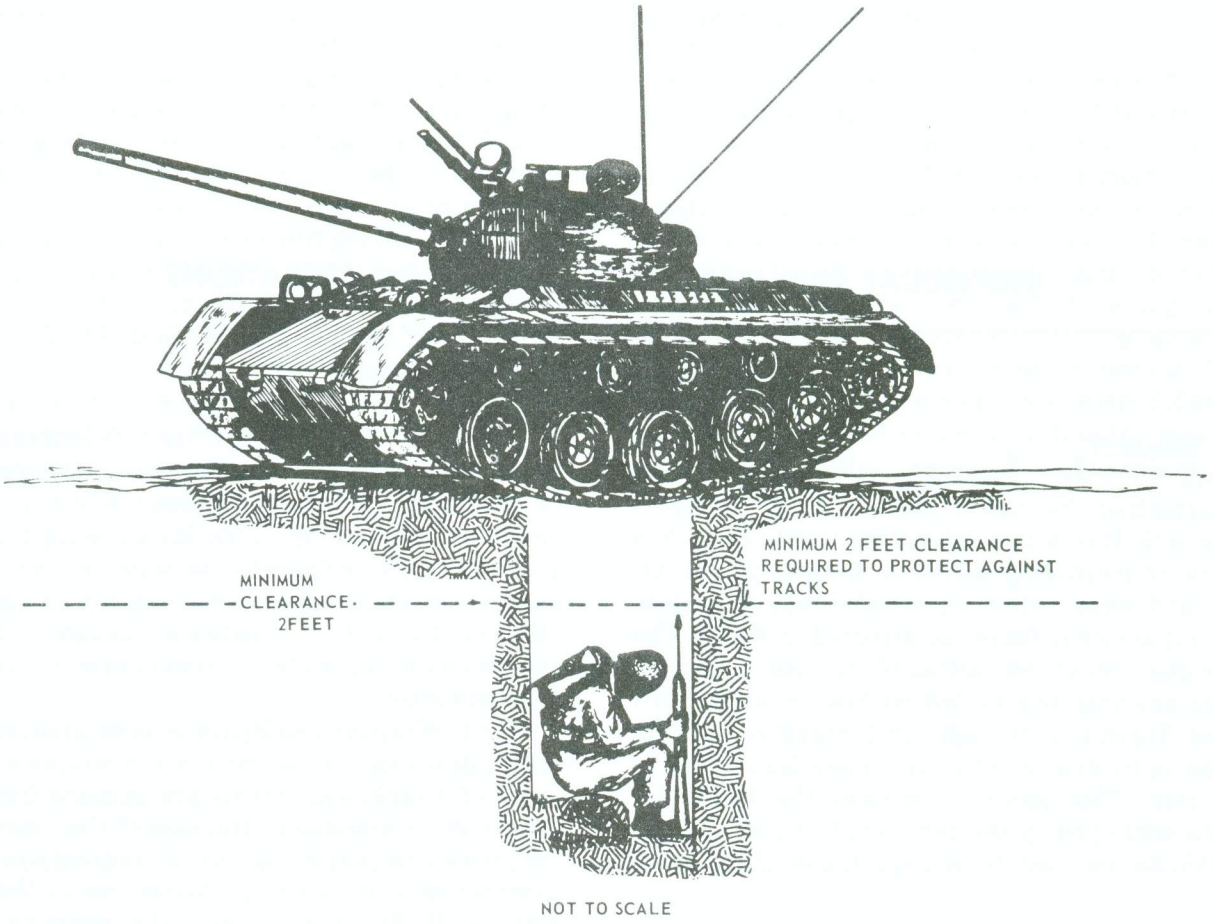


Figure 35. Individual antiarmor position.

87. Individual Protective Measures Against Armor

Individual protective measures against armor include well dug-in positions, concealment and camouflage, and the use of areas impassable to armor from which the individual emerges to engage them. Figure 35 depicts an individual position which will stand up against an armored vehicle.

88. Employment of Field Expedient Antiarmor Weapons

a. Field expedient antiarmor weapons are listed in paragraphs 31 and 32. Many of these weapons can be constructed from material often available on the battlefield. Many can be employed by the individual, while others require two men.

b. These weapons are employed as follows:

(1) *Molotov cocktail (para 31b(1)).* Molotov cocktails are employed by throwing them against armor, preferably the engine compartment. Burning gasoline seeping through the engine grille will cause sufficient damage to immobilize most armored vehicles. Additionally, smoke drawn through the vehicle's ventilation system can suffocate crew members or otherwise cause them to unbutton and expose themselves to small arms or other weapons.

(2) *Eagle fireball (para 31b(2)).* This field expedient weapon is employed either by throwing or placing on the armored vehicle. It is most effective when placed on or close to the engine compartment. After the weapon bursts, the napalm enters the engine compartment through the intake openings, setting the engine on fire.

(3) *Eagle cocktail (para 31b(3)).* This field expedient weapon is also employed by throwing or placing on armored vehicles, preferably on the engine grille. Flame from this weapon will explode engine fuel tanks. In addition, the thermite grenade used in this weapon will burn through engine parts, causing permanent damage.

(4) *Smoke and flame (para 31b(4)).* Smoke pots, smoke and incendiary grenades may be employed so as to restrict the vision of the armored vehicle crew. In addition, smoke from the grenades can be drawn through the ventilation system suffocating crew members or causing them to unbutton.

(5) *Chained charges (towed charges) (para 31c(1))*. Chained charges are pulled across the path of armored vehicles. When exploded, they blow off the vehicle tracks, and, if shaped charges are used, will penetrate the underbelly of the vehicle causing casualties to the crew. Examples of chained charges are Daisy chains and sled mines.

(6) *Riot control agent (CS) grenades.* CS grenades may be effectively integrated with smoke grenades to limit crew members' effectiveness. The immediate effects of the CS may cause the crew to unbutton or abandon their vehicles. Additionally, CS greatly restricts observation and the crew members' ability to employ effective fire.

(7) *Saddle charges.* Saddle charges are hung over the gun barrel of a tank near its juncture with the turret or the wrapping around the barrel. Both charges should touch the barrel and each other. Figure 36 is an example of a saddle charge.

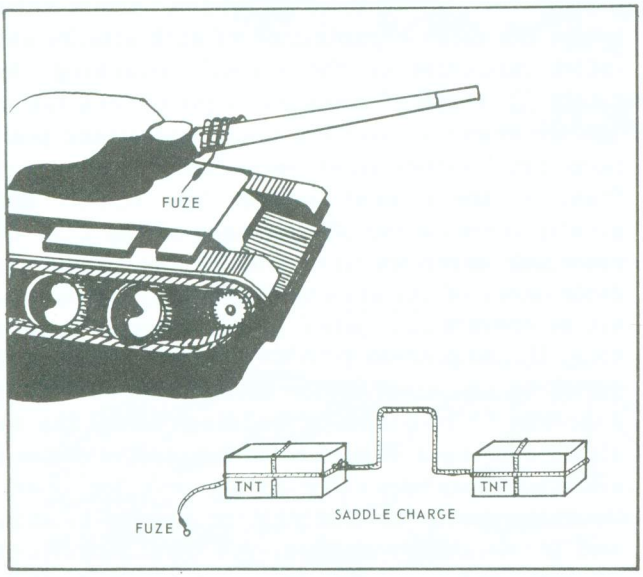


Figure 36. Saddle charge.

(8) *Command detonated charges (para 31c(2))*. Command detonated charges are so named because their exact instant of detonation is controlled by the person employing them. These charges are employed by burying them in roadbeds, alongside roads, and by hiding in weeds or other growth adjacent to roads. When an enemy tank comes abreast, or is directly over them, they are detonated by making contact between the communication wire and the power source used.

(9) *Hand carried charges (para 31c(3))*. These charges employ timed fuzes to preclude injury to the personnel employing them. They are employed by dropping, by throwing, or by otherwise placing them on top of the vehicles. They are most effective when directed at the suspension system, rear deck, auxiliary fuel tanks, or gun tube of armored vehicles. They will even damage a tank's turret if placed under the turret overhang of a tank.

(10) *Projectile charges (para 31c(4))*. Projectile charges may consist of any unexploded major caliber round, i.e., 105-mm, 155-mm, and small bombs. To employ, place in small troughs dug perpendicular to roads and detonate by using communications wire and a power source. These weapons are highly effective when directed at the suspension system of tanks.

(11) *Flame throwers.* Flame throwers, especially those using thickened fuel, are effective against tanks. They are employed by firing at the engine compartment and road wheels of tanks. The burning fuel from this weapon will cause secondary fires in the engine compartment and will set fire to the rubber portion of road wheels. See paragraph 12 for information on M74 incendiary rocket fired from M202 rocket launcher.

Section II. SMALL UNIT OPERATIONS

89. General

Because of the widespread employment of tanks in today's battlefield, small unit operations by infantrymen will be conducted against them. These operations will be designed to accomplish a specific task in the enemy's front or rear battle area. The weapons employed on these operations will, for the most part, consist of the lightweight family of antiarmor weapons and field expedient antiarmor weapons.

90. Armor-Killer Operations

Armor-killer operations are one method infantrymen can use to deal with large scale tank-infantry assaults. These operations are normally conducted by small groups of from four to ten men, employing fairly simple equipment such as incendiary grenades, antiarmor mines, flame throwers, automatic weapons, and medium antiarmor weapons. Well-trained armor-killer teams (fig 37) are equally effective in the attack or defense. The best armor-killer team is a rifle squad that is trained, as a unit, in armor-killer operations. These teams attack only one tank at a time, usually the one that presents the most immediate threat to the unit as a whole. Careful attention must be given to the positioning of these teams, and all manner of ruses should be used to lure tanks within the

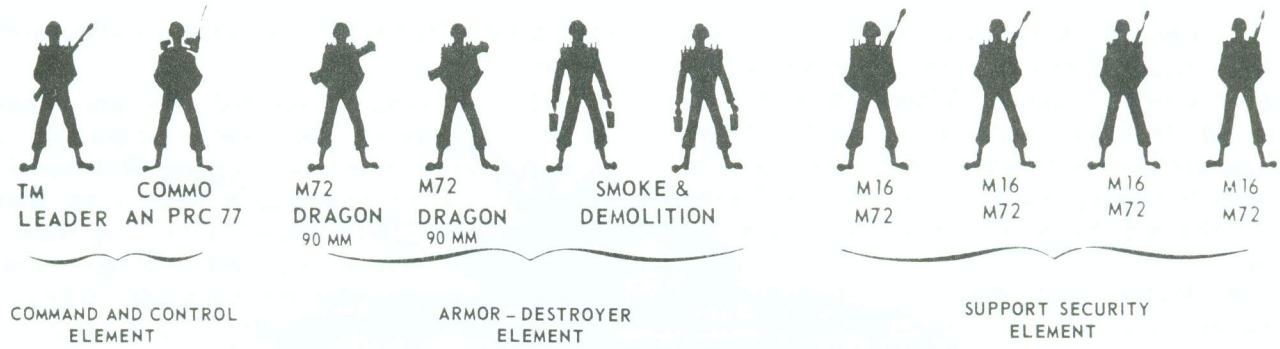


Figure 37. Armor-killer team.

killing zone of armor-killer teams. Each team should be organized into a support security element, an armor destroyer element, and a command and control element.

a. Support Security Element. The support security element should have a minimum of two automatic weapons. It should be sited so it can give continuous support to the armor-destroyer element during its attack and withdrawal. The support security element functions are to—

(1) Separate enemy tanks from their accompanying infantry.

(2) Provide protective fire for the tank destroyer element.

(3) Provide security for the entire team within its capability.

b. Armor Destroyer Element. The mission of this element is to destroy, immobilize, or damage armored vehicles. It should contain a portable antitank weapon and at least one individual to provide immediate protection to the other members of the element with incendiaries and smoke. The element may also be equipped with field expedient devices such as "Molotov Cocktails," or "Daisy Chains."

c. Command and Control Element. The team leader and communications man (alternate riflemen) make up the command and control element of the armor-killer team. This element may accompany one of the other elements depending on the situation. The mission of the command and control element is to—

(1) Provide a plan of attack, area of engagement, an extraction plan, as well as leadership during the conduct of an engagement.

(2) Maintain communications with the parent unit and report any acquired intelligence information.

d. Methods of Employment. When the enemy is withdrawing, the armor-killer team can be used to destroy and disorganize elements which the enemy is using to delay in advance. Teams may be dropped by parachute or transported by helicopter to the rear of the enemy's lines, or infiltrate through the lines to a predetermined point. They conduct hit and run tactics on enemy routes of withdrawal and supply routes, or disrupt the enemy delaying elements using similar tactics. When it is known that an enemy is preparing for an armored offensive, armor-killer teams can delay organization of such attacks and inflict casualties on the enemy's attacking elements. This type of operation requires penetration into an enemy's assembly areas and attack positions. Small armor-killer teams can be employed in front of the combat outpost line (COP) and greatly increase the effectiveness of the COP by providing early warning and forcing premature deployment of the enemy. Teams may be stationary or operate as a patrol in a designated area or zone. Built-up areas provide an excellent base in which to use armor-killer teams. The cover and concealment provided by buildings along the restricted avenues offered to enemy armor create a situation very desirable to armor-killer operations. Armored vehicles must be allowed to enter well inside a built-up area, and then demolitions or antiarmor weapons are used to block their exit. Since dismounted elements may precede or move with tanks in built-up areas, security must be provided to the armor-killer teams. Smoke grenades are particularly valuable in reducing the crews' vision and will permit a team to approach and destroy the vehicles with antiarmor weapons or other expedient means.

e. Techniques of Employment.

(1) The success of an armor-killer operation depends on achieving surprise. Attaining surprise requires that each member of the armor-killer team be thoroughly trained on his individual actions and responsibilities. Emphasis is placed on camouflage, security, fields of fire, communications, and alternate plans. The armor-killer ambush site must be selected with extreme care. The team must think like the enemy, and the planned

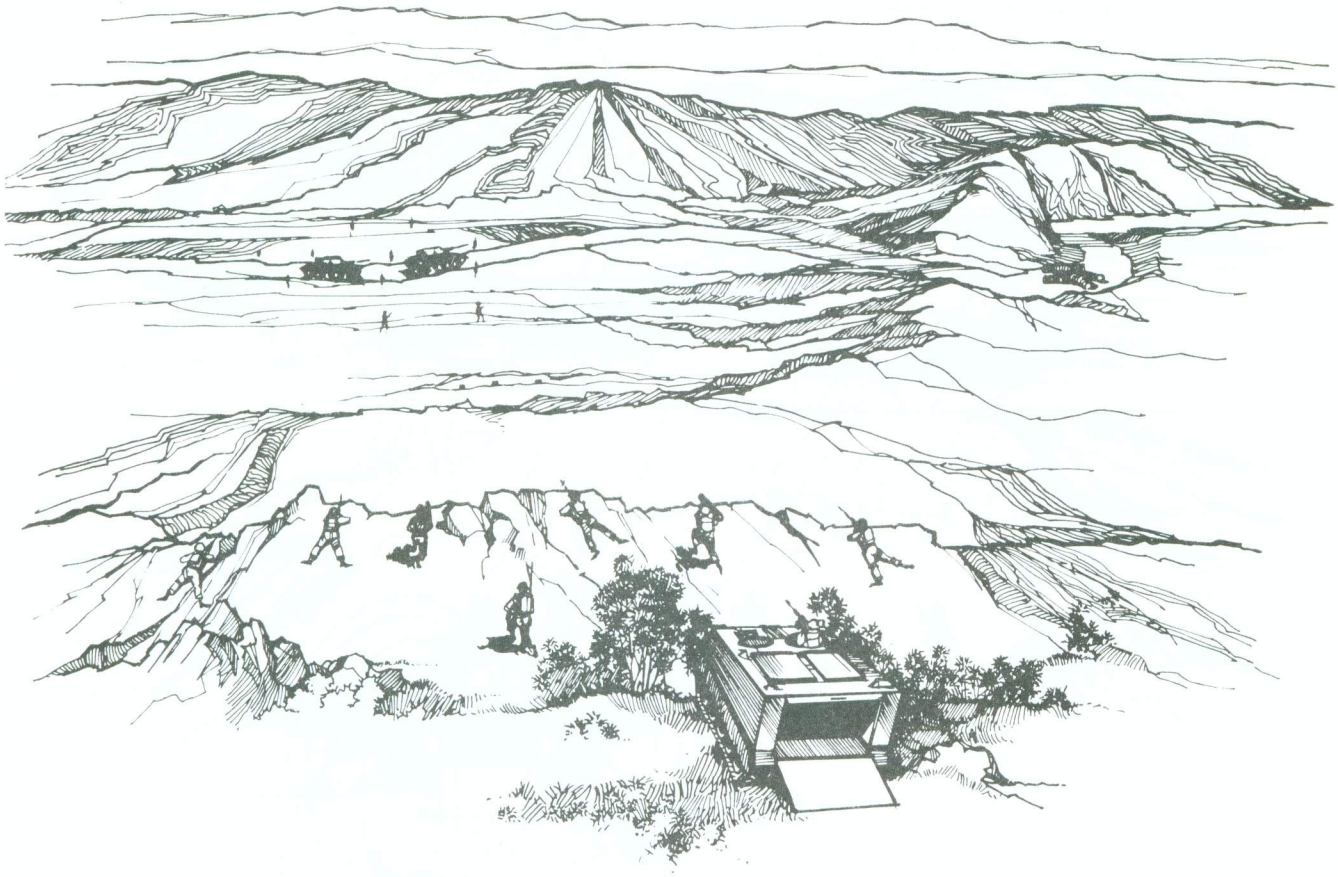


Figure 38. The armor-killer team before an ambush.

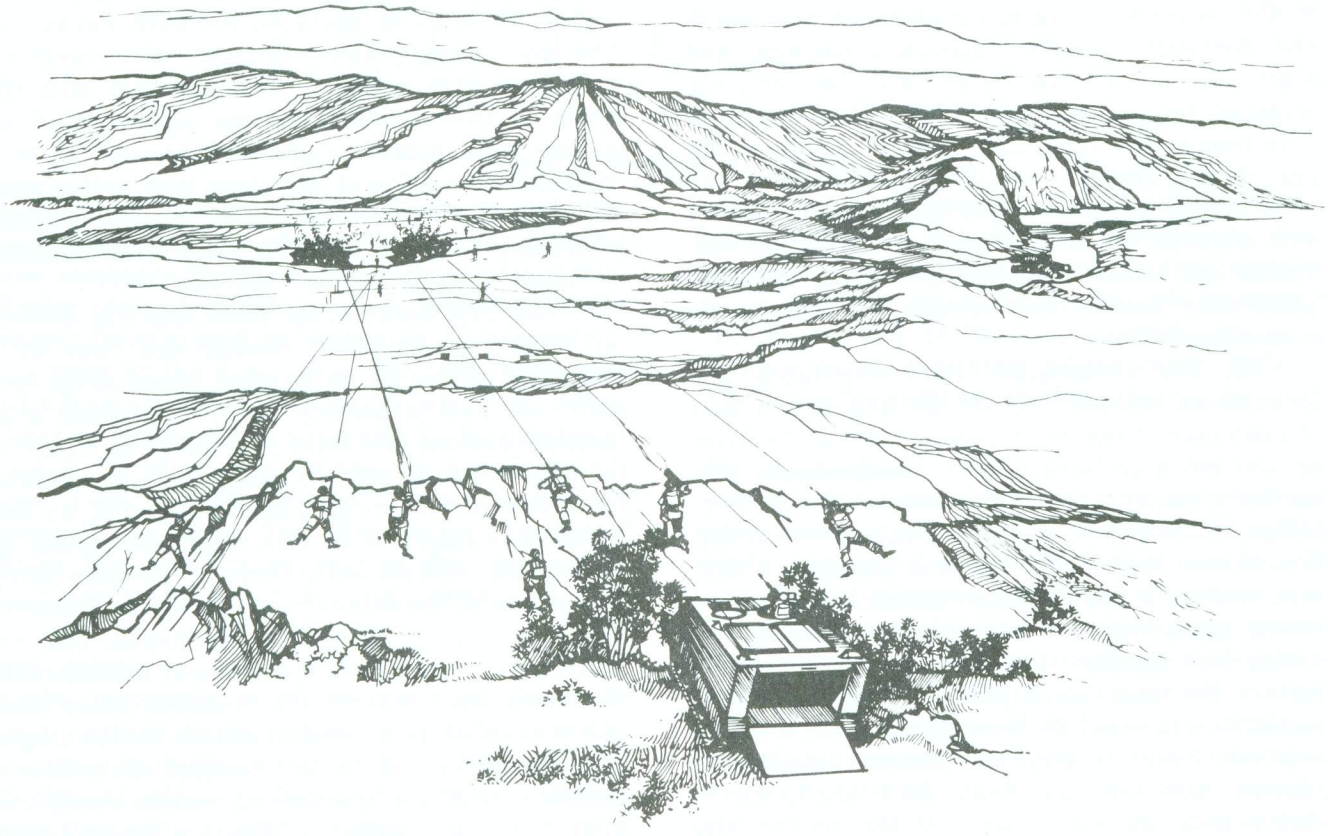


Figure 39. The armor-killer team during an ambush.

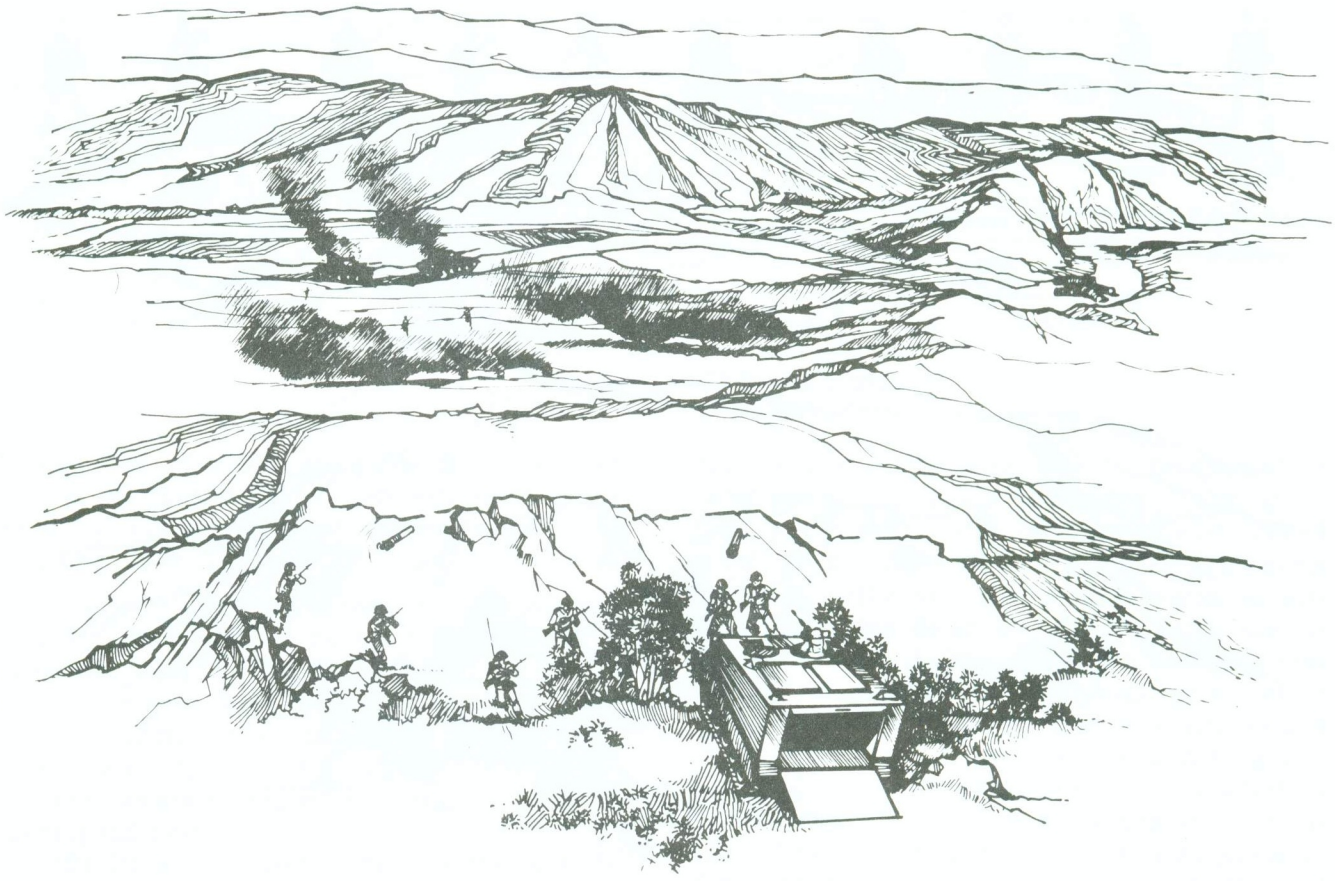


Figure 40. The armor-killer team after an ambush.

ambush must be based on certain assumptions as to the enemy's strength, direction of movement, and formation. Defiles, stream crossings, and other obvious ambush sites will be carefully screened by well-trained troops. This screening may require the team to withdraw before it can execute the ambush; therefore, the ambush site must not be so obvious that dismounted infantry will discover the armor-killer team. No all ambushes can be executed exactly as planned; some plans may require last minute modification or even cancellation.

(2) The armor-killer team illustrated performing an ambush (fig 38, 39 and 40) is only one example of the many possible situations when an ambush may be employed. Using a personnel carrier gives an armor-killer team mobility, flexibility, and a degree of protection against enemy fire. Notice that each weapon is assigned a definite sector of fire. This assignment will insure enemy casualties and delay his reaction. By situating the ambush at a distance of 200 to 500 meters, the team can accurately engage personnel and armor targets; at the same time, the distance is great enough to provide a degree of protection against discovery by flank security elements. Smoke pots are laid forward of the ambush site and detonated electrically. Smoke provides concealment for the team when it withdraws from action. Security is provided for both flanks and the rear. Security elements must be in communication by wire, radio, or visual contact with the main ambush site. When the approach of an enemy force comes in greater strength, or in a different formation or direction than anticipated, the role of security and early warning becomes extremely important. Under such circumstances, a change of plans may be required.

(3) The armor-killer team has the mission of inflicting immediate damage and then withdrawing. Although an unusual opportunity may exist to cause extremely heavy casualties, most ambush actions are brief and have the objective of destroying one or two vehicles. Many methods may be devised to command the start of an ambush. The response to this command should be immediate with all individuals of the team firing in volume at the same time. The support element fire is placed on all exposed personnel, both infantry and vehicle crewmen. Armor destroyer individuals must have their weapons ready and, when possible, place several rounds on the target. The command and control element must have a simple and clearly understood system which will insure that all members of the team break off the action at the same time; pyrotechnic flares and

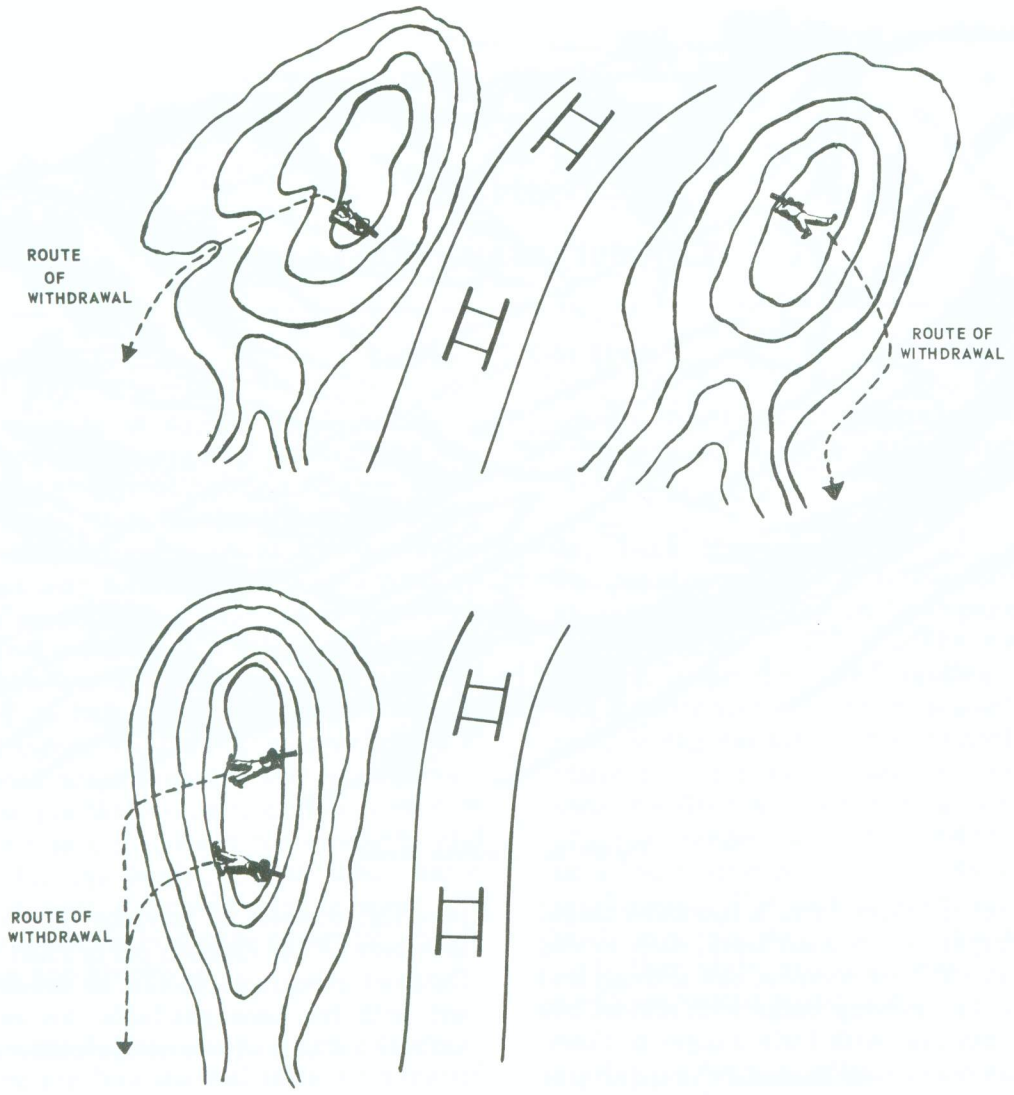


Figure 41. Route of withdrawal.

well-suited for this purpose. Covered and concealed withdrawal routes and a covering fire plan are necessary to insure an orderly withdrawal. Under ideal circumstances, all contact with the enemy force should be broken by all elements of the team at the same time. The team must then withdraw as rapidly as possible before the enemy force can recover from the attack. As previously stated, the illustrated ambush technique is only one of the many techniques that can be used by armor-killer teams. The effective employment of these teams is limited only by the imagination and resourcefulness of the team commander.

91. Raids

Light antiarmor weapons lend themselves to raids on tank parks, communication centers, ammunition and supply dumps, and command posts in the enemy's rear. Within their range capabilities, they allow a raiding patrol to stand off from its objective, destroy it, and move out before the enemy can react. Raids are characterized by detailed planning and deliberate action by each member of the raiding party. At the objective, the raid leader must insure that his mission is not jeopardized by hasty or careless actions on the part of some member of the party. Refer to FM 21–75 for further details on patrolling.

92. Ambushes

a. The armor ambush is an operation which can be employed by infantrymen, both as an expedient method of tank destruction and as a means by which small groups can adequately protect likely armor approaches during all types of operations. It is an excellent method of covering deadspace in sectors of fire, of limiting armor movement in close or wooded country, and of harassing small armored reconnaissance units. Ambushes should employ lightweight antiarmor weapons or expedient devices, and they should be positioned in those areas in which armor will be canalized. Tanks

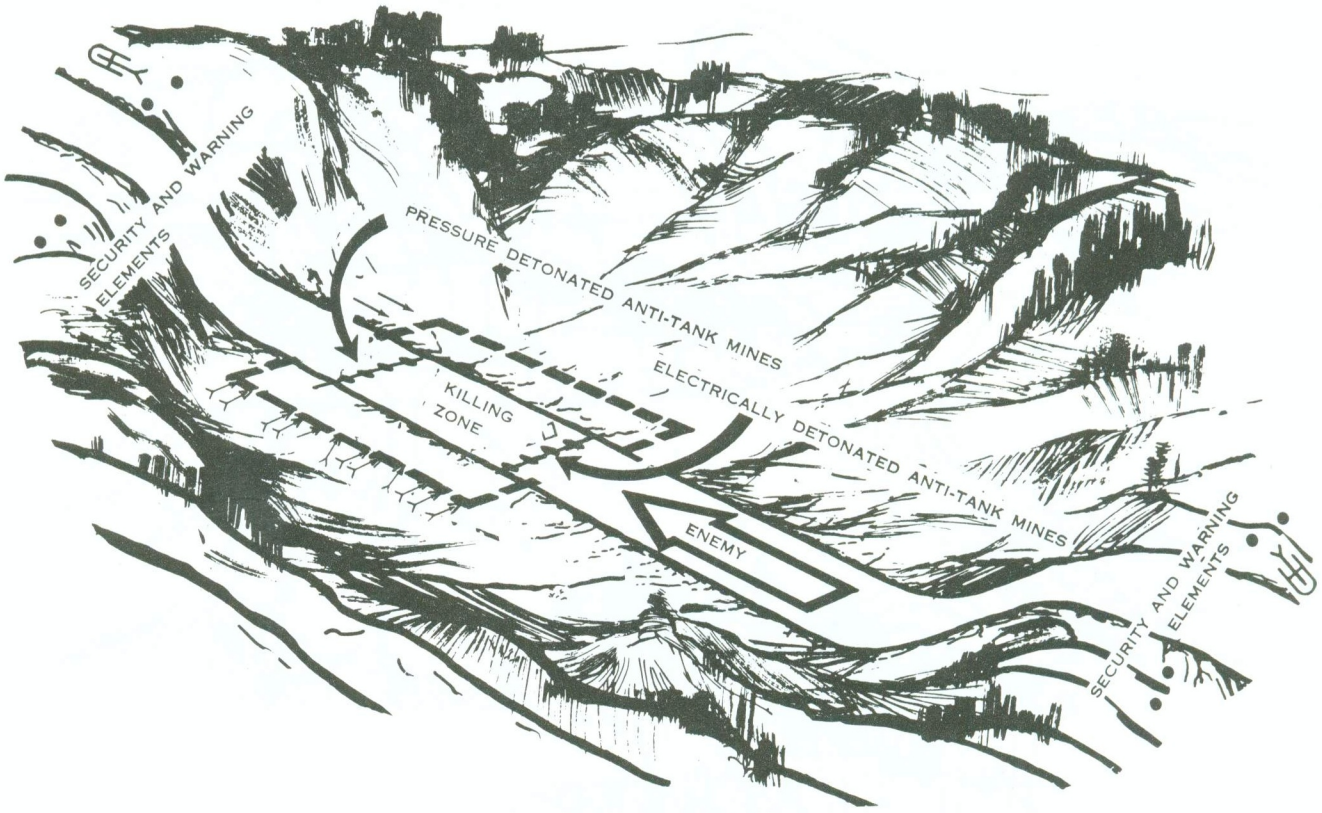


Figure 42. Ambush setup.

moving without infantry form a lucrative target to infantry forces. A two-man team, each armed with a medium antitank weapon, can ambush and destroy one or two moving tanks with almost 100 percent certainty and with little danger to themselves. Ambush teams may be stay-behind units, or they may be emplaced and extracted by helicopter. The key is careful selection of firing positions, good timing, and a planned route of withdrawal. Examples are shown in figure 41.

b. Ambush plans and techniques must be flexible enough to cope with the unexpected. All personnel must be familiar with the plan as it concerns all phases and teams of the ambush, and all men must know the mission and actions of their fellow teammates. In the absence of supporting field artillery, automatic weapons should be employed to make armored vehicle crews button up, to halt accompanying infantry, and to cover the withdrawal of the ambush party. Pressure and electrically detonated mines should be used to stop the lead vehicle, and are also an excellent means of triggering the ambush. Smoke can be employed between vehicles to isolate them from each other and to allow the ambush party to get in close and use flame and other expedient antiarmor weapons. All-round security must be established at the ambush site and an efficient and practical method of communication between all members of the ambush party must be employed. Detailed rehearsals should be conducted consistent with the time available. An example of an ambush setup is shown in figure 42.

93. Stay-Behind Forces

a. At times, units may be directed to employ stay-behind forces, or massed enemy armor attacks may dictate their use. A primary mission of stay-behind forces may be the destruction of enemy armor, supply installations, and command or communications centers.

b. When a unit is directed to act as a stay-behind force, plans for its activities are prepared in detail, to include plans for resupply and withdrawal. Tactical SOP's should cover actions by units when isolated as a result of enemy action. Normally, stay-behind forces remain concealed and otherwise avoid detection, consistent with the accomplishment of their mission. They may divide into armor-killer teams and destroy enemy armor using both organic and field expedient antiarmor weapons. Stay-behind forces concentrate on destroying lightly defended POL and ammo storage areas, small convoys, command and control vehicles and other profitable targets of opportunity.

CHAPTER 5

ARMOR CHARACTERISTICS

Section I. GENERAL

94. Fundamentals of Armor Employment

Armor is a concept of mounted combat that employs both air and ground fighting vehicles to accomplish its basic mission—the destruction of the enemy. Normally, armor operates within a force structure that may include tanks, mechanized infantry, self-propelled artillery, armored engineers, armored cavalry, US Air Force tactical aircraft in close air support, and Army aviation, supported on the battlefield by a flexible communications and logistics system. The organization of these combined arms forces is tailored by cross-attachment to use the favorable characteristics of each type unit to complement the strengths and compensate for the weaknesses of other units. Commensurate with its intended employment, the resulting force varies in degree of armor protection, mobility, and firepower.

95. Fundamental Missions

The following are fundamental missions assigned to various type units:

a. Tank units close with and destroy enemy forces, using fire, maneuver, and shock effect in coordination with other arms.

b. Armored cavalry units perform reconnaissance and provide security for the unit to which it is organic, assigned or attached, and may engage in offensive, defensive, and delaying actions as an economy of force unit.

c. Infantry units close with the enemy by means of fire and maneuver to destroy or capture him or repel his assault by fire, close combat, and counterattack.

d. Countries that employ large numbers of assault guns normally employ them in the attack to accompany the assaulting infantry, releasing tanks for exploiting penetrations or conducting flanking movements. In the defense, assault guns are generally used to reinforce dismounted elements, releasing tanks for reserve and/or counterattack missions. Normally, assault guns are organic to assault gun battalions or regiments, depending on the size and organization of the parent unit.

96. Tank Characteristics

The backbone of armor is the tank: a versatile weapon system designed to engage and destroy enemy targets in combat. The tank is a full-tracked, armor protected fighting vehicle which can be effectively employed in most types of terrain, during daylight as well as periods of limited visibility. Armament found on most tanks consists of a flat trajectory main gun with maximum effective ranges out 4,400 meters, a coaxially-mounted machinegun, and the tank commander's machinegun. The newer tanks incorporate dual-mode searchlights (white lights and infrared) and other night vision devices to enhance their night operations capabilities.

97. Tank Vulnerability

a. Although tank capabilities vary with the different models particularly in armament and armor protection, there are vulnerabilities which are common to all armored vehicles. Though tank crewmen are vulnerable when exposed, they prefer to keep hatches open and remain exposed until they come under fire. The reason for this is that when "buttoned-up" the crew must operate with increased visual deadspace. By taking advantage of this visual deadspace, dismounted elements can approach and destroy a tank using numerous antitank devices. Most soldiers realize that visual deadspace is a limitation of a tank; however, weapon deadspace is equally important. All tanks have limitations in their capability to elevate or depress the weapons mounted on the vehicle. It is possible, therefore, that even though a tank crewman can see dismounted elements, he cannot fire on them without repositioning the tank. The amount of weapon deadspace will vary with the type of tank; however, on all tanks weapon deadspace is greatest on the sides and rear of the tank. A representative diagram illus-

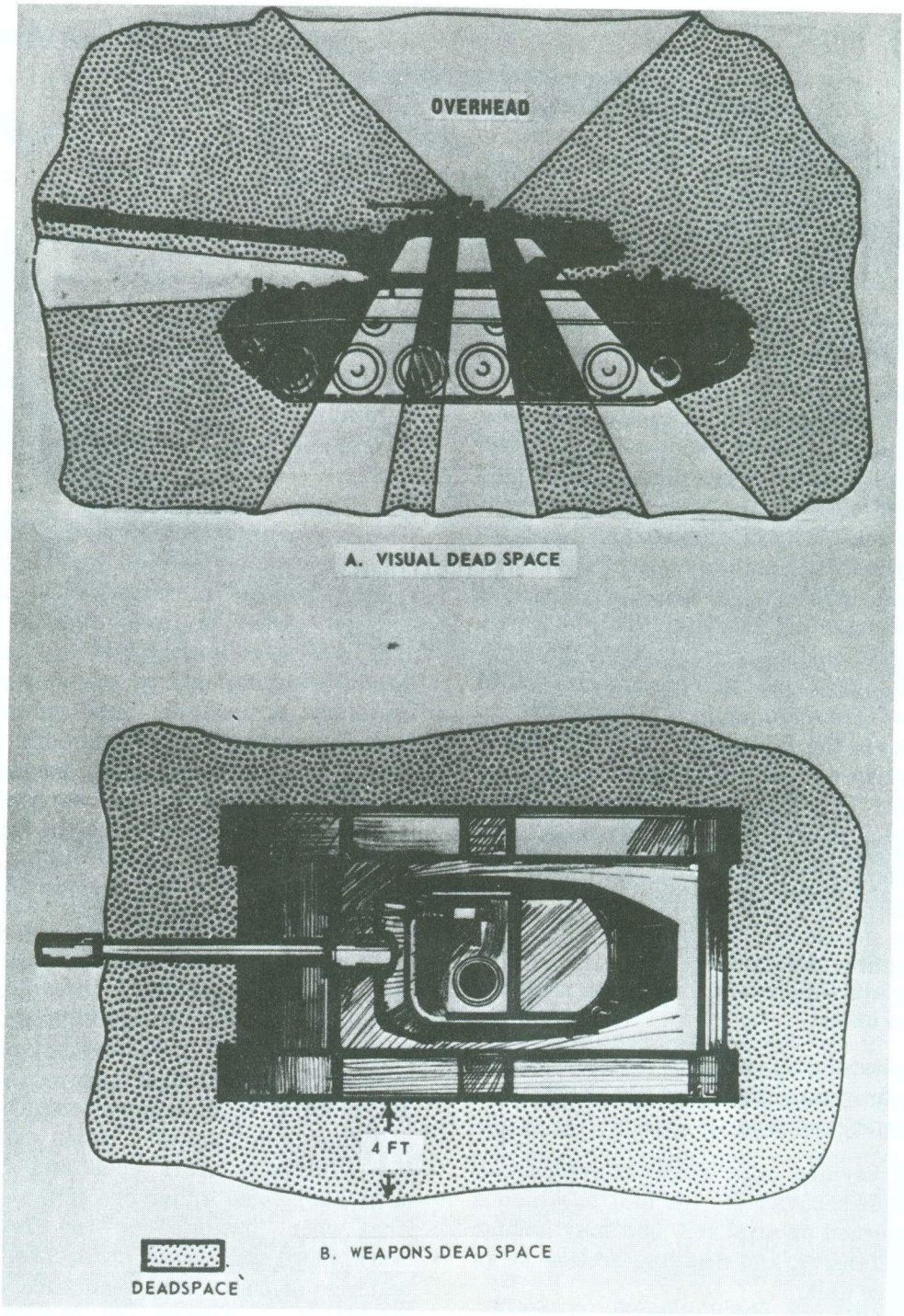


Figure 43. Deadspace (schematic).

trating both visual and weapon deadspace is shown in A and B, figure 43.

b. Even with its great weight and size the tank has vulnerabilities (fig 44), to include the following:

(1) *The degree of armor protection.* It is impossible to provide armor of sufficient thickness throughout a tank that will protect it completely from armor-defeating ammunition. Accordingly, a compromise must be made that will provide greater degrees of protection in certain locations than in others. The amount of protection provided depends on the type of steel, the angle of slope, and the armor thickness. The greatest degree of protection on a tank is on the front of the hull and turret; the least protection is on the sides, rear, top, and undercarriage or "belly." The least protected armor areas, therefore, offer the best chance of being penetrated.

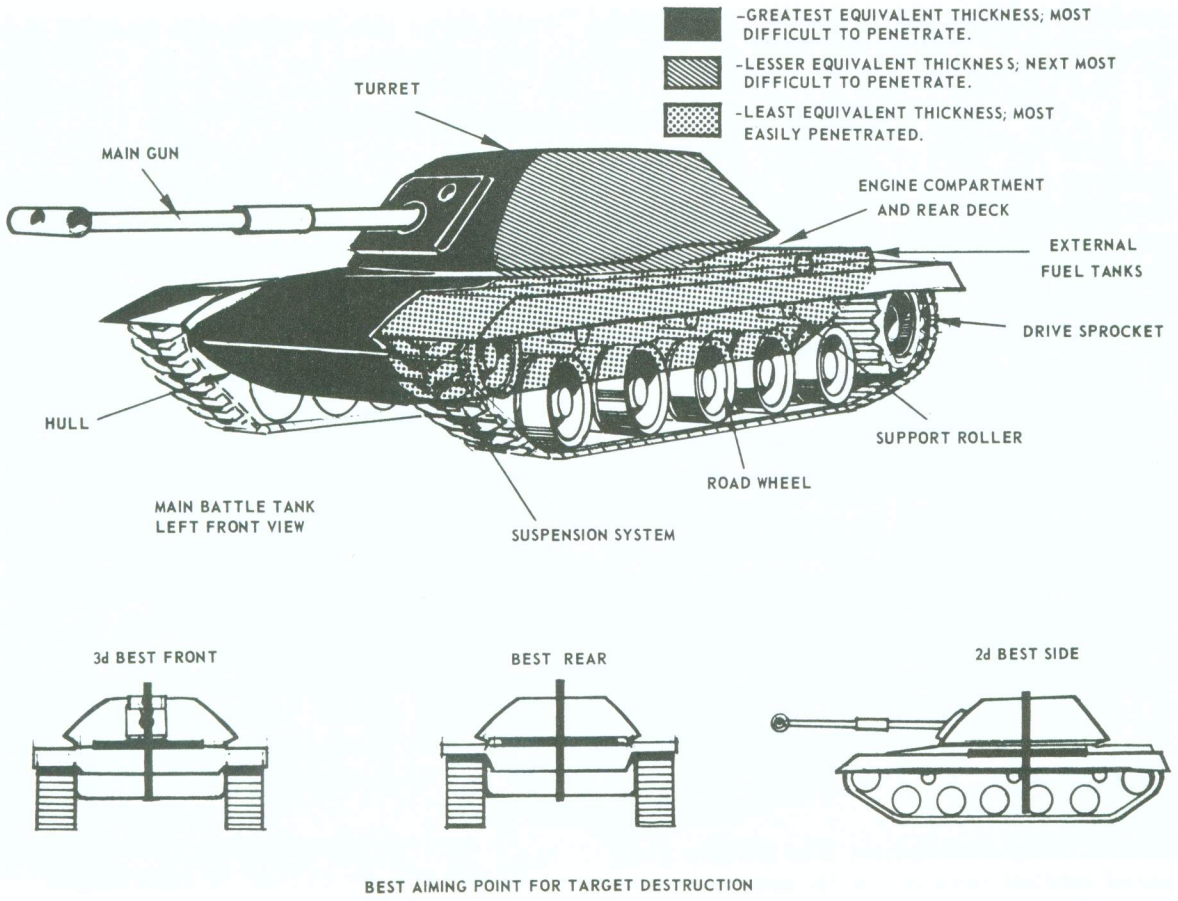


Figure 44. Tank vulnerability (schematic).

(2) *The engine compartment.* The engine compartment is a particularly vulnerable area. A tank can be stopped by using simple incendiary devices, such as a thermate grenade or napalm. It is unnecessary to destroy the entire engine. Sufficient damage to any critical engine component will prevent the vehicle from running. A disabled tank becomes a stationary pillbox, but it is much easier to destroy.

(3) *The suspension system.* The suspension system (includes the track) is a susceptible area. Properly positioned explosives will break the track, or logs properly placed between the roadwheels may immobilize a tank. It should be pointed out that destruction of roadwheels or support rollers may slow down or hinder tank movement; however, in most instances destruction of roadwheels or support rollers will not stop a tank.

(4) *The fuel system.* Many foreign tanks use both internal and auxiliary fuel tanks. The auxiliary tanks, which are approximately the size of a 55-gallon drum, are mounted on the side or on the rear of the tank. Though normally jettisoned when contact is made with enemy forces, auxiliary fuel tanks are ideal aiming points for surprise attacks by tank-hunter teams. Internal fuel tanks are generally located in the engine compartment, but their exact location will vary with the type of tank.

(5) *The weapon systems.* Of all the vulnerable areas on a tank, the most difficult one to destroy is a tank's weapon system. Before an attempt is made to attack this area, a tank should be practically disabled and the crew blinded by smoke. If these factors prevail, dismounted elements can then approach from a blind area and place an explosive charge under the turret overhang in the rear, or over the engine.

98. Assault Guns and Personnel Carriers

Assault guns are usually heavily armored in front, and they may or may not have an open top crew compartment. If possible, flanking fire should be used to penetrate the thinner side armor. If stopped, as by an antitank mine, the vehicle becomes susceptible to flank attacks as most of the heavier assault guns cannot traverse the main gun. Personnel carriers are vulnerable to antitank weapons because of their light armor. For a frontal attack, fires should be directed at the center front of the vehicle; for a flank attack,

fires should be directed at the hull just above the top of the tracks or wheels. Wheeled APC's are also vulnerable to damage to tires by small arms fire, and mines.

Section II. CURRENT ARMORED VEHICLES

99. General

a. The antiarmor gunner may encounter many different types of armored vehicles. Any of the vehicles described and illustrated in this manual may be found on the battlefield, either in friendly or enemy armies. Many vehicles included in this chapter are employed by countries other than the country designated by the text. The illustrations and tabulated data are meant to aid the antiarmor gunner in the rapid identification of most armored vehicles.

b. The chart in appendix D shows pertinent data on armored vehicles in tabulated form to assist in quick comparison. The data is of necessity brief, and paragraphs 100 through 102 should be read for more detailed information.

100. Tanks

a. United States.

(1) *M48A3 (fig 45).*

(*a*) *General description.* The 90-mm gun, full-tracked combat tank is a fully armored combat vehicle. The M48A3 tank is an updated M48 series tank with a continental V–12, air cooled engine; an improved engine deck that reduces infrared radiation and improves engine cooling; an improved fire control system incorporating a coincidence rangefinder that allows more rapid engagement of targets. The tank's armament consists of a 90-mm gun with a 7.62-mm machinegun coaxially-mounted in the combination gun mount, and a caliber .50 machinegun mounted in the tank commander's cupola. Earlier models of the M48 series have different combinations of the commander's cupola and power packs.

(*b*) *Vehicle characteristics.*

1. Weight: 52 short tons.
2. Height: 10 feet 2 inches.
3. Length: 28 feet 6 inches.
4. Width: 11 feet 11 inches.
5. Speed: 30 miles per hour.
6. Cruising range: 310 miles (approximate).

(*c*) *Armament.* One 90-mm gun, one 7.62-mm and one caliber .50 machinegun.

(*d*) *Mobility characteristics.*

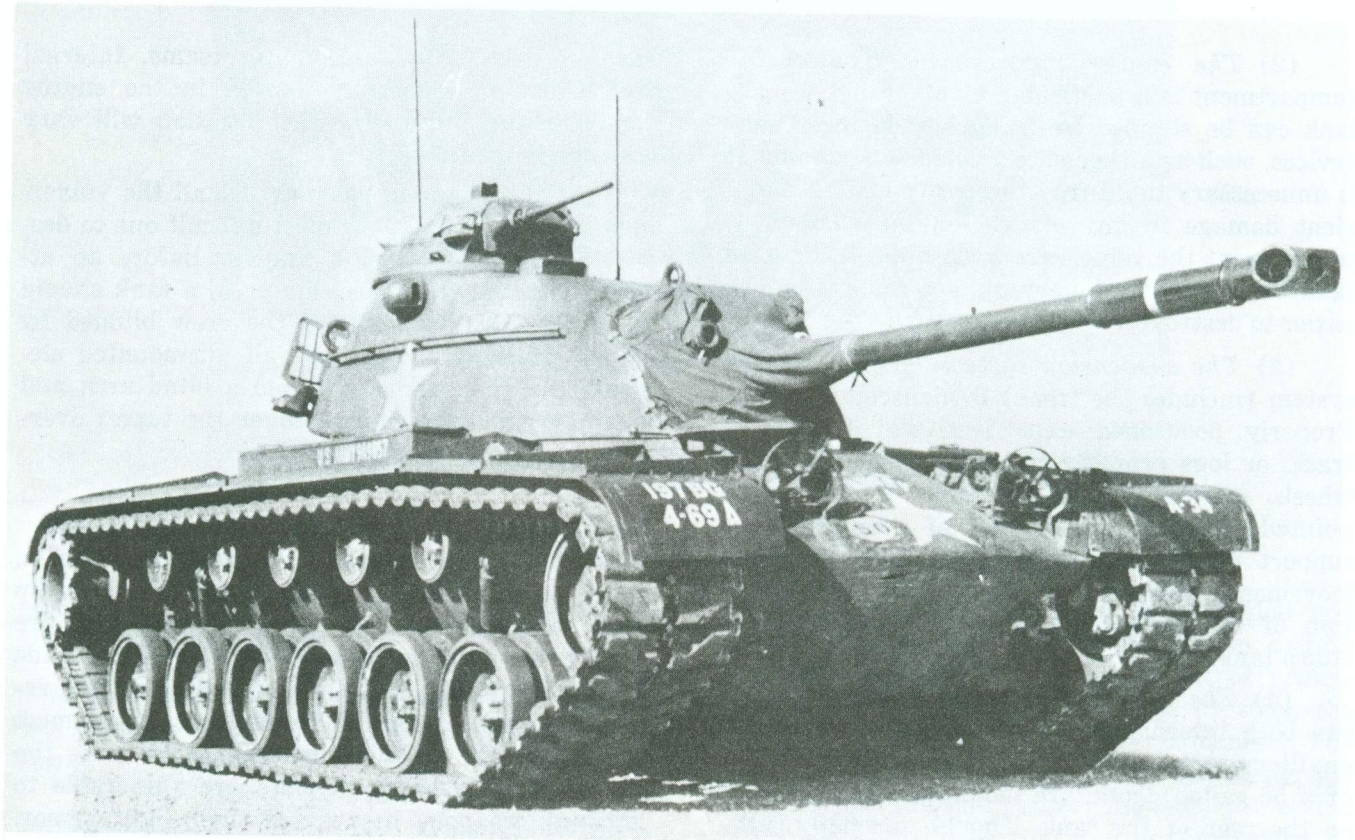


Figure 45. United States tank, M48A3.

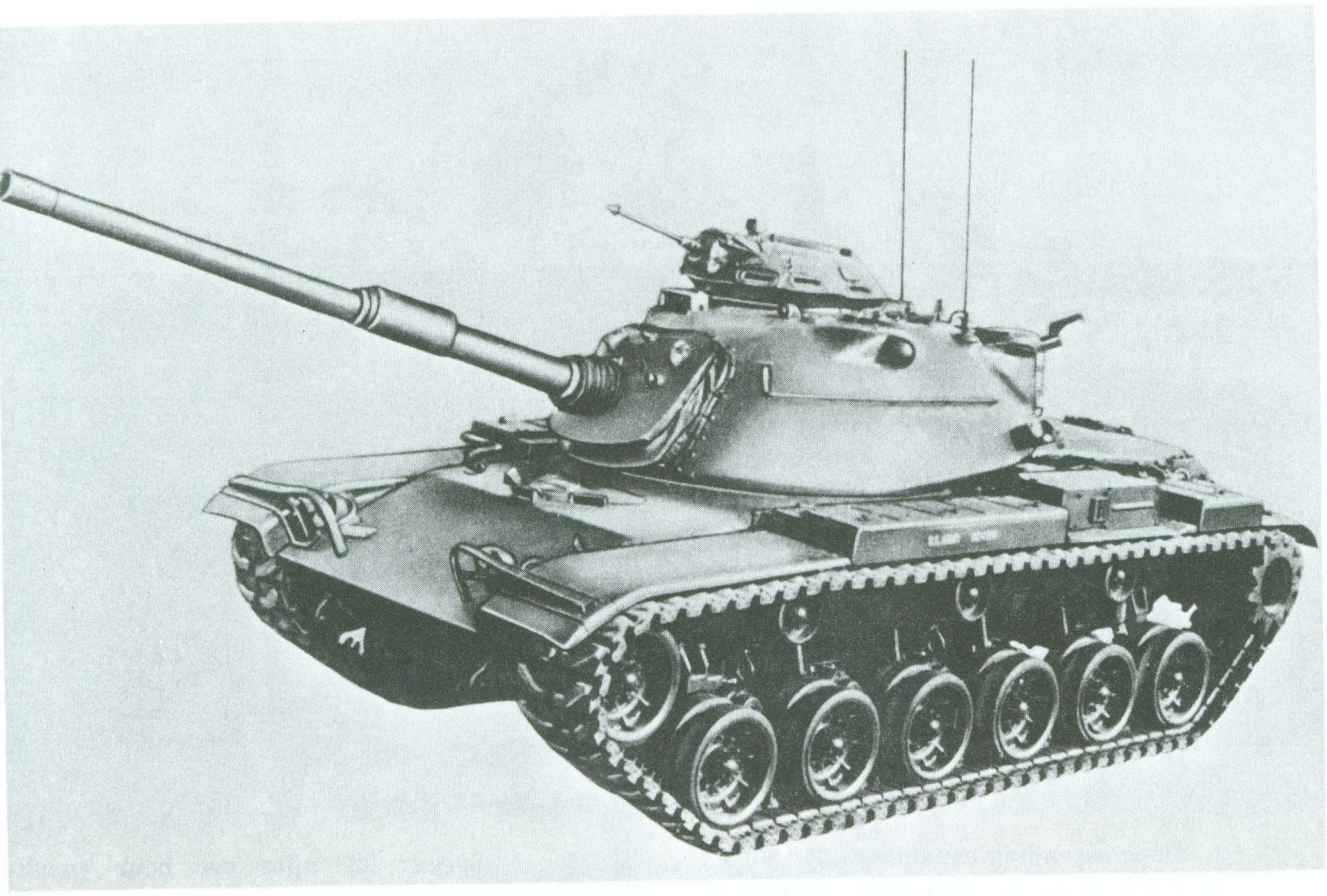


Figure 46. United States tank, M60.

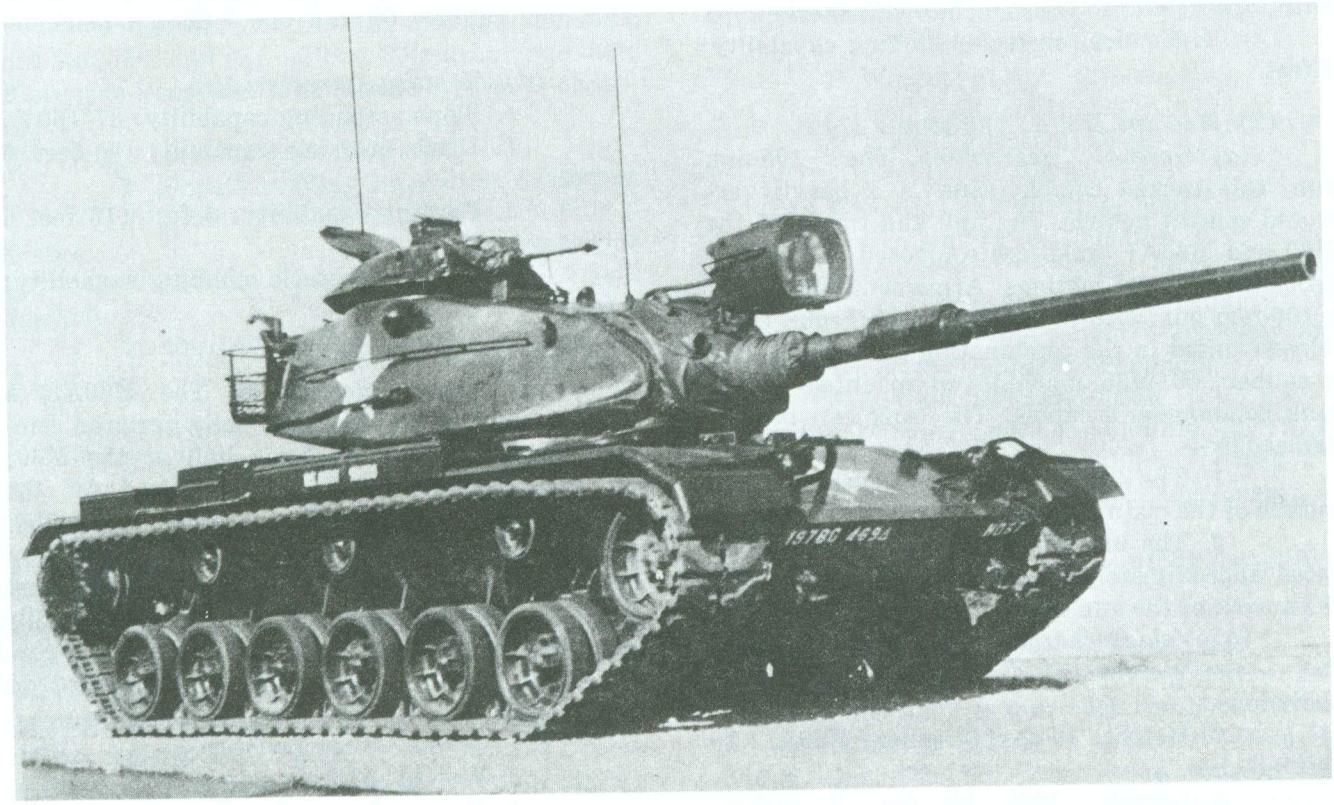


Figure 47. United States tank, M60A1.

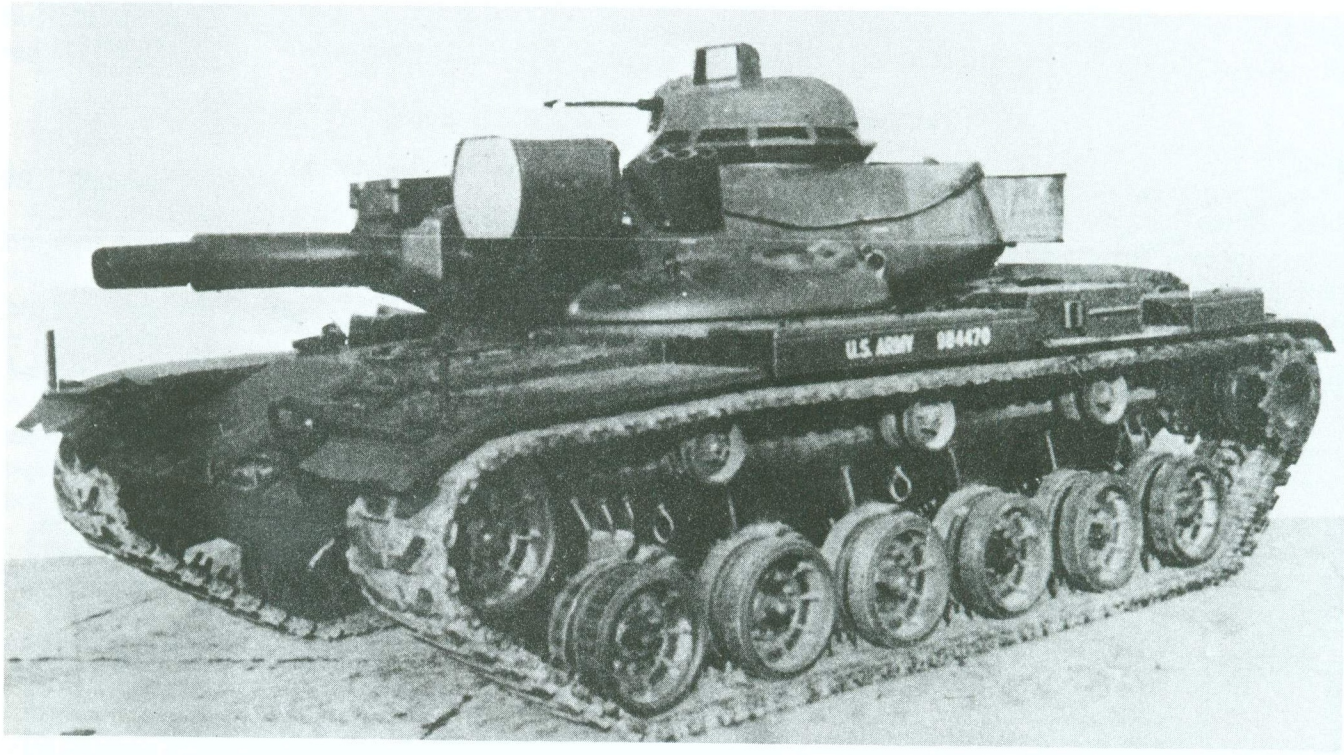


Figure 48. United States tank, M60A2.

1. Slope ascending capability: 37°/60%.
2. Ditch crossing capability: 8 feet 6 inches.
3. Fording capability: 4 feet (8 feet with fording kit; 13 feet 6 inches with snorkel.
4. Vertical obstacle climbing capability: 3 feet.

(2) *M60 and M60A1 (fig 46 and 47).*

(*a*) *General description.* The 105-mm gun, full-tracked combat tank is a heavily armored combat vehicle. The hull and turret of the M60 and M60A1 tanks are composed of homogeneous armor steel castings. Armament consists of a 105-mm gun with a 7.62-mm machinegun coaxially-mounted in the combination gun mount, and a caliber .50 M85 machinegun mounted in the tank commander's cupola. The tank can be recognized by—

1. The absence of a blast deflector at the muzzle of the main gun; and
2. The presence of a bore evacuator located approximately two-thirds of the way from the muzzle of the gun tube.

(*b*) *Vehicle characteristics.*

1. Weight: 51 short tons; M60A1: 53 short tons.
2. Height: 10 feet 6 inches: M60A1: 10 feet 9 inches.
3. Length: M60 30 feet 7 inches: M60A1 31 feet.
4. Width: 11 feet 11 inches.
5. Speed: 32 miles per hour (maximum).
6. Cruising range: 310 miles.

(*c*) *Armament.* One 105-mm high velocity gun, one caliber .50 and one 7.62-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 37°/60%.
2. Ditch crossing capability: 8 feet 6 inches.
3. Fording capability: 4 feet (13 feet 6 inches with kit).
4. Vertical obstacle climbing capability: 3 feet.

(3) *M60A2 (fig 48).*

(*a*) *General description.* The M60A2, a full-tracked combat tank, is a fully armored combat vehicle. It has the basic hull of the M60; however the turret has been designed for the 152-mm gun launcher. In addition, the vehicle has a coaxially-mounted 7.62-mm machinegun, a cupola-mounted caliber .50 machinegun, and eight grenade dispensers. The vehicle is readily identified by its short main gun, its unusual turret shape, and a Xenon searchlight mounted on the left side.

(*b*) *Vehicle characteristics.*

1. Weight: 57.2 short tons.
2. Height: 10 feet 8 inches.
3. Length: 24 feet 1 inch.
4. Width: 11 feet 11 inches.

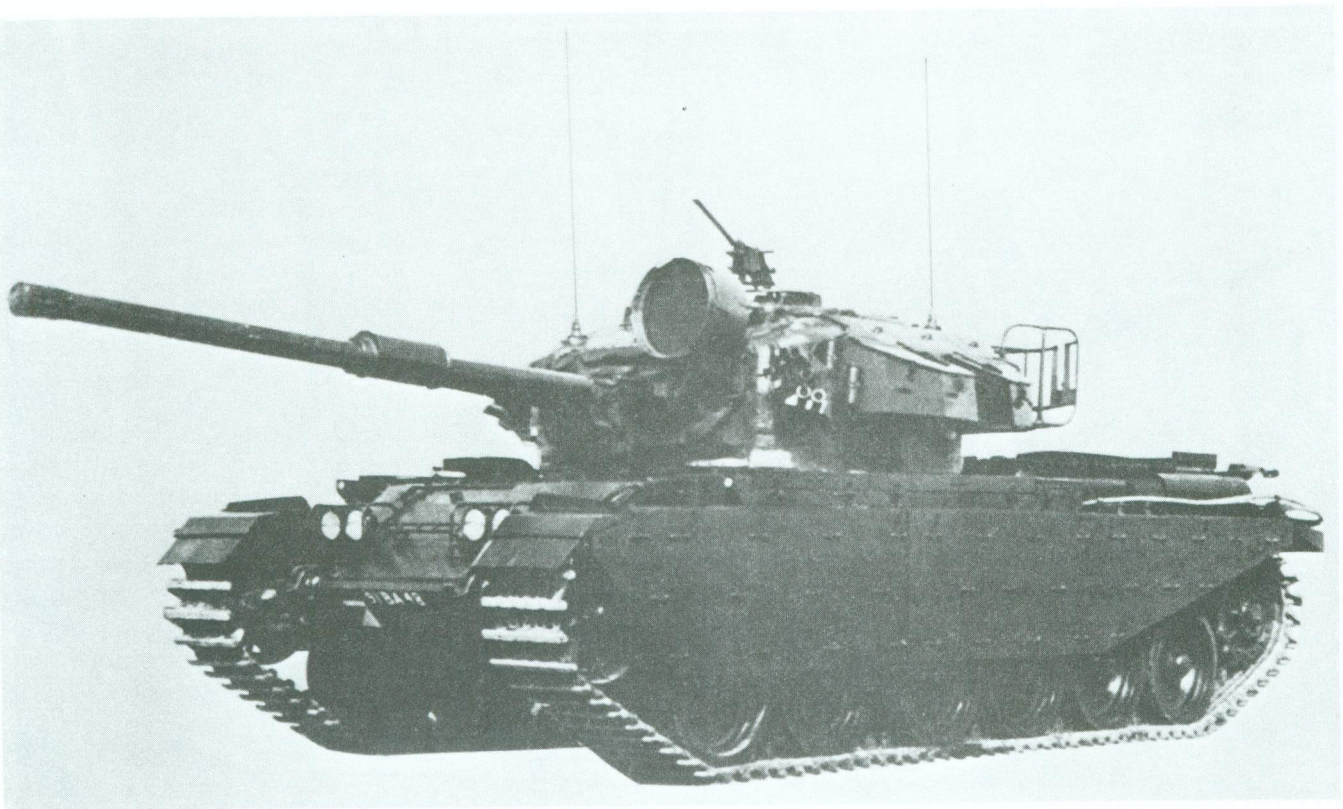


Figure 49. British tank, Centurion.

5. Speed: 30 miles per hour.

6. Cruising range: 310 miles.

(*c*) *Armament.* One 152-mm gun launcher, one 7.62-mm and one caliber .50 machinegun, and 8 grenade launchers. The missile system is classified.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 37°/60%.

2. Ditch crossing capability: 8 feet 6 inches.

3. Fording capability: 4 feet (no fording kit).

4. Vertical obstacle climbing capability: 3 feet.

b. Great Britain.

(1) *Centurion (fig 49).*

(*a*) *General description.* There were 13 Marks of the Centurion. Basically, the recognition features are the same for Marks 7 thru 12. The Centurion mounts a 105-mm high velocity gun with a bore evacuator located approximately 2/3 down the barrel from the muzzle end. The turret is easily recognizable by the angular boxes located on the left side, and the flat sloping sides. It has two smoke grenade launchers of six tubes each located on the front of the turret, slightly back from the mantlet. The suspension system is easily recognizable by the six large road wheels which are partly obscured by the skirting armor extending down the sides of the tank. Other features are the flat, angular front glacis, and the square-shaped front fenders.

(*b*) *Vehicle characteristics (Mark 9).*

1. Weight: 51.0 short tons.

2. Height: 9 feet 10 inches.

3. Width: 11 feet 2 inches.

4. Length: 25 feet 8 inches.

5. Speed: 21.5 miles per hour.

6. Cruising range 150 miles.

(*c*) *Armament.* 105-mm high velocity gun, 1 x .50 caliber ranging machinegun, 2 x .30 caliber machineguns, one mounted coaxially and one mounted on the commander's cupola.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 35°/57%.

2. Ditch crossing capability: 11 feet.

3. Fording capability: unprepared 4 feet 8 inches (with snorkel 15 feet).

4. Vertical obstacle climbing capability: 3 feet.

(2) *Vickers (fig 50).*

(*a*) *General description.* Recognition features are the 105-mm gun with the bore evacuator approximately 2/3 down the barrel from the muzzle end, the six large road wheels, the straight sided turret, and the ribbed track shield.

(*b*) *Vehicle characteristics.*

1. Weight: 42.5 short tons.

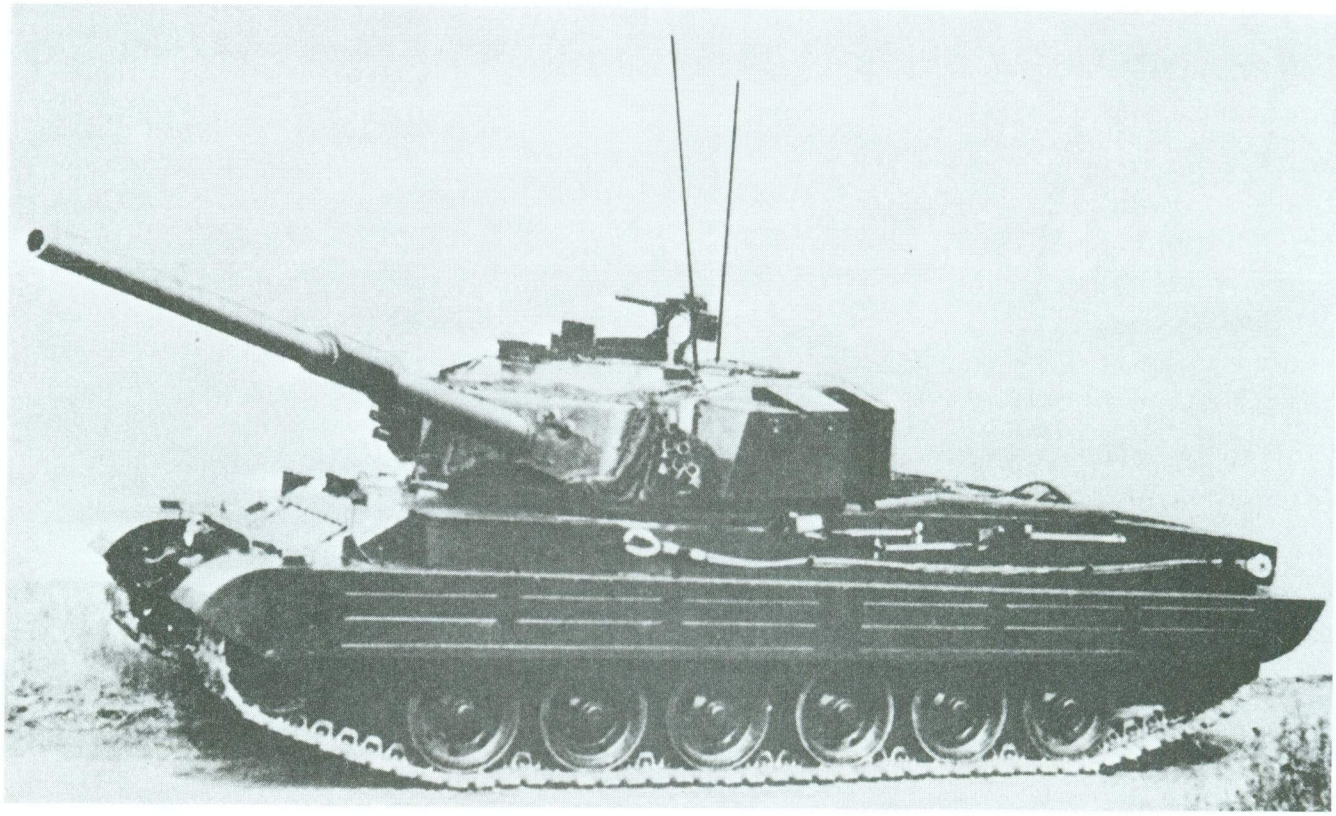


Figure 50. British tank, Vickers.

Figure 51. British tank, Chieftain.

2. Height: 8 feet.

3. Width: 10 feet 5 inches.

4. Length: 23 feet 11 inches.

5. Speed: 35 miles per hour.

6. Cruising range: 325 miles, 420 with auxiliary fuel tanks.

(*c*) *Armament.* 105-mm high velocity gun, .50 caliber ranging machinegun, one coaxial .30 caliber machinegun. Provision is made for a detachable pedestal-mounted .30 caliber machinegun on the commander's cupola.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 35°/57%.

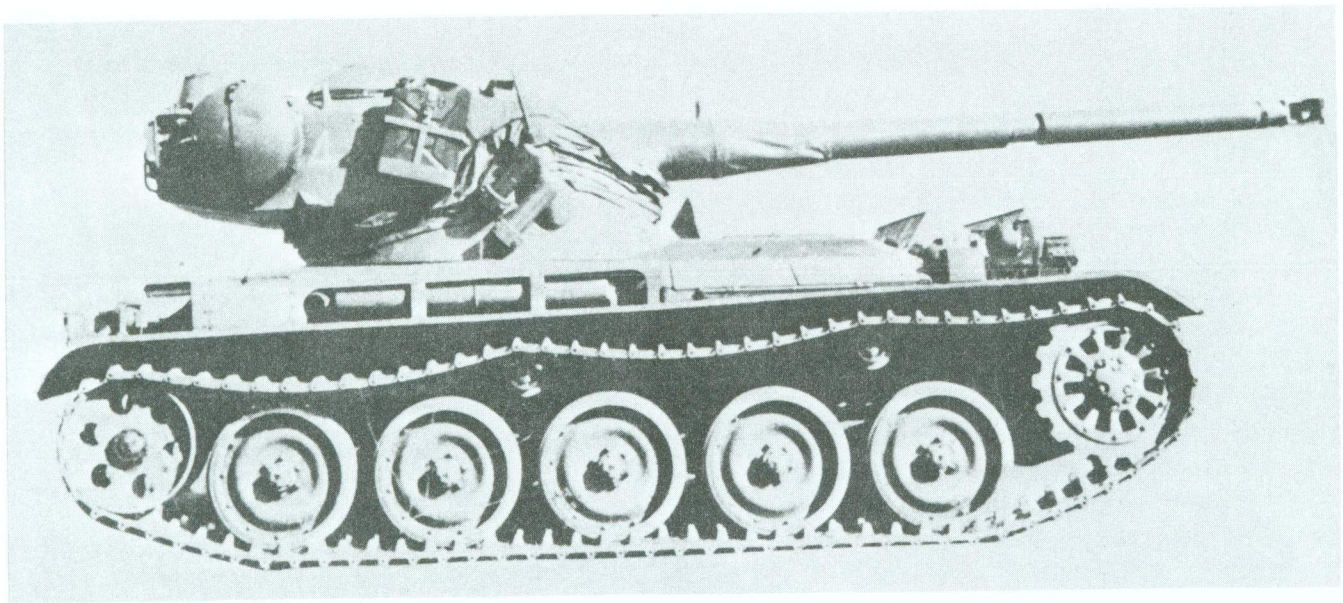
2. Ditch crossing capability: 8 feet.

3. Fording capability: unprepared 3 feet 8 inches; with preparation 7.3 feet.

4. Vertical obstacle climbing capability: 3 feet.

(3) *Chieftain (fig 51).*

(*a*) *General description.* The Chieftain is



① 90-mm.

Figure 52. French tank, AMX–13.

the current main battle tank of the United Kingdom, and mounts a 120-mm high velocity tank gun as main armament. The Chieftain is readily recognizable by its extremely large gun with the bore evacuator approximately one third down from the muzzle end, and the asbestos-wrapped gun tube. Other features are the six large road wheels, skirting armor, well rounded turret with grenade launchers on each side, and the armor enclosed searchlight on the right side of the turret. Another unique feature is the commander's cupola which is contrarotating and can be opened to an umbrella-like position, and the 7.62-mm machinegun mounted on the front of the cupola which can be aimed and fired from the inside of the tank.

(*b*) *Vehicle characteristics.*

1. Weight: 57.9 short tons.
2. Length: 25 feet 1 inch.
3. Width: 11 feet 10 inches.
4. Height: 9 feet.
5. Speed: 25.3 miles per hour.
6. Cruising range: 250 miles.

(*c*) *Armament.* 120-mm high velocity gun as main armament, 1 x .50 caliber ranging machinegun, 2 x 7.62-mm machineguns, one coaxial and one mounted on the commander's contrarotating cupola.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 35°/57%.
2. Ditch crossing capability: 10 feet 4 inches.
3. Fording capability: 3 feet 6 inches.
4. Vertical obstacle climbing capability: 2 feet 11 inches.

c. France.

(1) *AMX–13 (① and ②, fig 52).*

(*a*) *General description.* The AMX–13 is a family of light tanks in four versions mounting 75-mm, 90-mm (① fig 52), and 105-mm guns. Two types of missiles are mounted in conjunction with the 75-mm gun: the SS–11 (② fig 52) and the Harpon antitank missiles. Both are mounted in a group of four. The tank is easily recognizable by its hull which is sloped to the rear, the turret which sits slightly to the rear of center, the oscillating mass of the turret, the five single road wheels with four support rollers, with the track angled from front to rear. The 75-mm has a single baffle muzzle brake, the 105 a double baffle muzzle brake.

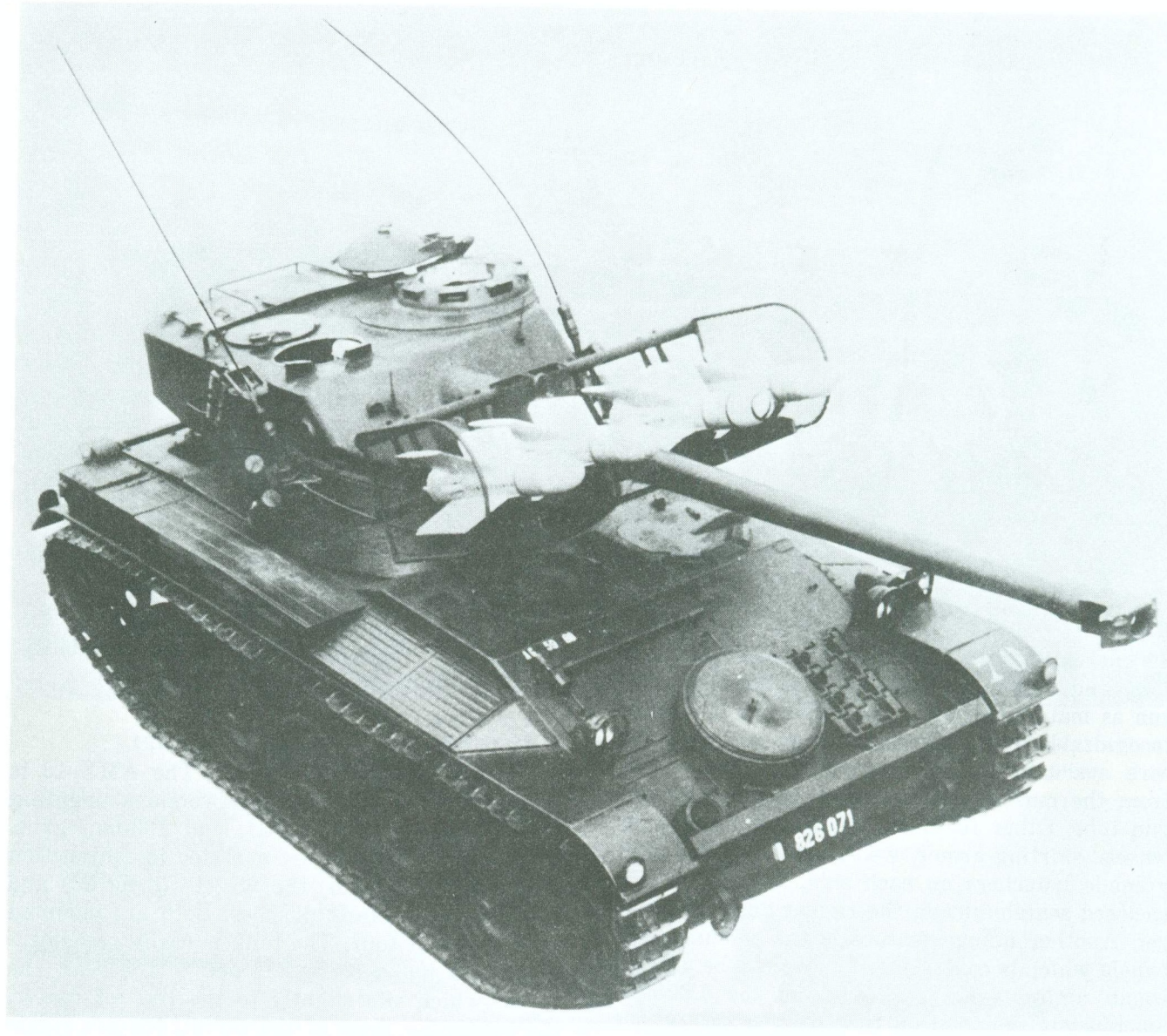
(*b*) *Vehicle characteristics.*

1. Weight: 16.4 short tons.
2. Height: 9 feet 9 inches.
3. Length: 15 feet.
4. Width: 8 feet 3 inches.
5. Speed: 37 miles per hour.
6. Cruising range: 211 miles.

(*c*) *Armament.* 75-mm, 90-mm, or 105-mm guns, four SS–11 or Harpon missiles with some of the 75-mm. 1 x 7.5-mm machinegun coaxially mounted. A 7.5-mm machinegun can be mounted on the turret.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 31°/52%.
2. Ditch crossing capability: 6 feet 2 inches.



② 75-mm gun and four SS–1 antitank missiles.

Figure 52—Continued.

3. Fording capability: 2 feet 7 inches.

4. Vertical obstacle climbing capability: 2 feet 1 inch.

(2) *AMX–30 (fig 53).*

(*a*) *General description.* The 105-mm gun full-tracked, combat tank AMX–30 is a heavily armored, relatively low silhouette combat vehicle. Its main gun has no muzzle brake or bore evacuator, but has a four section aluminum heat shield. The turret is composed of one piece of cast armor steel. This tank provides NBC protection for the crew, 100 percent of the outside air is filtered. The vehicle can be identified by its hemispherical turret with grenade dispenser and the square infrared searchlight mounted left of the main gun.

(*b*) *Vehicle characteristics.*

1. Weight: 35.8 short tons.

2. Height: 8 feet 3 inches.

3. Length: 20 feet 11 inches.

4. Width: 10 feet 2 inches (approximate).

5. Speed: 40 miles per hour.

6. Cruising range: 300 miles.

(*c*) *Armament.* One 105-mm, one 12.7-mm, and one 7.62-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 31°/52%.

2. Ditch crossing capability: 9 feet 7 inches.

3. Fording capability: 7 feet 2 inches (with snorkel 13 feet 2 inches).

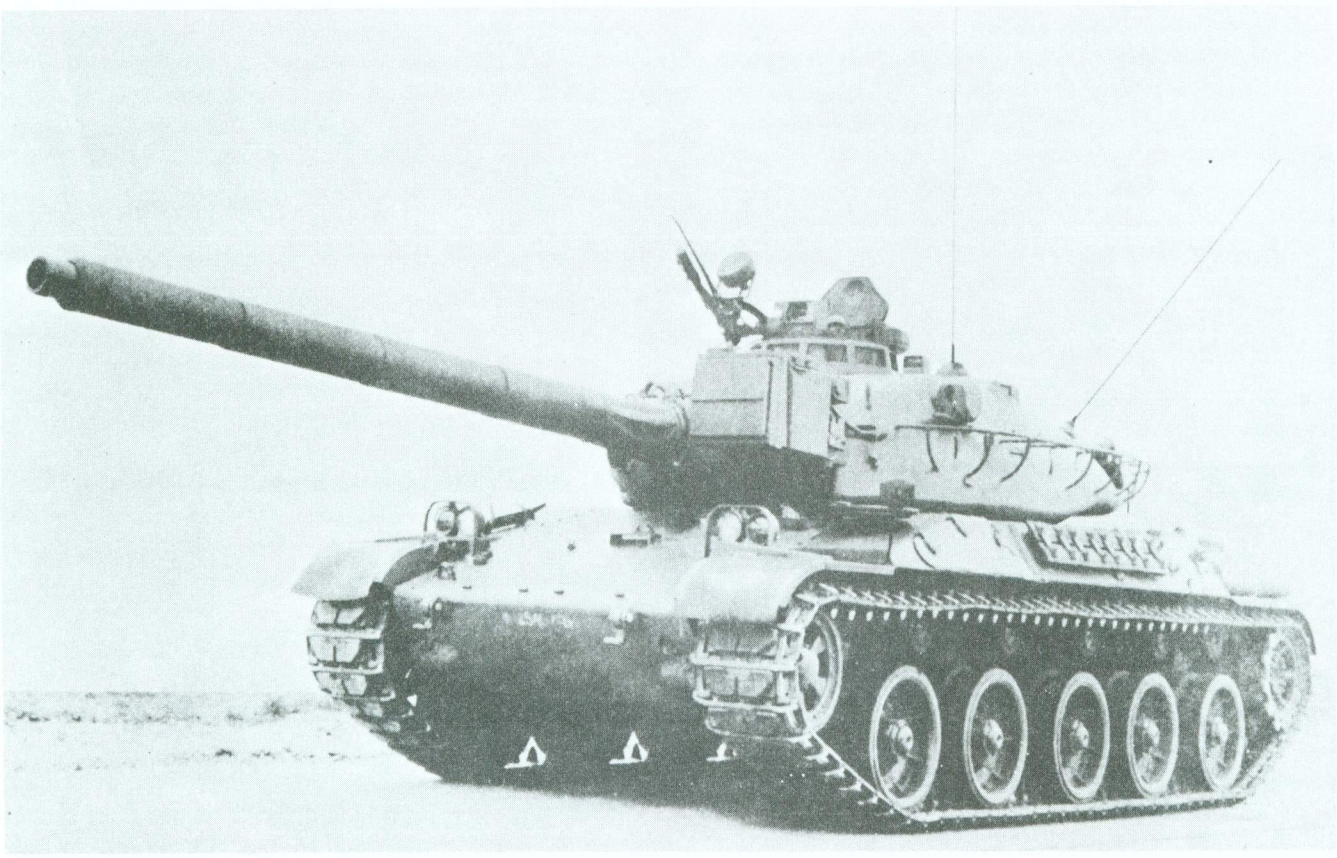


Figure 53. French tank, AMX–30.

4. Vertical obstacle climbing capability: 3 feet.

d. Switzerland. PZ–61 (fig 54).

(1) *General description.* The PZ–61, main battle tank of Switzerland, mounts the British 105-mm high velocity gun as main armament, with a bore evacuator halfway down the tube, and has a 20-mm cannon as coaxial armament. Other recognition features are the dome-like turret with two raised hatches on top, the three, single tube smoke grenade launchers on each side of the turret, the sloping rear deck, the six dual roadwheels with the six holes in each wheel, and the three support rollers.

(2) *Vehicle characteristics.*

(*a*) Weight: 40.7 short tons.

(*b*) Height: overall 8 feet 11 inches.

(*c*) Length: 21 feet 11 inches.

(*d*) Width: 10 feet.

(*e*) Speed: 31 miles per hour.

(*f*) Cruising range: 186 miles.

(3) *Armament.* 105-mm high velocity, 20-mm cannon coaxially mounted as secondary armament and one 7.5-mm machinegun mounted on the turret roof.

(4) *Mobility characteristics:*

(*a*) Slope ascending capability: 36°/59%.

(*b*) Ditch crossing capability: 9 feet 2 inches.

(*c*) Fording capability: unprepared 3 feet 7 inches (with snorkel 15 feet, approximately).

(*d*) Vertical obstacle climbing capability: 2 feet 6 inches.

e. West Germany. Leopard (fig 55).

(1) *General description.* The leopard is a full-tracked, relatively low silhouette combat vehicle armed with a 105-mm high velocity gun. The hull and turret are designed to give maximum protection against an atomic blast. The hull has particularly clean lines, with one large exhaust grille on each side. The suspension has seven roadwheels and four support rollers on each side.

(2) *Vehicle characteristics.*

(*a*) Weight: 39.3 short tons.

(*b*) Height: 7 feet 10 inches.

(*c*) Length: 22 feet 10 inches.

(*d*) Width: 10 feet 8 inches.

(*e*) Speed: 43.5 miles per hour.

(*f*) Cruising range: 310 miles.

(3) *Armament.* One 105-mm gun, one caliber .50 and one 7.62-mm machinegun.

(4) *Mobility characteristics.*

(*a*) Slope ascending capability: 31°/52%.

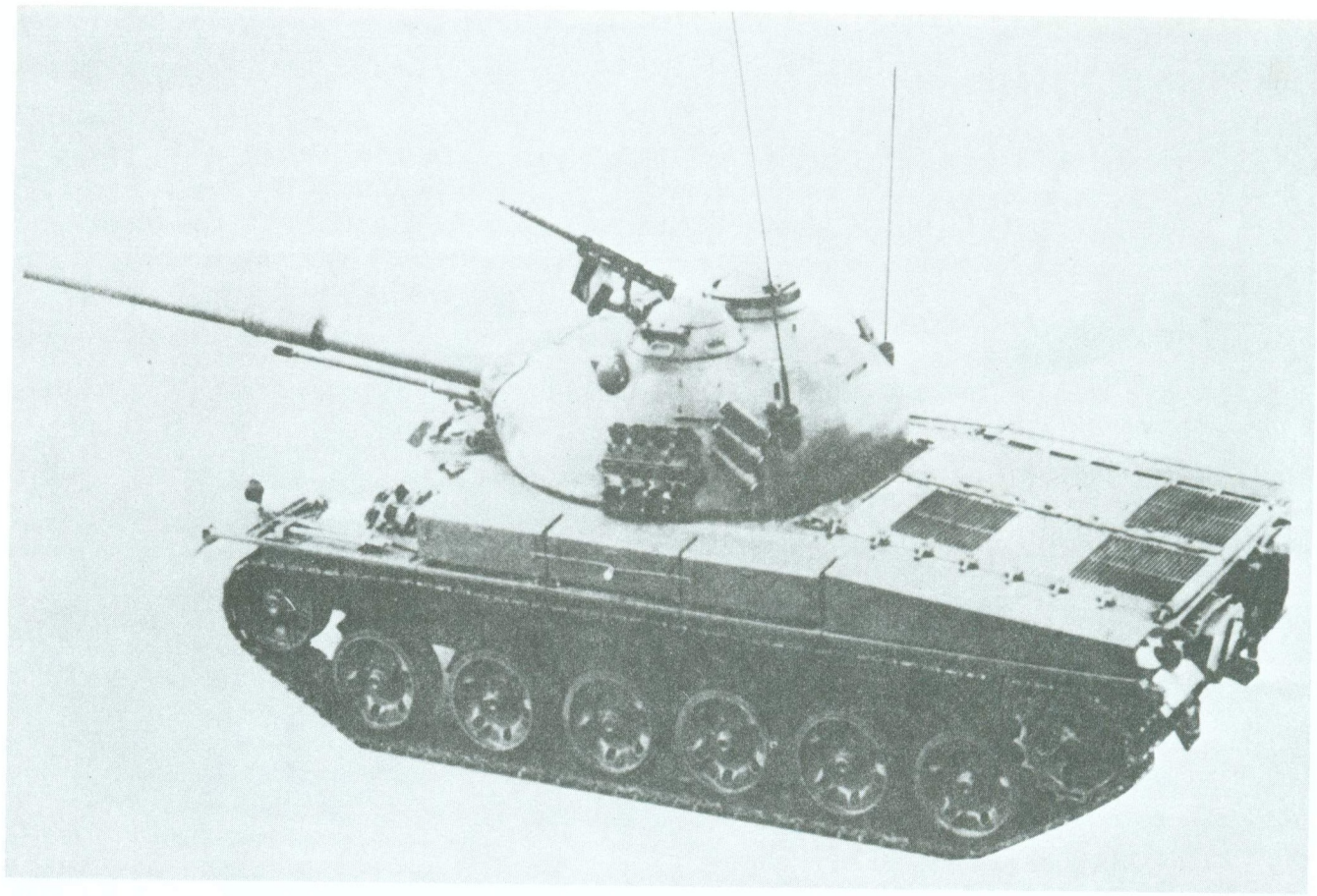


Figure 54. Swiss tank, PZ61.

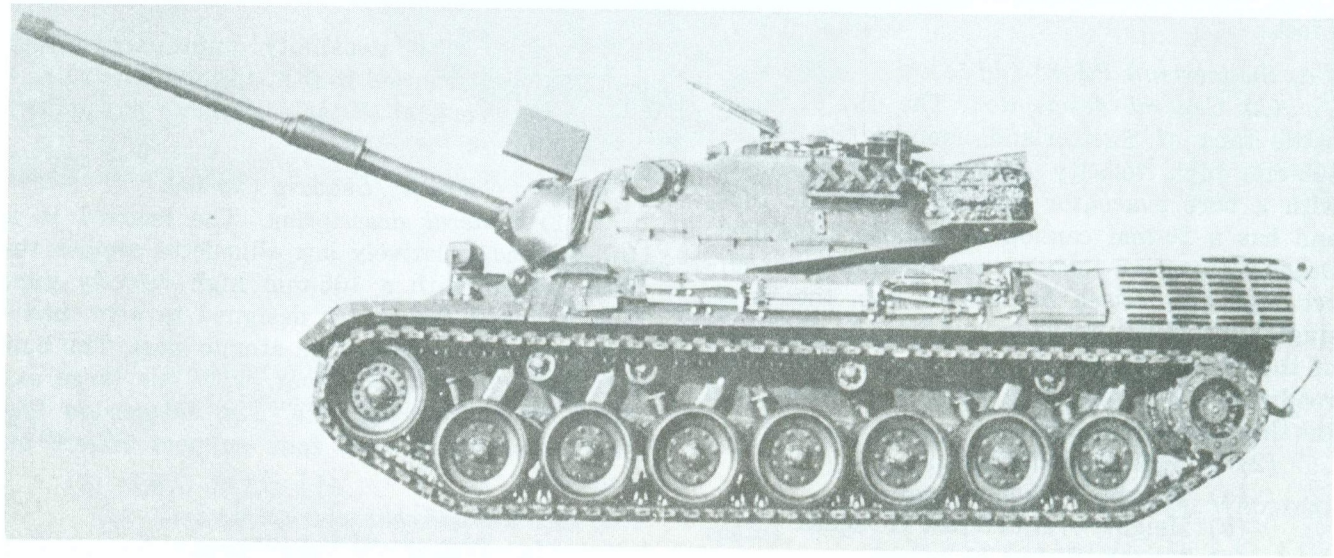


Figure 55. West German tank, Leopard.

(*b*) Ditch crossing capability: 9 feet 6 inches.

(*c*) Fording capability: 3 feet 11 inches (unprepared) (15 feet with snorkel).

(*d*) Vertical obstacle climbing capability: 3 feet 6 inches.

f. Soviet Union.

(1) *T34/85 (fig 56).*

(*a*) *General description.* Despite its early introduction (1944), the T34/85 is still considered a good armored vehicle. It features heavily sloped armor, a low silhouette, good cross-country per-

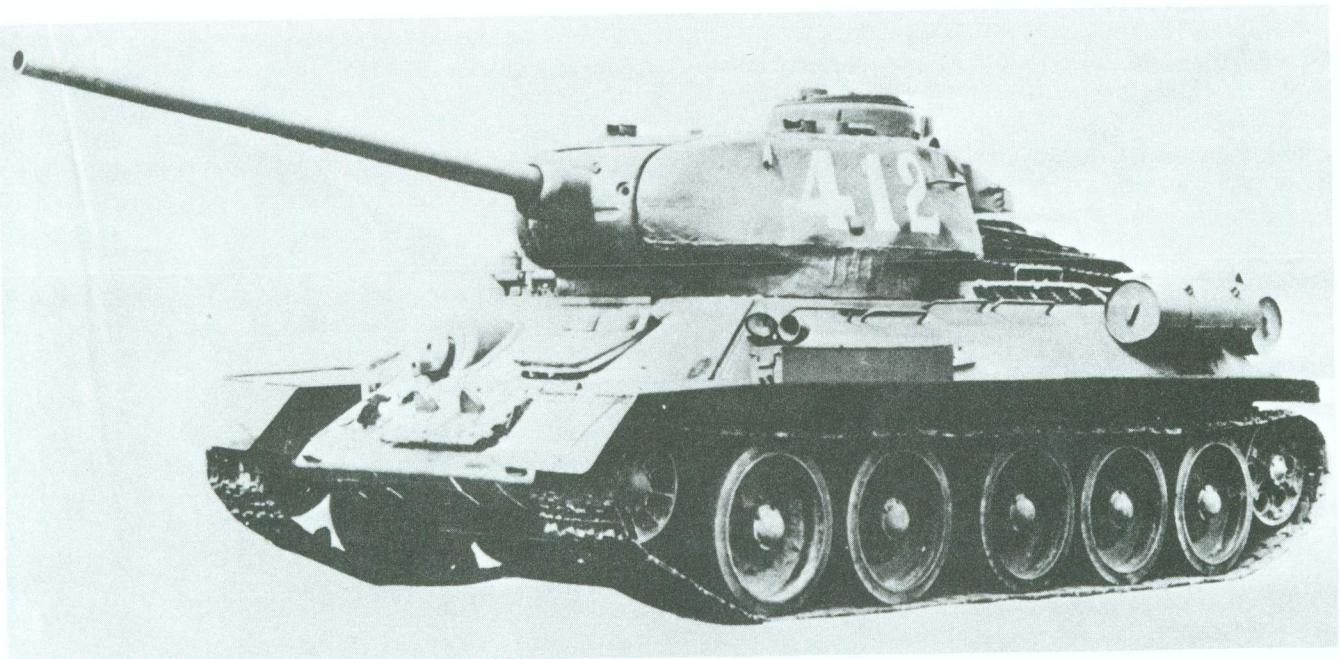


Figure 56. Russian tank, T34/85.

formance, effective firepower, high maximum speed, and relatively good cruising range. It can be readily recognized by its five large Christie-type roadwheels, absence of support rollers, a well-sloped front plate with a hinged driver's latch, a ball-mounted machinegun, and a hexagonal turret housing a long-barreled 85-mm gun without muzzle brake.

(*b*) *Vehicle characteristics.*

1. Weight: 35 short tons.

2. Height: 8 feet 6 inches.

3. Length: 20 feet 4 inches.

4. Width: 9 feet 10 inches.

5. Speed: 35 miles per hour (approximate).

6. Cruising range: 190 miles (without auxiliary tanks), with auxiliary tanks, 310 miles.

(*c*) *Armament.* One 85-mm gun and two 7.62-mm machineguns. The 85-mm gun will penetrate 114-mm of armor at 502 meters. The maximum effective range of the 7.62-mm machinegun is 900 meters.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 8 feet 3 inches.

3. Fording capability: 4 feet 4 inches (18 feet with snorkel).

4. Vertical obstacle climbing capability: 2 feet 4 inches.

(2) *T54 (fig 57).*

(*a*) *General description.* The T54 is the standard Soviet medium tank. Numerous modifications on the T54 have resulted in new submodels. The T54 has excellent mobility and well-shaped armor. There are five large road wheels with a larger space between the first and second wheels than the others; no support rollers. The turret has the shape of a flattened, elongated hemisphere. The T54 has a bore evacuator near the muzzle of the main gun. All T54 models may have infrared searchlights for the commander and the gunner.

(*b*) *Vehicle characteristics.*

1. Weight: 40 short tons.

2. Height: 7 feet 11 inches.

3. Length: 21 feet 4 inches.

4. Width: 10 feet 9 inches.

5. Speed: 30 miles per hour.

6. Cruising range: without auxiliary tanks 250 miles; with auxiliary tanks 420 miles.

(*c*) *Armament.* One D10T 100-mm tank gun, one 12.7-mm machinegun, and two 7.62-mm machineguns, one of which is coaxially-mounted on the turret; the second machinegun is fixed in the hull front.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 8 feet 10 inches.

3. Fording capability: 4 feet 7 inches (18 feet with snorkel).

4. Vertical obstacle climbing capability: 2 feet 7 inches.

(3) *T55 (fig 58).*

(*a*) *General description.* The T55 is an

Figure 57. Russian tank, T54.

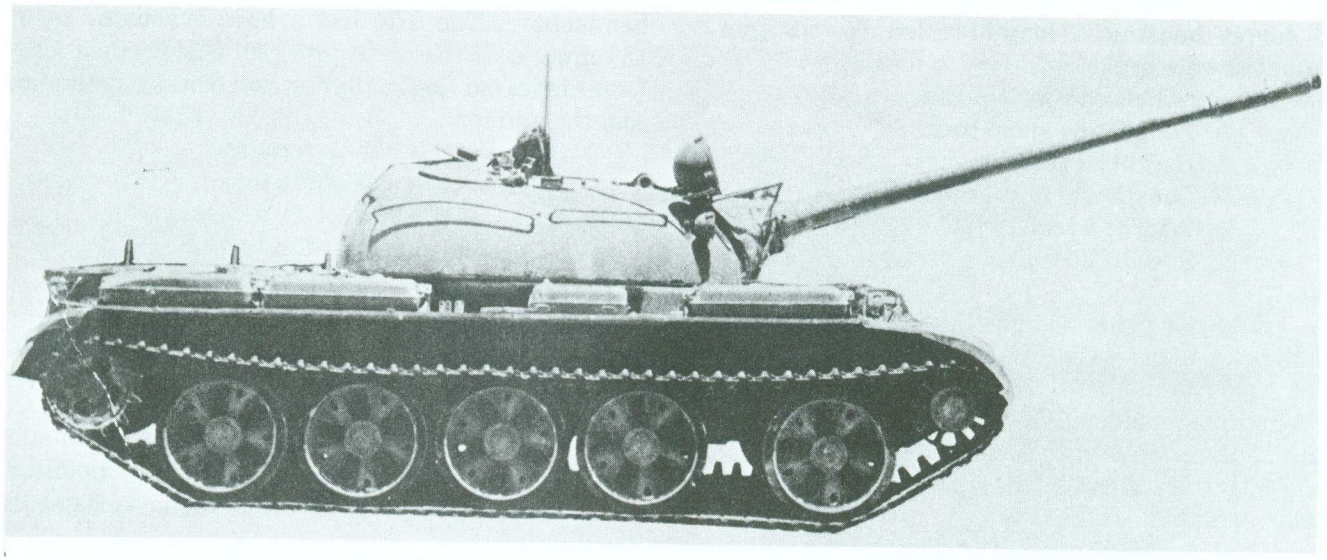


Figure 58. Russian tank, T55.

improved version of the T54 series of medium tanks. The T55 mounts the same 100-mm tank gun (with a conspicuous bore evacuator on the end of the gun tube) as the T54B. The T55 may have the 12.7-mm antiaircraft machinegun and the raised ring around the loader's hatch (right-hand hatch). The T55 mounts infrared searchlights. It can be identified by the spacing between the first and second road wheels.

(*b*) *Vehicle characteristics.*

1. Weight: 40 short tons.
2. Height: 7 feet 9 inches.
3. Length: 21 feet 2 inches.
4. Width: 10 feet 7 inches.
5. Speed: 30 miles per hour.
6. Cruising range: without auxiliary

Figure 59. Russian tank, T62.

tanks, 250 miles; with auxiliary tanks, 375 miles.

(*c*) *Armament.* One 100-mm main gun and two 7.62-mm machineguns. The T55 may be seen with or without the 12.7 machinegun mounted on the turret roof. (Latest models have discontinued the bow machinegunners.)

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 8 feet 10 inches.

3. Fording capability: 4 feet 7 inches (18 feet with snorkel).

4. Vertical obstacle climbing capability: 2 feet 7 inches.

(4) *T62 (fig 59).*

(*a*) *General description.* The T62 is the newest Soviet medium tank. It is readily distinguishable by its five large road wheels and the absence of support rollers. The T62 has a well-rounded turret, comparatively low silhouette, and well-sloped frontal armor. The main gun is larger and has a bore evacuator located approximately 1/3 of the distance from the muzzle, which, combined with the absence of spacing between the road wheels, differentiates the T62 from the T54/T55 series of medium tanks.

(*b*) *Vehicle characteristics.*

1. Weight: 40.2 short tons.

2. Height: 7 feet 10 inches.

3. Length: 22 feet.

4. Width: 10 feet 11 inches.

5. Speed: 30 miles per hour.

6. Cruising range: 250 miles.

(*c*) *Armament.* 115-mm smoothbore main gun and one 7.62-mm machinegun. The 12.7-mm machinegun may be mounted on the turret roof.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 9 feet 2 inches.

3. Fording capability: 4 feet 7 inches (18 feet with snorkel).

4. Vertical obstacle climbing capability: 2 feet 7 inches.

(5) *PT76/85 (fig 60).*

(*a*) *General description.* The PT76 is a lightly armored, very mobile, amphibious vehicle. It has six medium-size road wheels and no support rollers. It has a round turret with well-sloped sides and a large hatch. There are two openings in the rear of the hull for the hydrojet water propulsion system. The chassis, with extensive modifications, is used in several other vehicles; for example, the BTR–50P, APC.

(*b*) *Vehicle characteristics.*

1. Weight: 15.4 short tons.

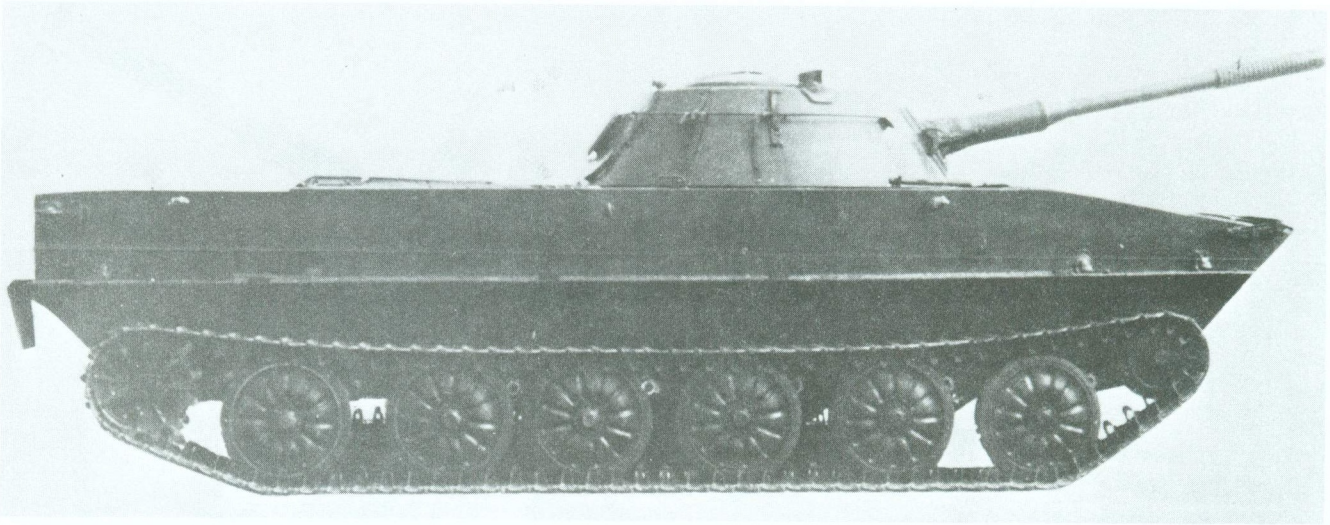


Figure 60. Russian amphibious tank, PT76/85.

Figure 61. Russian tank, JS–3.

2. Height: 7 feet 2 inches.
3. Length: 22 feet 7 inches.
4. Width: 10 feet 3 inches.
5. Speed: land, 27 miles per hour; water, 6 miles per hour.
6. Cruising range: without auxiliary

Figure 62. Russian tank, T10.

tanks 160 miles.

(*c*) *Armament.* One 76-mm gun and one 7.62-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 38°/62%.

2. Ditch crossing capability: 9 feet 2 inches.

3. Fording capability: amphibious.

4. Vertical obstacle climbing capability: 3 feet 7 inches.

(6) *JS–3 (fig 61).*

(*a*) *General description.* The JS–3 is the third tank developed in the Joseph Stalin series. The dome-shaped cast turret presents a heavily sloped surface to all quarters. The heavy plates of the hull front are brought to a point, considerably increasing the penetration problem. These two features, together with the torsion suspension employing six road wheels and three support rollers per side, offer excellent recognition details. An improved model of the JS–3 is the JS–4, which externally resembles the JS–3; however, it offers improved performance characteristics.

(*b*) *Vehicle characteristics.*

1. Weight: 51 short tons.

2. Height: 8 feet.

3. Length: 22 feet 4 inches.

4. Width: 10 feet.

5. Speed: 23 miles per hour (maximum).

6. Cruising range: without auxiliary tanks, 112 miles.

(*c*) *Armament.* One 122-mm gun, one 12.7-mm and one 7.62-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 36°/59%.

Figure 63. Russian tank, T–10M.

2. Ditch crossing capability: 8 feet 1 inch.

3. Fording capability: 4 feet 2 inches.

4. Vertical obstacle climbing capability: 3 feet 4 inches.

(7) *T10 (fig 62).*

(*a*) *General description.* The T10 is the first of the latest series of Soviet heavy tanks and is armed with an improved model of the 122-mm gun. The basic role of the T10 is that of a long range killer. In general appearance, the T10 resembles the JS–3 which it replaces. It can be distinguished from the JS–3 by the following: seven road wheels; gun with a bore evacuator; larger turret with a coaxially-mounted 12.7-mm machinegun; cut-off corners on rear fuel tanks, and increased angularity of hull armor. The vulnerability of this tank has been materially reduced by the increasing frontal armor thickness and angularity.

(*b*) *Vehicle characteristics.*

1. Weight: 53.9 short tons.

2. Height: 7 feet 10 inches.

3. Length: 23 feet 5 inches.

4. Width: 11 feet 7 inches.

5. Speed. 22 miles per hour.

6. Cruising range: without auxiliary tanks, 137 miles.

(*c*) *Armament.* One 122-mm gun and two 12.7-mm machineguns.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 32°/53%.

2. Ditch crossing capability: 9 feet 10 inches.

3. Fording capability: 4 feet.

4. Vertical obstacle climbing capability: 3 feet.

(8) *T–10M (fig 63).*

(*a*) *General description.* The T–10M is the latest modification of the heavy tank series. It closely resembles the T–10 with its seven small-diameter, all-steel roadwheels and three track support rollers per side. The turret, however, is sloped greater toward the front and its 122-mm main armament has a multibaffle muzzle brake, as opposed to the smaller double-baffle muzzle brake of the T–10, each has a bore evacuator to the rear of the muzzle brake. The T–10M may have a sheet metal "bustle" on the rear of the turret, but newer versions have replaced this with flat stowage boxes on the front of each fender. The larger 14.5-mm coaxial and turret roof machinegun may also aid in identifying this tank.

(*b*) *Vehicle characteristics.*

1. Weight: 53.1 short tons.

2. Height: 7 feet 10 inches.

3. Length: 23 feet.

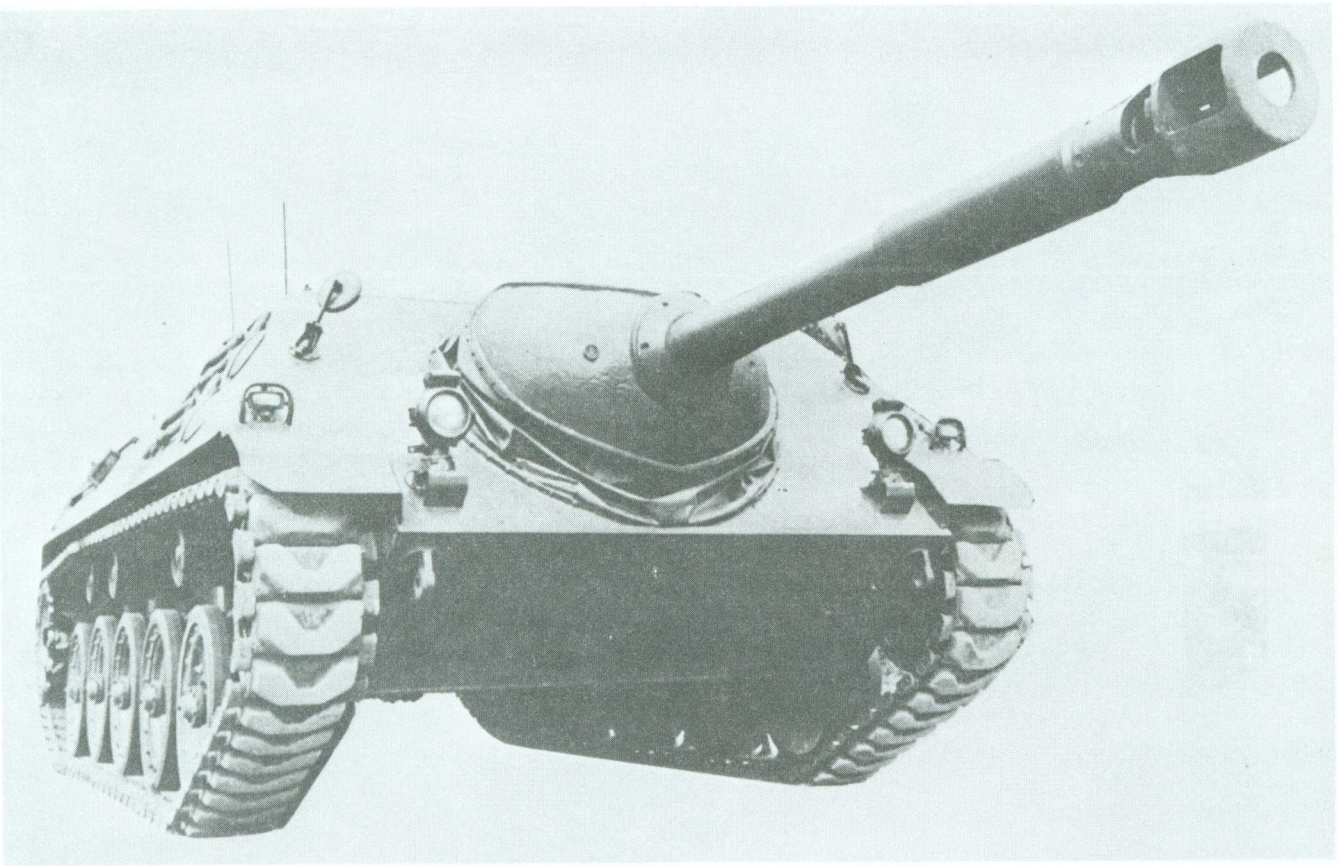


Figure 64. West German tank destroyer.

4. Width: 11 feet 8 inches.

5. Speed: 22 miles per hour.

6. Cruising range: 137 miles.

(*c*) *Armament.* One 122-mm gun and two 14.5-mm heavy machineguns.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 32°/53%.

2. Ditch crossing capability: 9 feet 10 inches.

3. Fording capability: 4 feet (18 feet with snorkel).

4. Vertical obstacle climbing capability: 3 feet.

101. Assault Guns (Tank Destroyers)

a. West Germany. Kanonen Jagdpanzer (fig 64).

(1) *General description.* This assault gun is reminiscent of the World War II German assault guns. Recognition features of this assault gun are the 90-mm gun with the double baffle muzzle brake, and bore evacuator immediately behind the muzzle brake, the five dual roadwheels each side with three support rollers, the protruding mantlet, and the armor enclosed hull.

(2) *Vehicle characteristics.*

(*a*) Weight: 25.3 short tons.

(*b*) Height: 6 feet 7 inches.

(*c*) Length: 29 feet 6 inches.

(*d*) Width: 9 feet 10 inches.

(*e*) Speed: 50 miles per hour.

(*f*) Cruising range: 320 miles.

(3) *Armament.* One 90-mm gun, one coaxially mounted, 7.62 machinegun and one roof mounted 7.62 machinegun.

(4) *Mobility characteristics.*

(*a*) Slope ascending capability: 30°/50%.

(*b*) Ditch crossing capability: 8 feet 4 inches.

(*c*) Fording capability: 4 feet 11 inches.

(*d*) Vertical obstacle climbing capability: 2 feet 7 inches.

b. Soviet Union.

(1) *ASU–57 (fig 65).*

(*a*) *General description.* The ASU–57 is a mobile, low silhouette, lightly armored, air-droppable vehicle found in airborne units. This vehicle has three medium-sized road wheels, two support rollers, and a trailing compensating idler wheel in the rear. It has narrow tracks, a sloping front, and an open box-like fighting compartment with vertical sides. The long gun is mounted low in the front plate. The muzzle brake may be either a long multibaffle-type, or the doublebaffle type shown in figure 65.

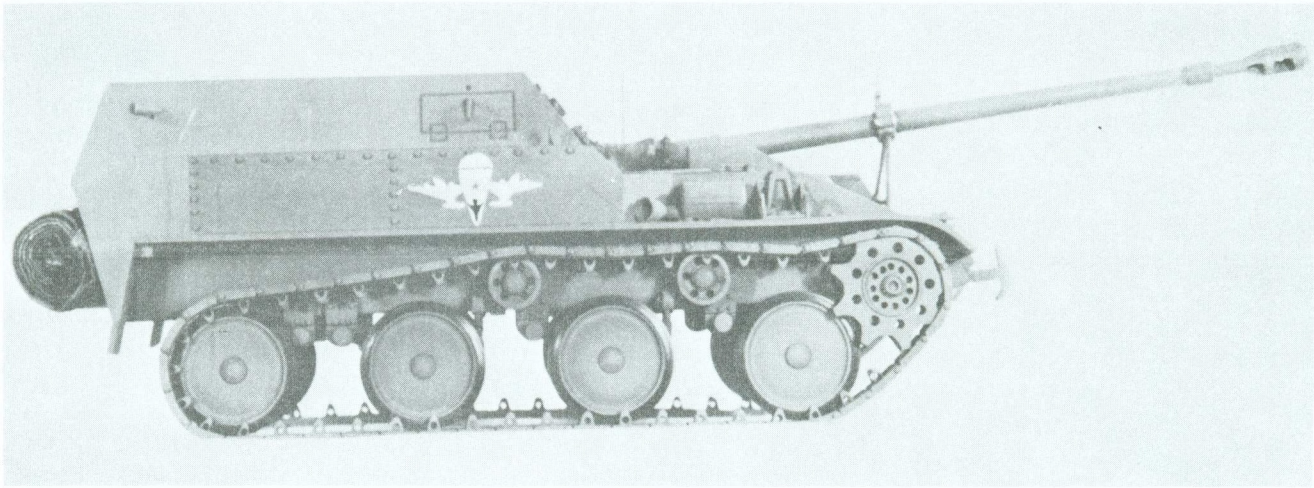


Figure 65. Russian assault gun, ASU–57.

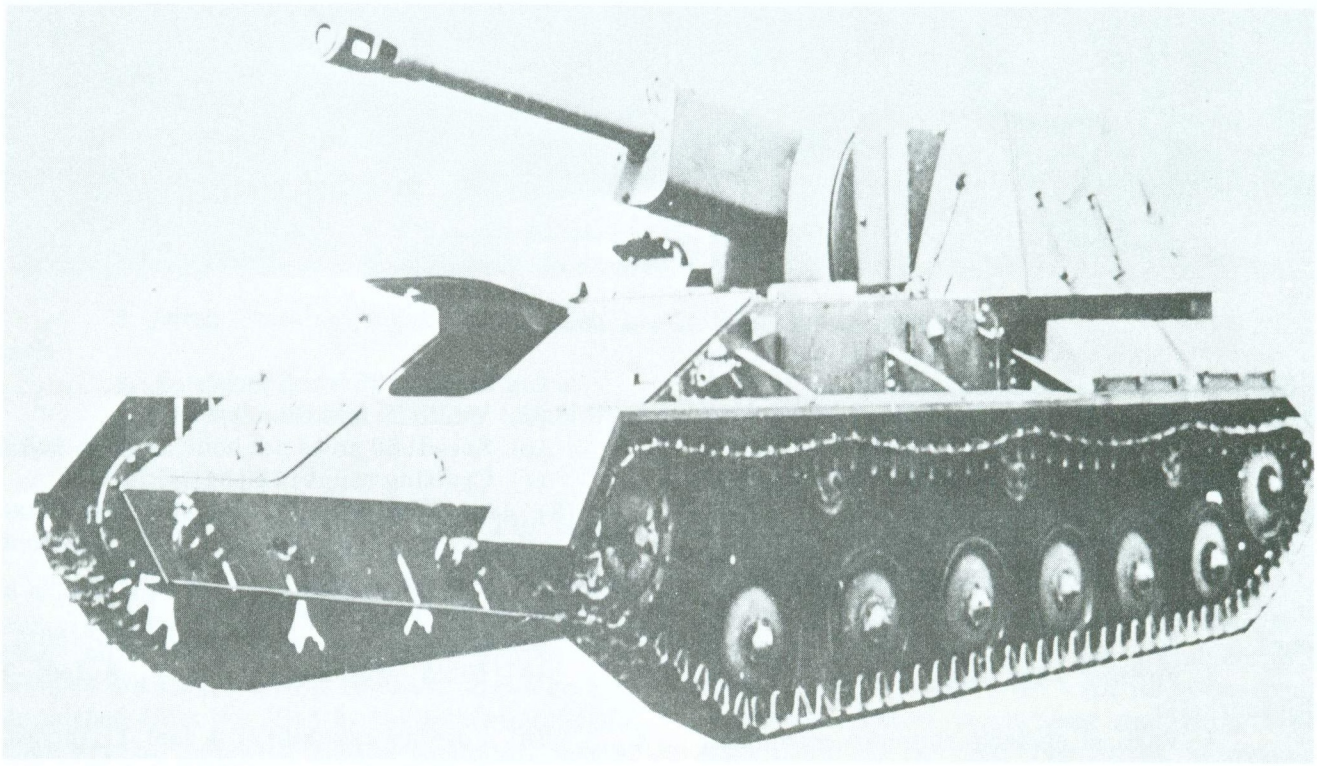


Figure 66. Russian assault gun, SU–76.

(*b*) *Vehicle characteristics.*

1. Weight: 3.69 short tons.

2. Height: 4 feet 8 inches.

3. Length: 11 feet 5 inches.

4. Width: 6 feet 10 inches.

5. Speed: 28 miles per hour.

6. Cruising range: 155 miles.

(*c*) *Armament.* One 57-mm gun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 4 feet 7 inches.

3. Fording capability: 2 feet 4 inches.

4. Vertical obstacle climbing capability: 1 foot 7 inches.

(2) *SU–76 (fig 66).*

(*a*) *General description.* The SU–76 is an open-topped armored and tracked vehicle with a fixed, raised superstructure. It has six small road wheels and three track support rollers. The recoil and recuperator mechanism is prominently extended from the superstructure which is mounted at the rear of the chassis.

(*b*) *Vehicle characteristics.*

1. Weight: 12.3 short tons.

2. Height: 6 feet 9 inches.

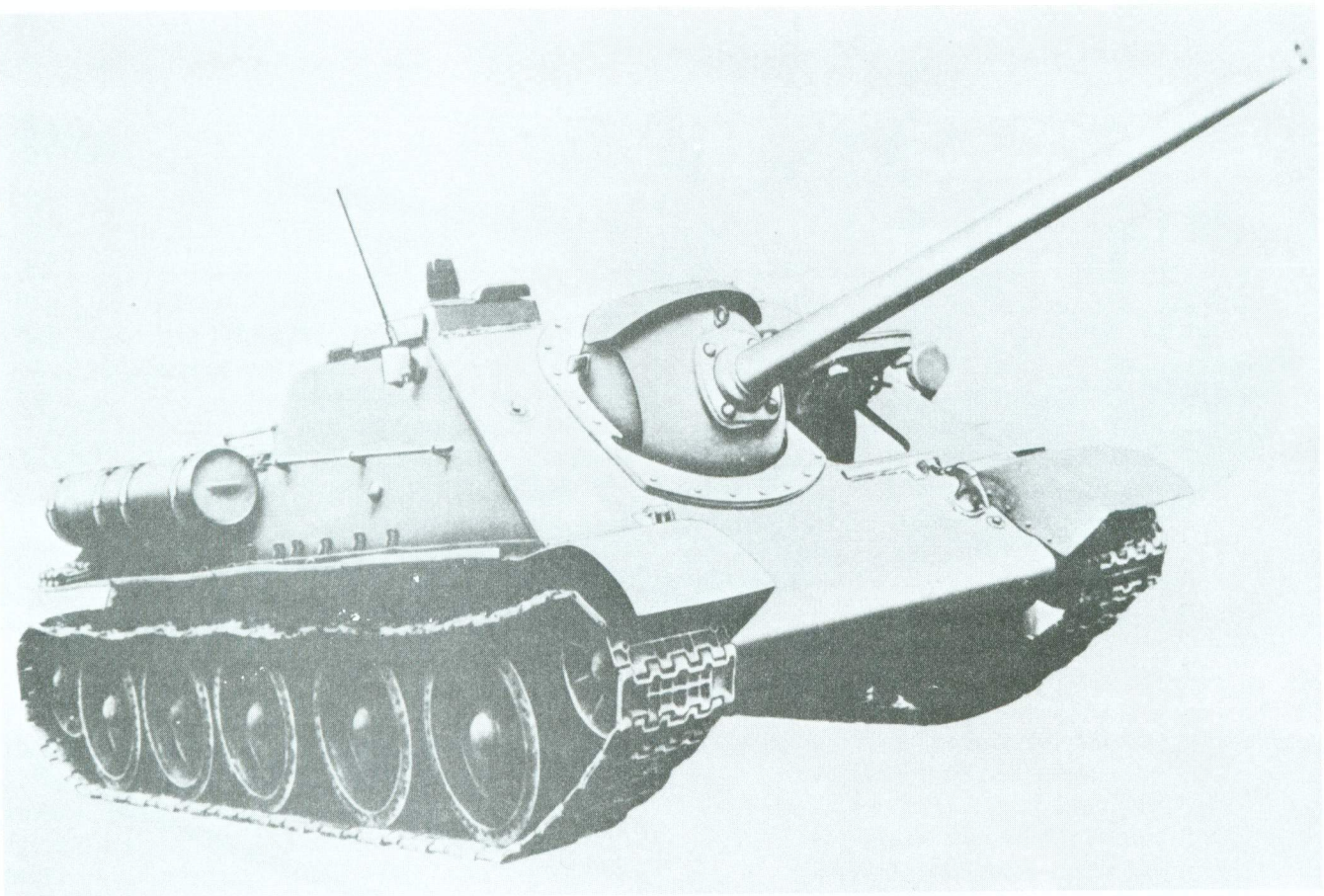


Figure 67. Russian assault gun, SU–85.

3. Length: 16 feet 5 inches.
4. Width: 8 feet 11 inches.
5. Speed: 28 miles per hour.
6. Cruising range: 225 miles.
(*c*) *Armament.* One 76-mm gun.
(*d*) *Mobility characteristics.*
1. Slope ascending capability: 30°/50%.
2. Ditch crossing capability: 6 feet 7 inches.
3. Fording capability: 3 feet.
4. Vertical obstacle climbing capability: 2 feet 2 inches.

(3) *SU–85 (fig 67).*

(*a*) *General description.* The SU–85 assault gun uses the T–34 chassis with its five large road wheels having a larger spacing between the second and third road wheels. A rectangular superstructure sits well forward on the chassis so that the hull and superstructure front form a straight surface well sloped towards the rear. Notice that the right side of the superstructure is flat; this feature will serve to differentiate the SU–85 from the SU–100 which is nearly identical in appearance. The gun tube, like the same gun in the T–34/85 tank, does not have either a bore evacuator or a muzzle brake.

(*b*) *Vehicle characteristics.*
1. Weight: 32.5 short tons.
2. Height: 7 feet 6 inches.
3. Length: 20 feet 3 inches.
4. Width: 9 feet 10 inches.
5. Speed: 35 miles per hour.
6. Cruising range: 186 miles.
(*c*) *Armament.* One 85-mm gun.
(*d*) *Mobility characteristics.*
1. Slope ascending capability: 35°/57%.
2. Ditch crossing capability: 7 feet 6 inches.
3. Fording capability: 4 feet 2 inches.
4. Vertical obstacle climbing capability: 2 feet 4 inches.

(4) *ASU–85 (fig 68).*

(*a*) *General description.* The ASU–85 can be recognized by its six road wheels using the flat-track suspension; the forward-placed superstructure with the roof of the engine compartment, at the rear, nearly as tall as the superstructure itself; a centered duct-work from front to rear on the superstructure roof and the fun with a double-baffle muzzle brake and a bore evacuator set slightly rearward from the muzzle brake.

(*b*) *Vehicle characteristics.*

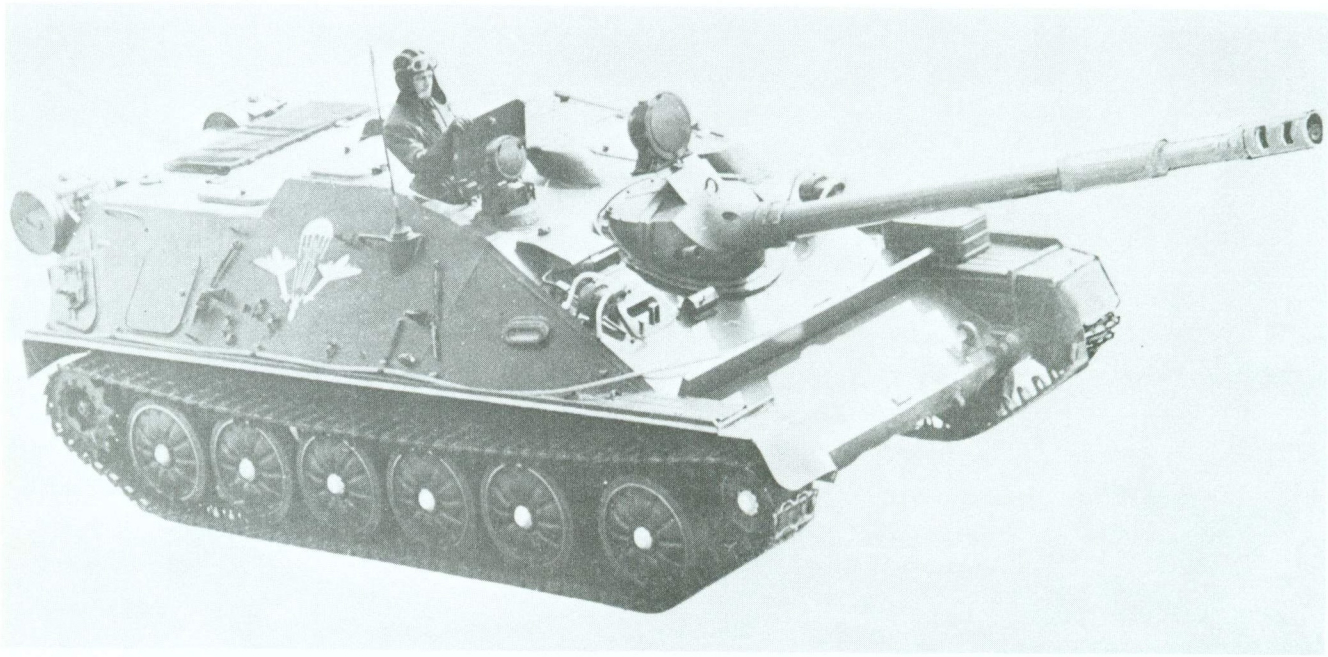


Figure 68. Russian assault gun, ASU–85.

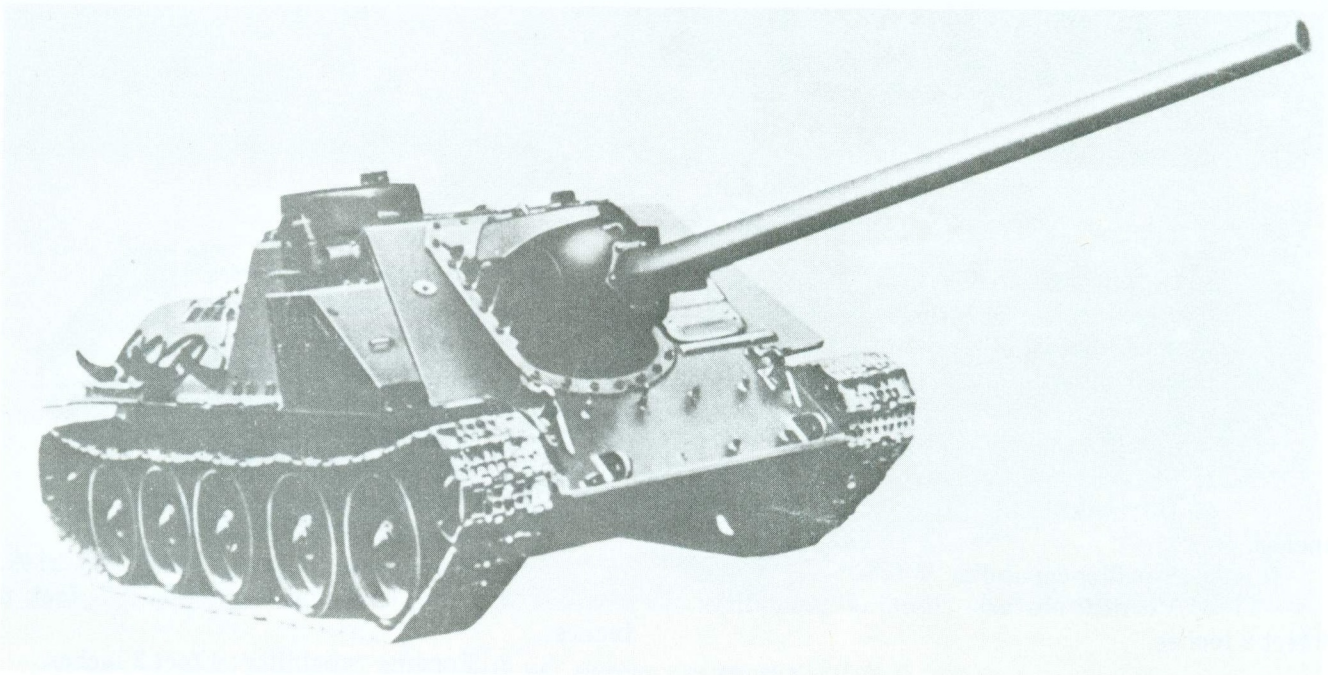


Figure 69. Russian assault gun, SU–100.

1. Weight: 15.43 short tons.
2. Height: 6 feet 9 inches.
3. Length: 19 feet 8 inches.
4. Width: 9 feet 2 inches.
5. Speed: 27 miles per hour.
6. Cruising range: 155 miles.

(*c*) *Armament.* One 85-mm gun and one 7.62 machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 38°/59%.
2. Ditch crossing capability: 9 feet 2 inches.
3. Fording capability: 4 feet 3 inches.
4. Vertical obstacle climbing capability: 3 feet 7 inches.

(5) *SU–100 (fig 69).*

(*a*) *General description.* The SU–100 assault gun uses the T–34 chassis with its five large road wheels having a larger spacing between the second and third road wheels. A rectangular superstructure sits well forward on the chassis so

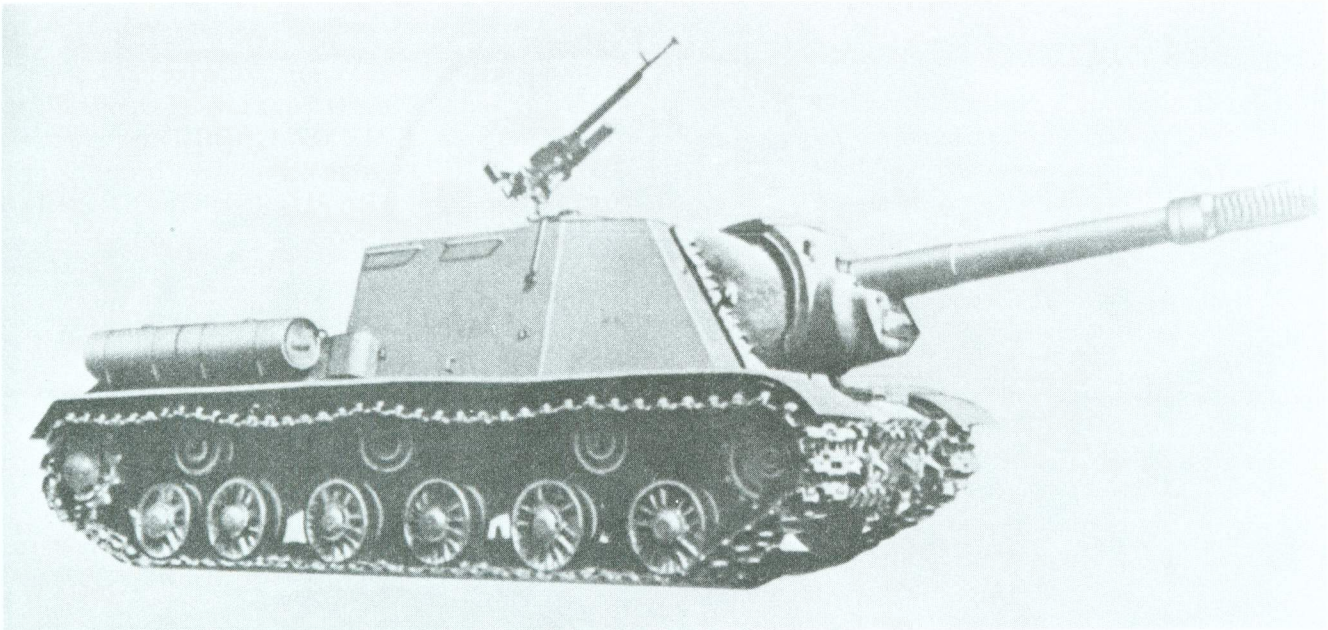


Figure 70. Russian assault gun, JSU–152.

that the hull and superstructure front form a straight surface well sloped towards the rear. Notice that the commander's position sticks out from the right side of the superstructure and will serve to differentiate the SU–100 from the SU–85 which is nearly identical in appearance. The gun tube, like the same gun is the original T–54 tank, has neither a bore evacuator nor a muzzle brake.

(*b*) *Vehicle characteristics.*

1. Weight: 33 short tons.

2. Height: 7 feet 6 inches.

3. Length: 20 feet 3 inches.

4. Width: 10 feet.

5. Speed: 35 miles per hour (maximum).

6. Cruising range: 186 miles.

(*c*) *Armament.* One 100-mm gun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 8 feet 3 inches.

3. Fording capability: 4 feet 2 inches.

4. Vertical obstacle climbing capability: 2 feet 4 inches.

(6) *JSU–152 (fig 70).*

(*a*) *General description.* The JSU–152 mounts a 152-mm gun with a multibaffle muzzle brake. The vehicle has a large, raised, hexagonal superstructure with the gun offset to the right on the superstructure. It has a stepped hull front, six small, steel-rimmed double road wheels and three support rollers offering excellent recognition features.

(*b*) *Vehicle characteristics.*

1. Weight: 50.7 short tons.

2. Height: 8 feet 1 inch.

3. Length: 22 feet 4 inches.

4. Width: 10 feet 3 inches.

5. Speed: 23 miles per hour.

6. Cruising range: 112 miles.

(*c*) *Armament.* One 152-mm assault gun and one 12.7-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 36°/59%.

2. Ditch crossing capability: 8 feet 2 inches.

3. Fording capability: 4 feet 2 inches.

4. Vertical obstacle climbing capability: 3 feet 4 inches.

102. Armored Personnel Carriers

a. United States. M113, M113A1 (fig 71).

(1) *General description.* The M113, M113A1 series armored personnel carrier is a lightweight, fully tracked combat vehicle designed to transport personnel and cargo. This vehicle is capable of amphibious operations, extended cross-country travel, and high speed operations on improved roads. Its light weight enables it to be air transported and parachute dropped. The M113 hull is constructed of aluminum armor plate reinforced with internal framing. Different models are used as ambulances, command post vehicles, and mortar carriers.

(2) *Vehicle characteristics.*

(*a*) *Weight: 11.5 short tons; M113A1 11.4 short tons (combat loaded).*

(*b*) Height: 7 feet 2 inches.

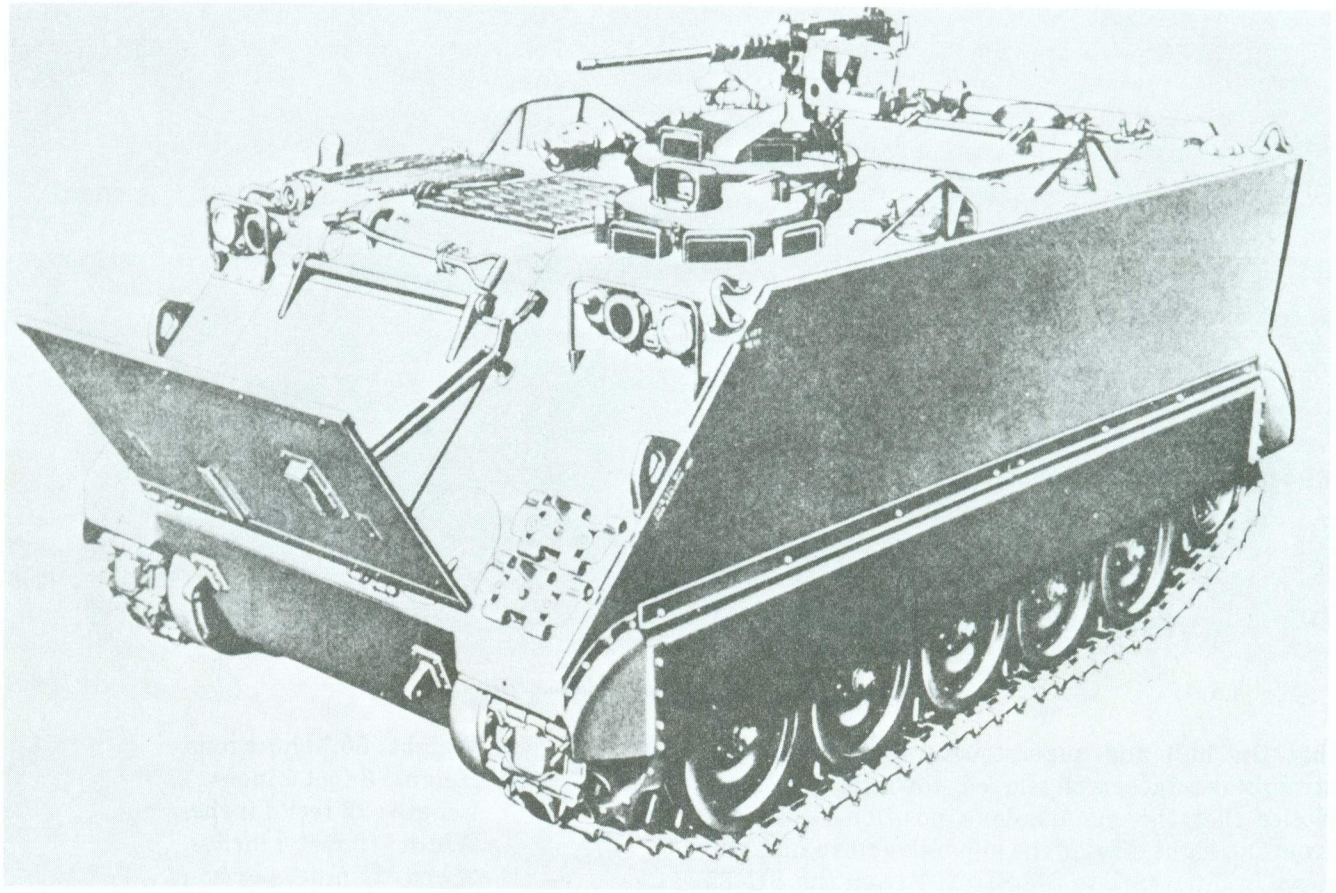


Figure 71. US armored personnel carrier, M113.

(*c*) Length: 15 feet 11 inches.

(*d*) Width: 8 feet 9 inches.

(*e*) Speed: 40 miles per hour; M113A1 38 miles per hour (maximum).

(*f*) Cruising range: 200 miles; M113A1 250 miles.

(3) *Armament.* One caliber .50 machinegun. The maximum effective range of the caliber .50 machinegun is 1600 meters.

(4) *Mobility characteristics.*

(*a*) Slope ascending capability: 37°/60%.

(*b*) Ditch crossing capability: 5 feet 6 inches.

(*c*) Fording capability: amphibious.

(*d*) Vertical obstacle climbing capability: 2 feet.

b. Great Britain. FV–432 (fig 72).

(1) *General description.* The FV–432 armored personnel carrier is a member of a tracked vehicle family. The vehicle is utilized as a command vehicle, an antitank vehicle (when mounting the Wombat antitank weapon), a cargo vehicle, a mortar carrier (81-mm mortar), a recovery vehicle, or an ambulance. Recognition features are its similarity to the US M113 APC, the five dual road wheels each side, and the track shrouds.

(2) *Vehicular characteristics.*

(*a*) Weight: 16.6 short tons.

(*b*) Height: 6 feet 2 inches without machinegun mounted.

(*c*) Length: 16 feet 9 inches.

(*d*) Width: 8 feet 9 inches.

(*e*) Speed: 32 miles per hour.

(*f*) Cruising range: 300 miles.

(3) *Armament.* One 7.62-mm machinegun. As stated in general description, vehicle is armed with different weapons when in different roles.

(4) *Mobility characteristics.*

(*a*) Slope ascending capability: 35°/57%.

(*b*) Ditch crossing capability: 6 feet 8 inches.

(*c*) Fording capability: unprepared, 3 feet 6 inches; with flotation screen 7 feet; at depths over 7 feet, vehicle becomes buoyant and swim track propelled.

(*d*) Vertical obstacle climbing capability: 2 feet.

c. France. AMX VTT (fig 73).

(1) *General description.* The AMX VTT armored personnel carrier has a somewhat lengthened standard light tank chassis. The superstruc-

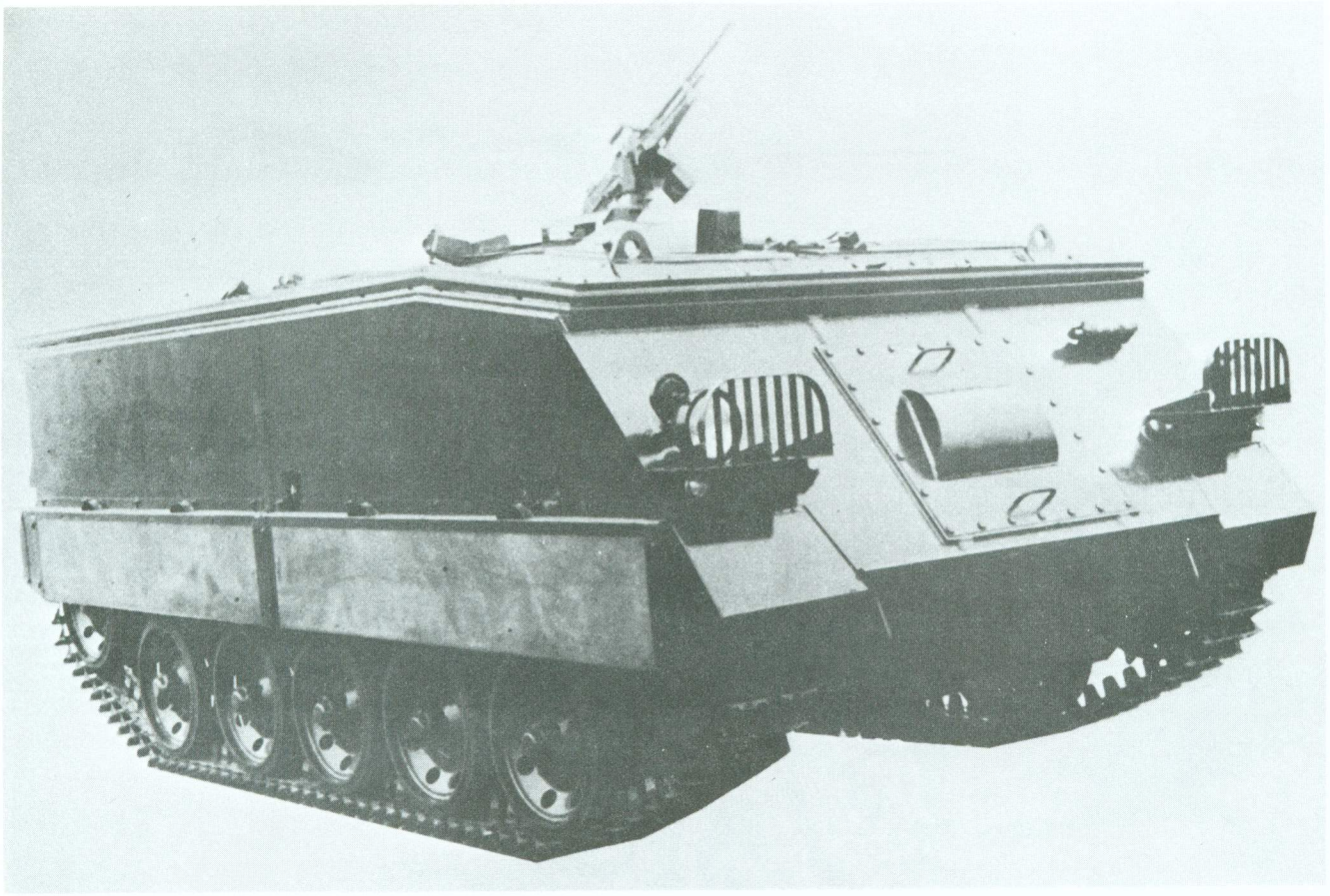


Figure 72. British armored personnel carrier, FV 432.

ture inclosing the crew compartment has partly vertical side plates and a turret-mounted 7.62-mm machinegun at the left front of the vehicle.

(2) *Vehicle characteristics.*

(*a*) Weight: 15.4 short tons.

(*b*) Height: 7 feet 10 inches.

(*c*) Length: 18 feet 2 inches.

(*d*) Width: 8 feet 3 inches.

(*e*) Speed: 38 miles per hour.

(*f*) Cruising range: 220 miles.

(3) *Armament.* One 7.62-mm machinegun.

(4) *Mobility characteristics.*

(*a*) Slope ascending capability: 31°/52%.

(*b*) Ditch crossing capability: 6 feet 9 inches.

(*c*) Fording capability: 2 feet 6 inches.

(*d*) Vertical obstacle climbing capability: 2 feet 2 inches.

(5) *AMX Similar Vehicles:*

(*a*) Recovery vehicle.

(*b*) Command post vehicle.

(*c*) Ambulance.

(*d*) Mortar carrier.

d. West Germany.

(1) *Light armored personnel carrier (fig 74).*

(*a*) *General description.* This light armored personnel carrier is a French-developed (Hotchkiss) light, multipurpose tracked vehicle with some models turret-mounting a 20-mm gun and grenade dispensers. The vehicle is marked by the long, sloping frontal plate and high-mounted suspension system with five road wheels. Different versions of this vehicle are used as cargo, ambulance, and mortar carriers.

(*b*) *Vehicle characteristics.*

1. Weight: 7 short tons.

2. Height: 6 feet 7 inches.

3. Length: 14 feet 7 inches.

4. Width: 7 feet 5 inches.

5. Speed: 40 miles per hour.

6. Cruising range: 218 miles (approximate).

(*c*) *Armament.* One 20-mm gun or 7.5-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 32°/53%.

2. Ditch crossing capability: 5 feet.

3. Fording capability: 2 feet 5 inches.

4. Vertical obstacle climbing capability: 2 feet 4 inches.

(2) *HS30 (fig 75).*

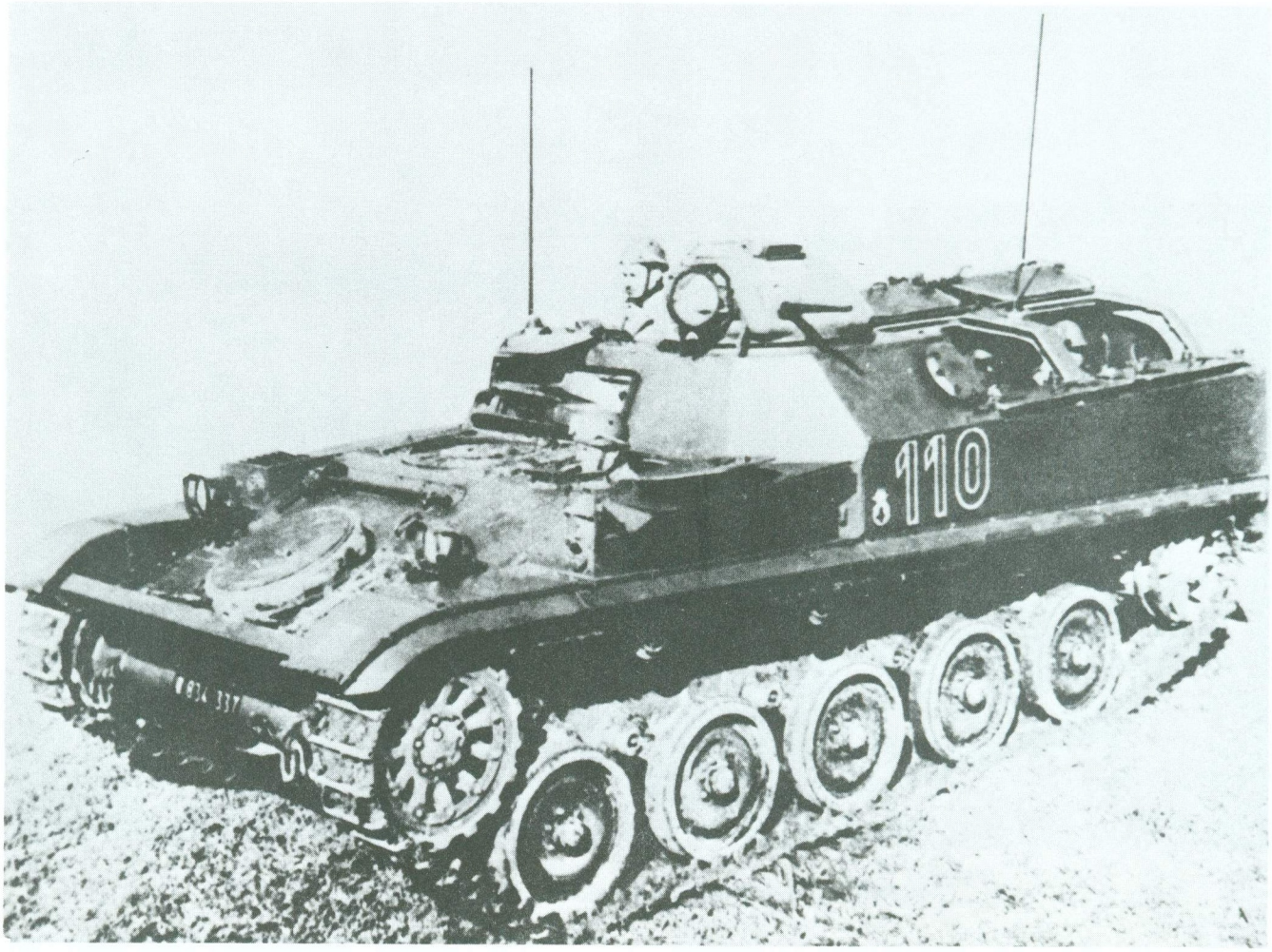


Figure 73. French armored personnel carrier, AMX VTT

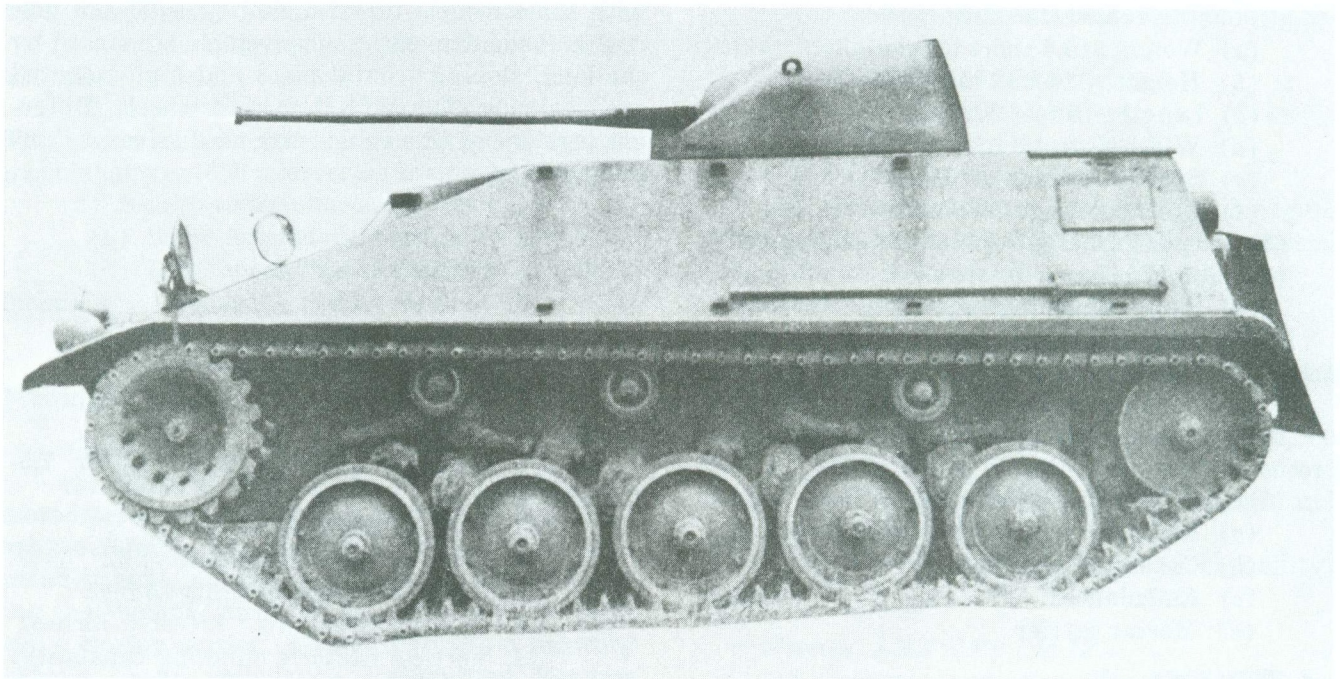


Figure 74. Western German light armored personnel carrier.

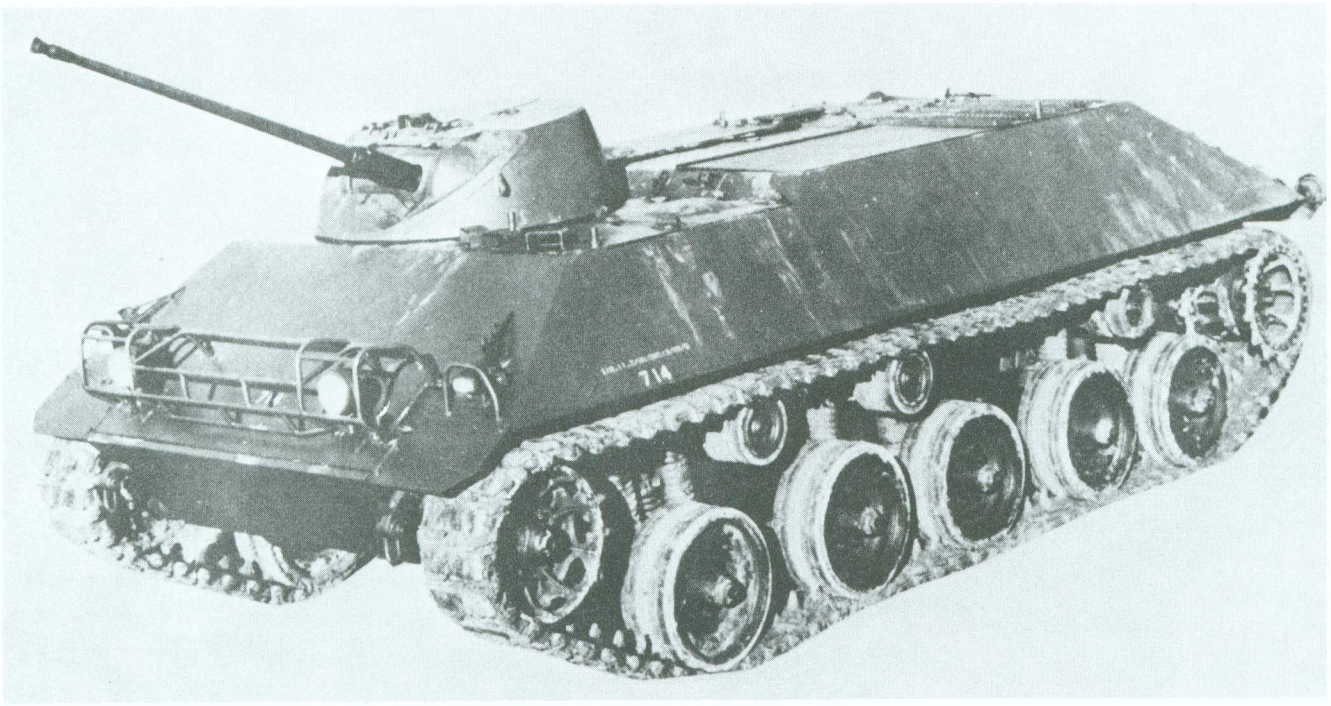


Figure 75. West German armored personnel carrier, HS30.

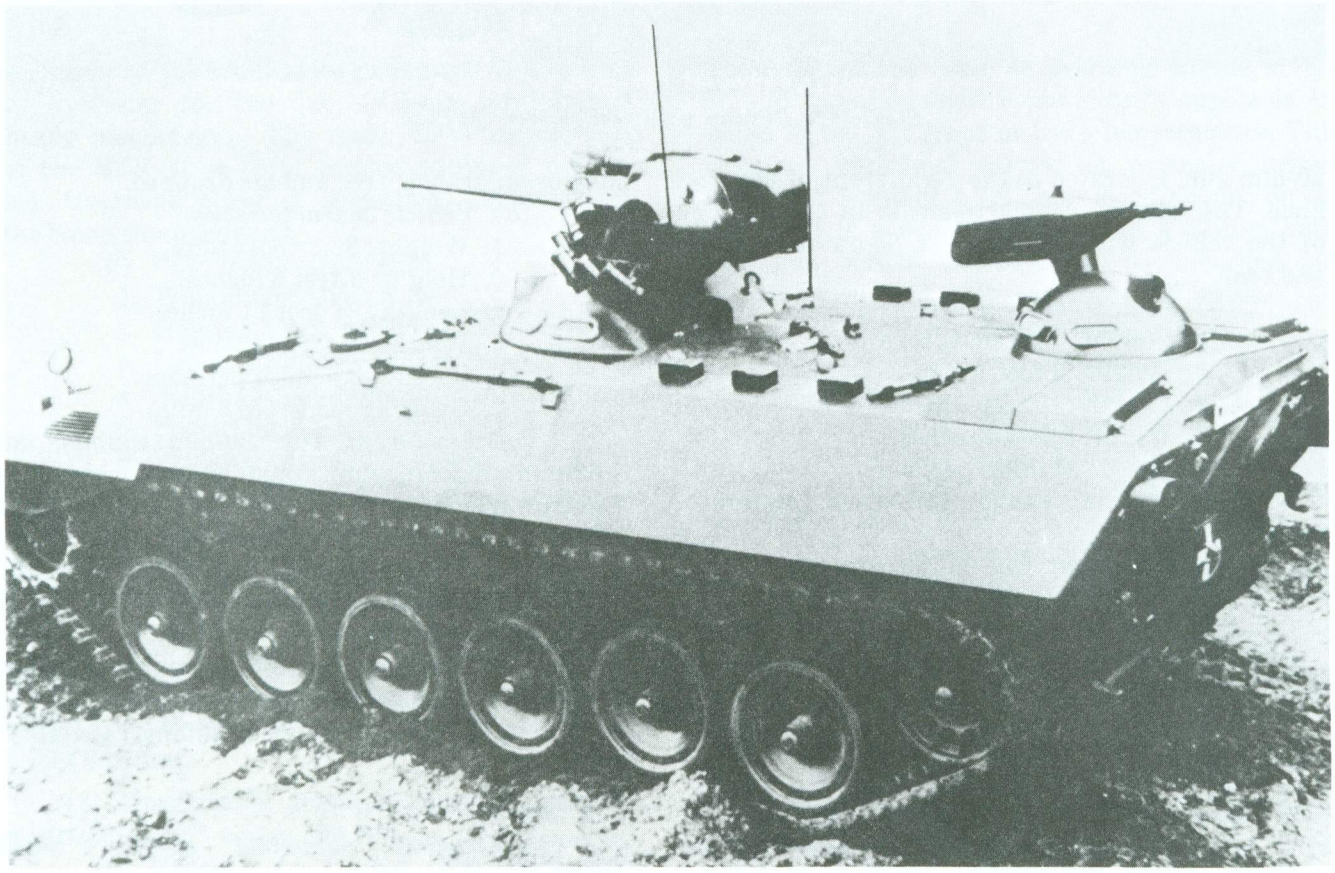


Figure 76. Marder armored personnel carrier.

(*a*) *General description.* The HS30, a Swiss-developed armored personnel carrier, is a relatively low silhouette, fully tracked combat vehicle designed to transport personnel. The vehicle has all-round sloping armor plates and an inclosed superstructure. A small turret, mounting a

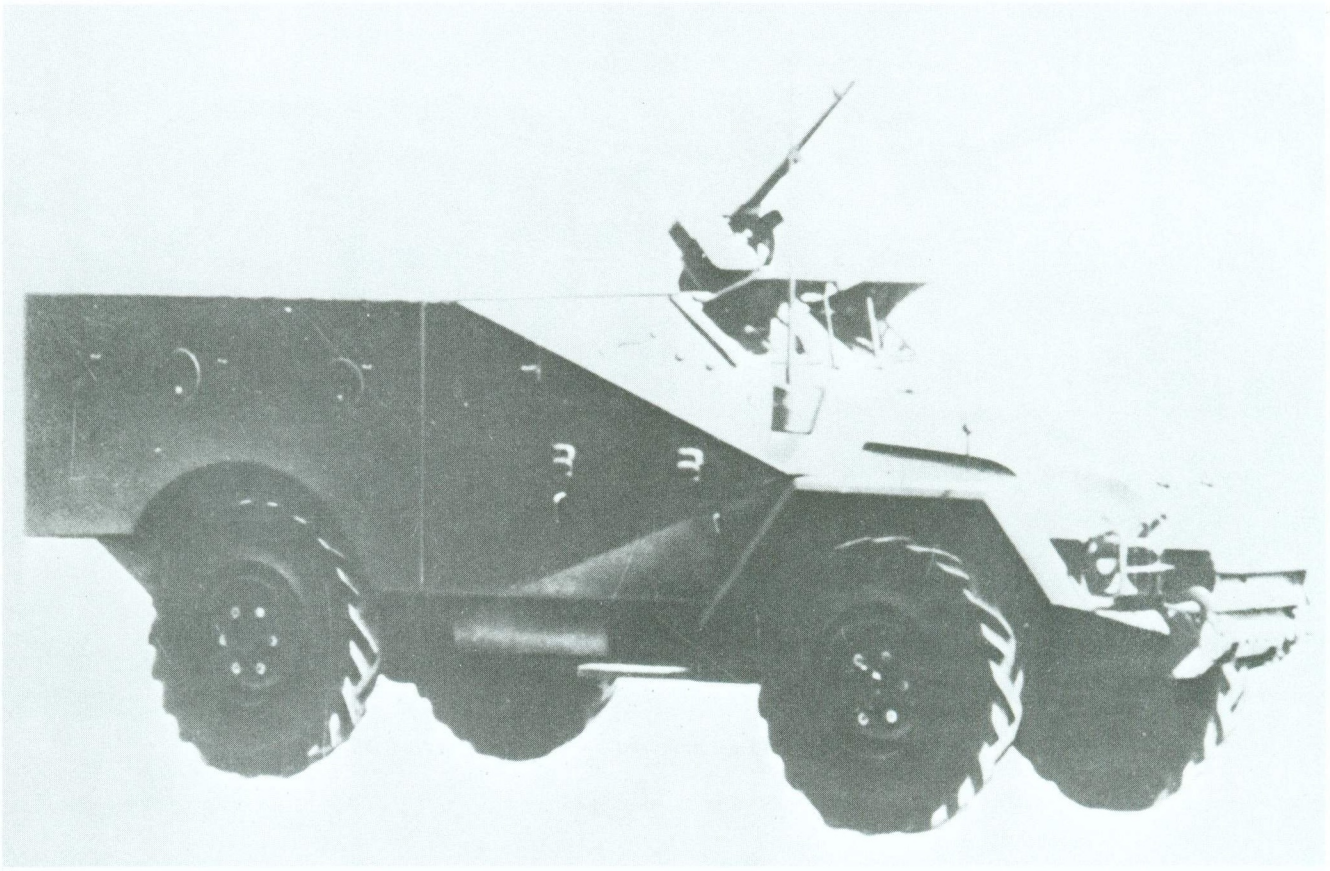


Figure 77. Russian personnel carrier, BTR–40.

20-mm gun, is located to the right front of the vehicle. The fighting compartment is in the middle of the vehicle with large access doors at the top and rear.

(*b*) *Vehicle characteristics.*

1. Weight: 14.6 short tons.

2. Height: 6 feet 1 inch.

3. Length: 18 feet 2 inches.

4. Width: 8 feet 4 inches.

5. Speed: 36 miles per hour.

6. Cruising range: 168 miles (approximate).

(*c*) *Armament.* One 20-mm gun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 31°/52%.

2. Ditch crossing capability: 5 feet.

3. Fording capability: 2 feet 4 inches.

4. Vertical obstacle climbing capability: 2 feet 6 inches.

(3) *Marder (fig 76).*

(*a*) *General description.* The Marder is a medium weight, full-tracked, mechanized infantry combat vehicle designed to be compatible with the Leopard tank. The hull is constructed of steel armor plate reinforced by internal framing. Different models are used as ambulances, command post vehicles, and mortar carriers. The vehicle may be air transported and air dropped.

(*b*) *Vehicle characteristics.*

1. Weight: 30.3 short tons.

2. Height: 9 feet 6 inches.

3. Length: 21 feet 11 inches.

4. Width: 10 feet 4 inches.

5. Speed: 43.5 miles per hour.

6. Cruising range: 373 miles.

(*c*) *Armament.* One 20-mm cannon, one 7.62-mm machinegun coaxially mounted, one 7.62-mm machinegun mounted on a rear cupola.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 31°/52%.

2. Ditch crossing capability: 6 feet 7 inches.

3. Fording capability: unprepared, 5 feet; snorkel kit is not standard yet.

4. Vertical obstacle climbing capability: 2 feet.

e. Soviet Union.

(1) *Armored personnel carrier, model BTR–40 (U) (fig 77).*

(*a*) *General description.* The BTR–40 is an early model Soviet carrier which is being replaced by the BRDM in a command and reconnaissance role. The BTR–40 normally mounts a 7.62-mm heavy machinegun that can be mounted

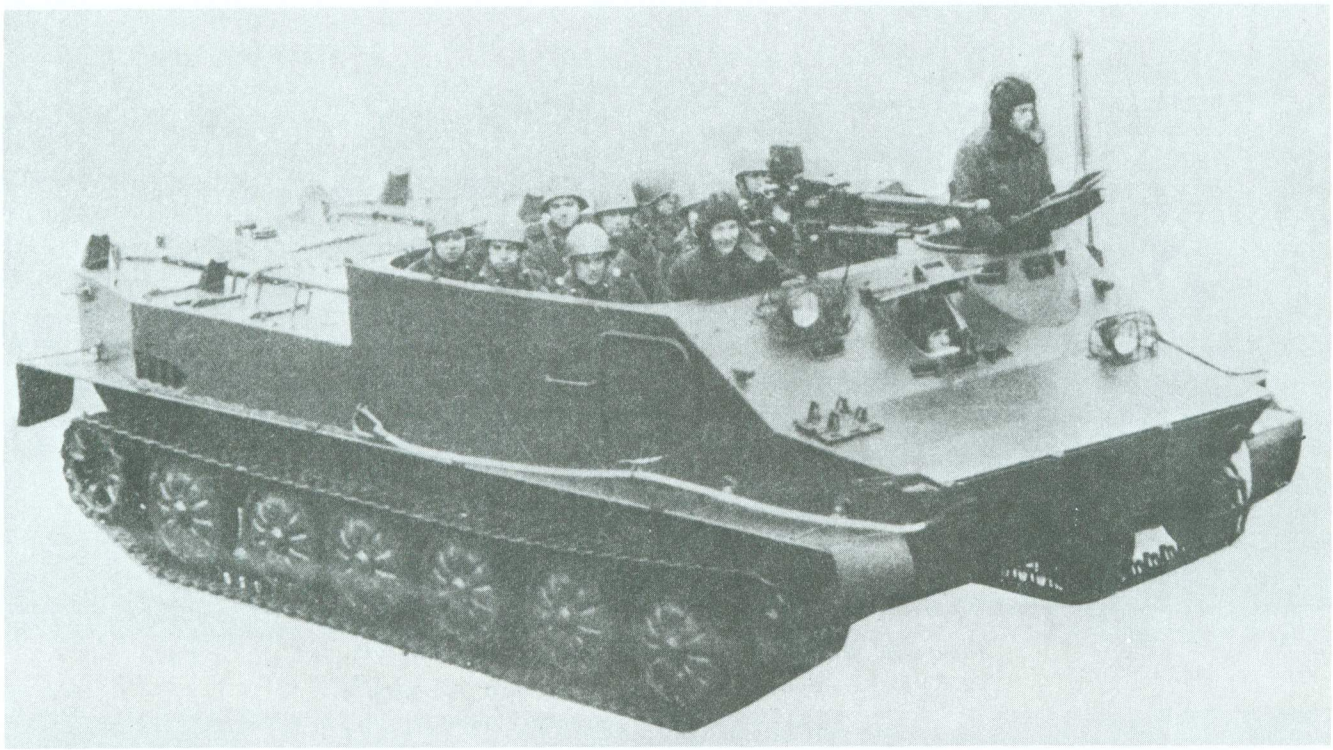


Figure 78. Russian armored personnel carrier, BTR–50P.

on either of the front sides or rear. It is also used as a carrier for the dual 14.5-mm antiaircraft heavy machinegun. The troop carrying capacity of the BTR–40 is eight combat equipped personnel. Overhead cover is sometimes provided for the troop compartment.

(*b*) *Vehicle characteristics.*

1. Weight: 5.8 short tons.
2. Height: 5 feet 8 inches.
3. Length: 16 feet 5 inches.
4. Width: 6 feet 3 inches.
5. Speed: 50 miles per hour.
6. Cruising range: 404 miles.

(*c*) *Armament.* Two 14.5-mm antiaircraft machineguns or one 7.62-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.
2. Ditch crossing capability: 2 feet 4 inches.
3. Fording capability: 3 feet 7 inches.
4. Vertical obstacle climbing capability: 1 foot 6 inches.

(2) *Amphibious armored personnel carrier, model BTR–50P–series (fig 78).*

(*a*) *General description.* The BTR–50P-series amphibious armored personnel carrier is seen in three versions; the basic BTR–50P with no cover on the troop compartment, the BTR–50PK with armored overhead cover, and the BTR–50PU command and control vehicle. All versions use the basic chassis and engine of the PT–76 tank. A small commander's cupola is located in the left front of the superstructure. This armored personnel carrier is normally armed with a 12.7-mm or a 7.62-mm machinegun; on occasion, it is encountered carrying a 57-mm antitank gun, M1943. The 57-mm is not mounted, but is carried aboard with carriage and trails.

(*b*) *Vehicle characteristics.*

1. Weight: 16 short tons.
2. Height: 6 feet 5 inches.
3. Length: 22 feet 6 inches.
4. Width: 10 feet 4 inches.
5. Speed: land, 27 miles per hour; water, 6 miles per hour.
6. Cruising range: 174 miles.

(*c*) *Armament.* One 12.7-mm or one 7.62-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 38°/62%.
2. Ditch crossing capability: 9 feet 2 inches.
3. Fording capability: amphibious.
4. Vertical obstacle climbing capability: 3 feet 7 inches.

(3) *Amphibious armored personnel carrier, BTR–60P-series (fig 79).*

(*a*) *General description.* The Soviet 8 x 8 amphibious armored personnel carrier BTR–60P series is seen in three versions; the basic

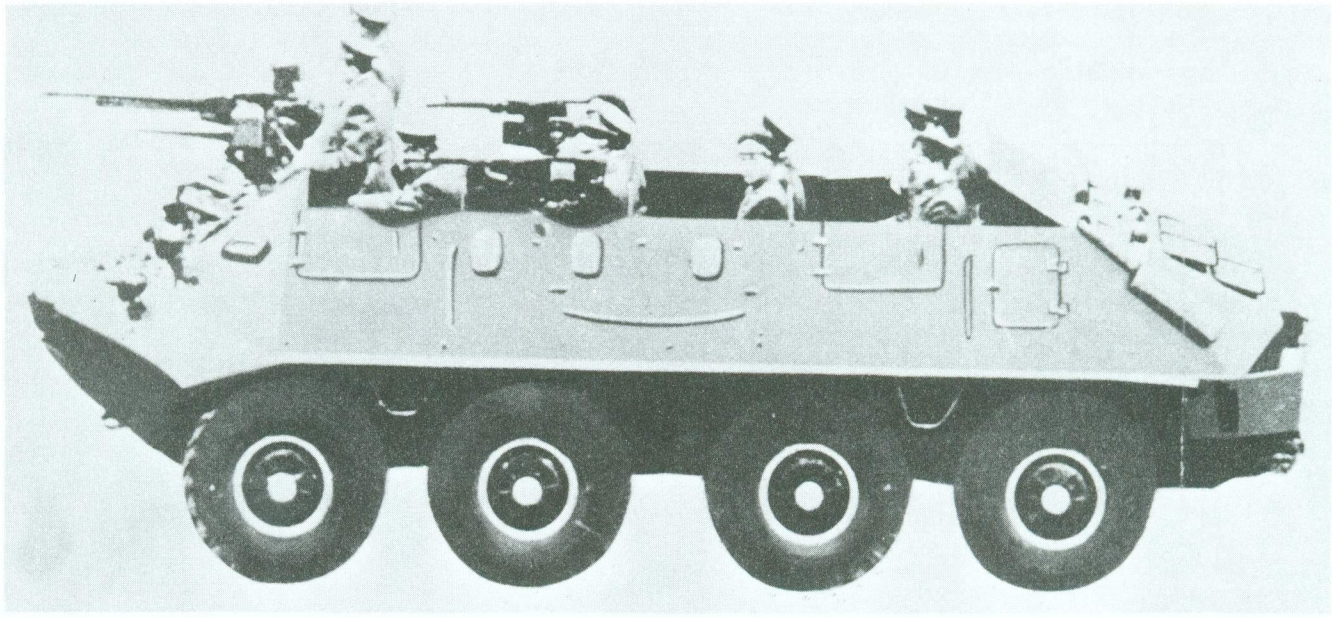


Figure 79. Russian armored personnel carrier, BTR–60P.

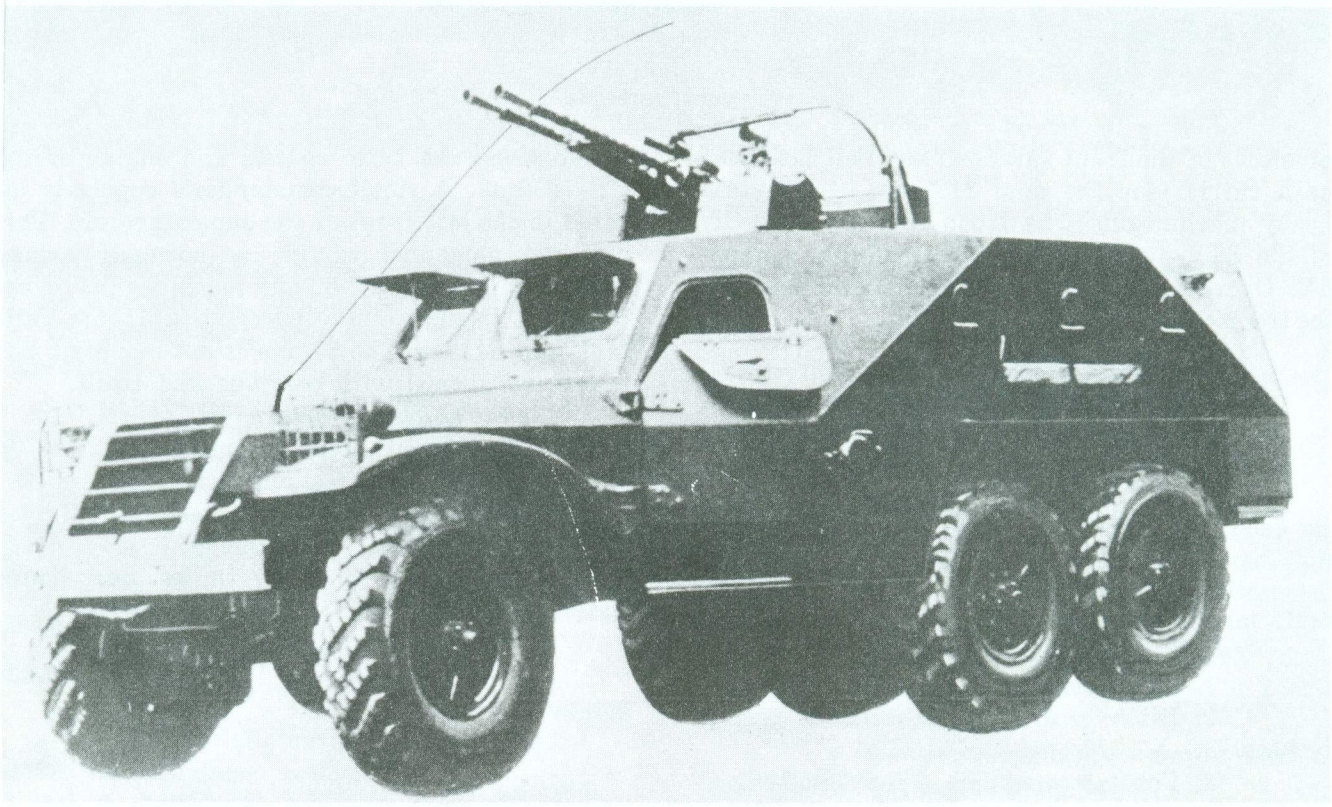


Figure 80. Russian armored personnel carrier, BTR–152.

BTR–60P with no overhead cover and armed with a 12.7-mm machinegun forward and two 7.62-mm machineguns on the sides, the BTR–60PA with overhead cover and armed the same as the BTR–60P, and the BTR–60PB with overhead cover armed with a turret mounted 14.5-mm heavy machinegun and a coaxial 7.62-mm machinegun. All versions of the BTR–60P series are powered by two rear mounted engines. Water propulsion is by means of the hydrojet system.

(*b*) *Vehicle characteristics.*

1. Weight: 11 short tons.
2. Height: 7 feet.
3. Length: 24 feet.
4. Width: 9 feet.

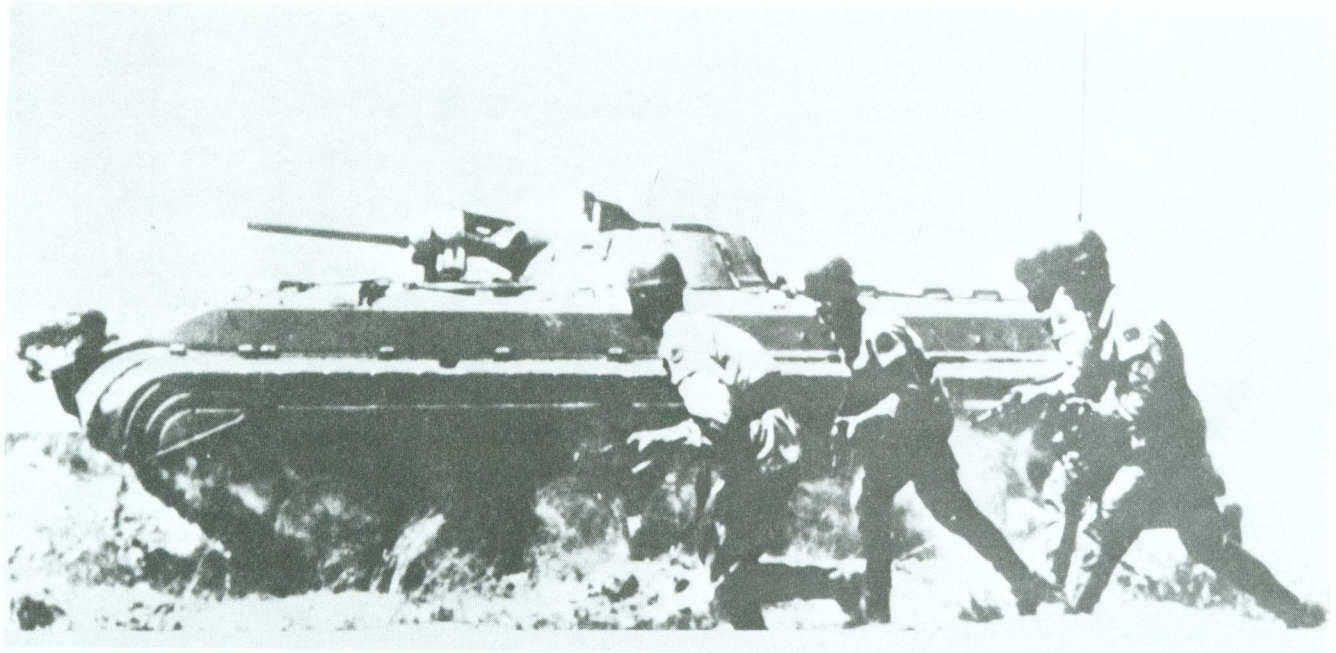


Figure 81. Russian armored personnel carrier, AAICV.

5. Speed: land, 45 miles per hour; water 6.2 miles per hour.

6. Cruising range: 311 miles.

(*c*) *Armament.* BTR–60P and BTR–60PA one 12.7-mm and two 7.62-mm machineguns. BTR–60PB one 14.5 and one 7.62-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 6 feet 6 inches.

3. Fording capability: amphibious.

4. Vertical obstacle climbing capability: 1 foot 4 inches.

(4) *Armored personnel carrier, model BTR–152V (fig 80).*

(*a*) *General description.* This 6 x 6 armored personnel carrier is a multipurpose vehicle. It is used as a weapons carrier, personnel carrier, command vehicle, and prime mover for heavy mortars and antitank guns. The original model is open-topped, while the latest model (BTR–152V, model 3) has overhead cover. Other models have inflation-deflation devices which allow the driver to change the tire pressure from inside the vehicle. Normal armament consists of either a 12.7-mm or a 7.62-mm machinegun. It is also used as a carrier for the dual 14.5-mm antiaircraft heavy machinegun.

(*b*) *Vehicle characteristics.*

1. Weight: 9.86 short tons.

2. Height: 6 feet 8 inches.

3. Length: 22 feet 5 inches.

4. Width: 7 feet 7 inches.

5. Speed: 40 miles per hour.

6. Cruising range: 404 miles.

(*c*) *Armament.* One 12.7-mm or one 7.62-mm machinegun or two 14.5-mm antiaircraft machineguns.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 2 feet 7 inches.

3. Fording capability: 2 feet 7 inches.

4. Vertical obstacle climbing capability: 1 foot 11 inches.

(5) *Amphibious Armored Infantry Combat Vehicle, BMP (U) (fig 81).*

(*a*) *General description.* The BMP is a full-tracked, amphibious, multipurpose armored vehicle. A turret mounting one 76-mm smoothbore gun, and an antitank guided missile launcher is located on the left front of the vehicle. The personnel compartment is located in the rear of the vehicle.

(*b*) *Vehicle characteristics.*

1. Weight: 14 short tons.

2. Height: 6 feet 3 inches.

3. Length: 22 feet 1 inch.

4. Width: 9 feet 8 inches.

5. Speed: land, 35 miles per hour; water, 4 to 5 miles per hour.

6. Cruising range: 311 miles.

(*c*) *Armament.* One 76-mm smoothbore gun with one 7.62-mm machinegun mounted coaxially, and one antitank guided missile.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 38°/62%.

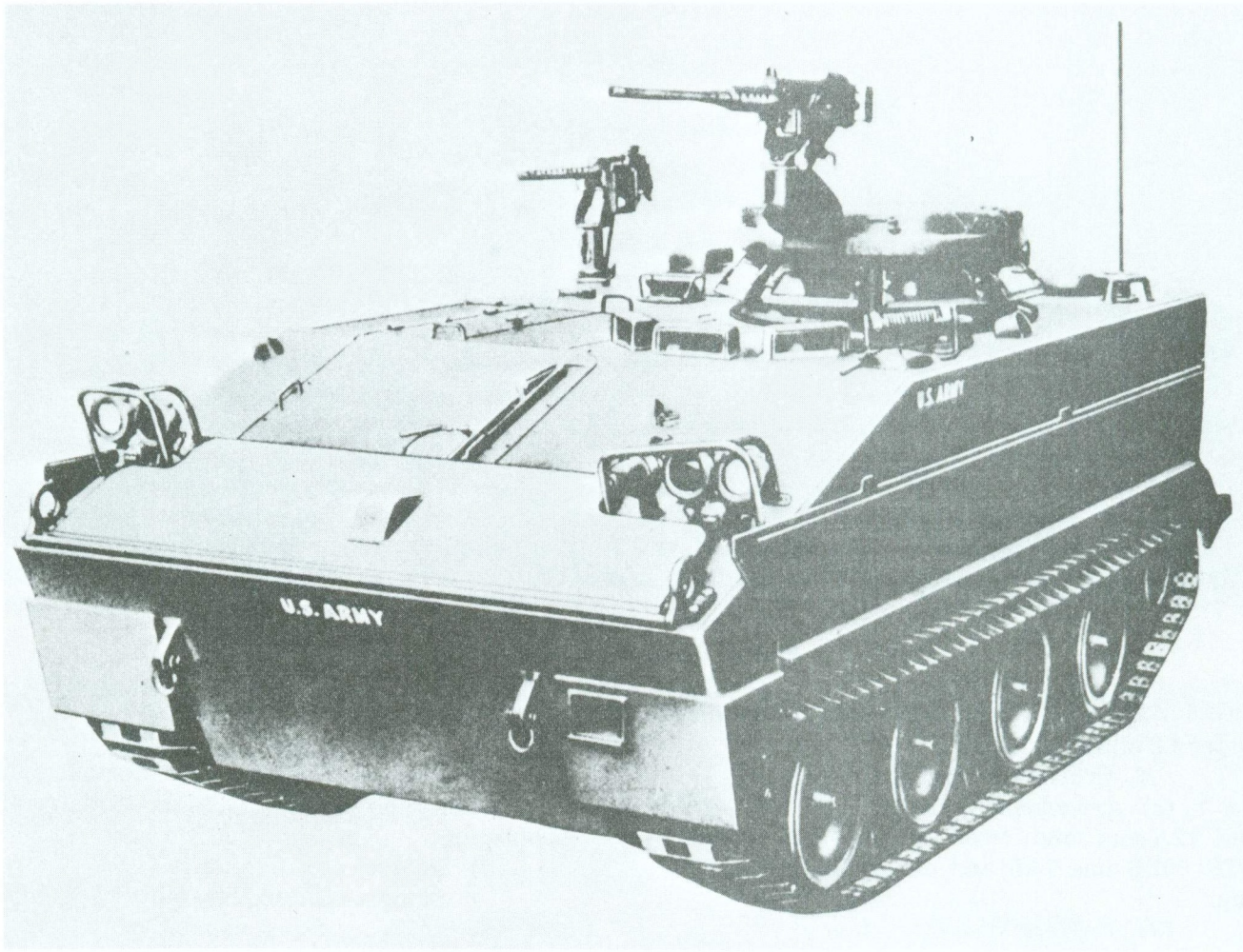


Figure 82. US armored reconnaissance vehicle, M114.

2. Ditch crossing capability: 9 feet (estimated).

3. Fording capability: amphibious.

4. Vertical obstacle climbing capability: 3 feet (estimated).

103. Armored Reconnaissance Vehicles

a. United States.

(1) *M114, M114A1E1 (fig 82 and 83).*

(*a*) *General description.* The M114 command and reconnaissance vehicle is a lightweight, low silhouette vehicle designed for command and reconnaissance missions. This vehicle is air transportable and is capable of extended cross-country travel and amphibious operations. The M114 is constructed of aluminum armor reinforced with internal framing. The M114A1E1 is gasoline powered.

(*b*) *Vehicle characteristics.*

1. Weight: 7.7 short tons.

2. Height: 6 feet 9 inches.

3. Length: 14 feet.

4. Width: 7 feet 8 inches.

5. Speed: 36 miles per hour (maximum).

6. Cruising range: 300 miles (approximate).

(*c*) *Armament.* One caliber .50 and one 7.62-mm machinegun. The maximum effective ranges for the caliber .50 and 7.62-mm machinegun are, respectively, 1600 and 900 meters. The M114A1E1's armament consists of one automatic 20-mm gun and one 7.62-mm machinegun mounted on the roof. The maximum effective range for the 20-mm gun is 2000 meters (approximate).

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 37°/60%.

2. Ditch crossing capability: 5 feet.

3. Fording capability: amphibious.

4. Vertical obstacle climbing capability: 1 foot 6 inches.

(2) *General Sheridan, M551 (fig 84).*

(*a*) *General description.* The General Sheridan is a lightweight, full-tracked, amphibious, armored reconnaissance airborne assault ve-

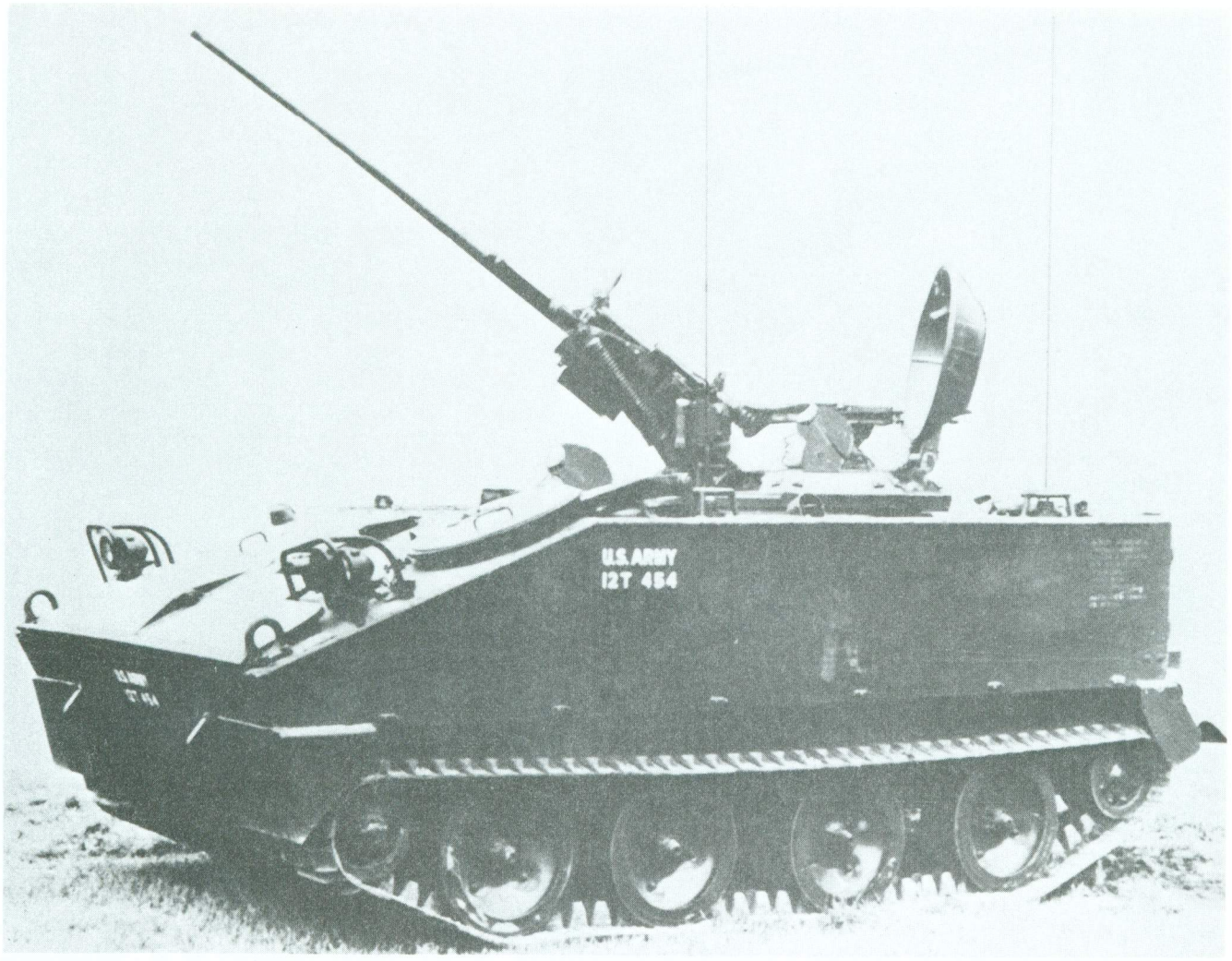


Figure 83. US armored reconnaissance vehicle, M114A1E1 2/20-mm gun.

hicle mounting a 152-mm gun launcher. In addition, the vehicle has a coaxially-mounted 7.62-mm machinegun, a turret-mounted caliber .50 machinegun, and eight grenade dispensers. The vehicle is readily identified by its short main gun, angular turret, and the absence of support rollers.

(*b*) *Vehicle characteristics.*

1. Weight: 16.5 short tons.
2. Height: 8 feet.
3. Length: 20 feet.
4. Width: 9 feet 2 inches.
5. Speed: 43 miles per hour.
6. Cruising range: 373 miles.

(*c*) *Armament.* One 152-mm gun launcher, one caliber .50 and one 7.62-mm machinegun. The maximum effective range of the missile system is classified. For conventional rounds, the maximum effective range is 2000 meters. The maximum effective ranges for the caliber .50 and 7.62-mm machineguns are, respectively, 1600 and 900 meters.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 37°/60%.
2. Ditch crossing capability: 8 feet 3 inches.
3. Fording capability: amphibious.
4. Vertical obstacle climbing capability: 3 feet.

(3) *Armored Car, XM 706 (fig 85).*

(*a*) *General description.* The XM706 is a lightweight, air transportable, amphibious, armored vehicle planned to perform a variety of roles, such as personnel carrier, convoy escort vehicle, reconnaissance car, riot control, patrol, and police vehicle. An open-top hull design permits the use of either a fixed turret with eight vertical gunports or a revolving turret containing two machineguns. The vehicle is readily identified by its angular hull and four large wheels.

(*b*) *Vehicle characteristics.*

1. Weight: 8.2 short tons.

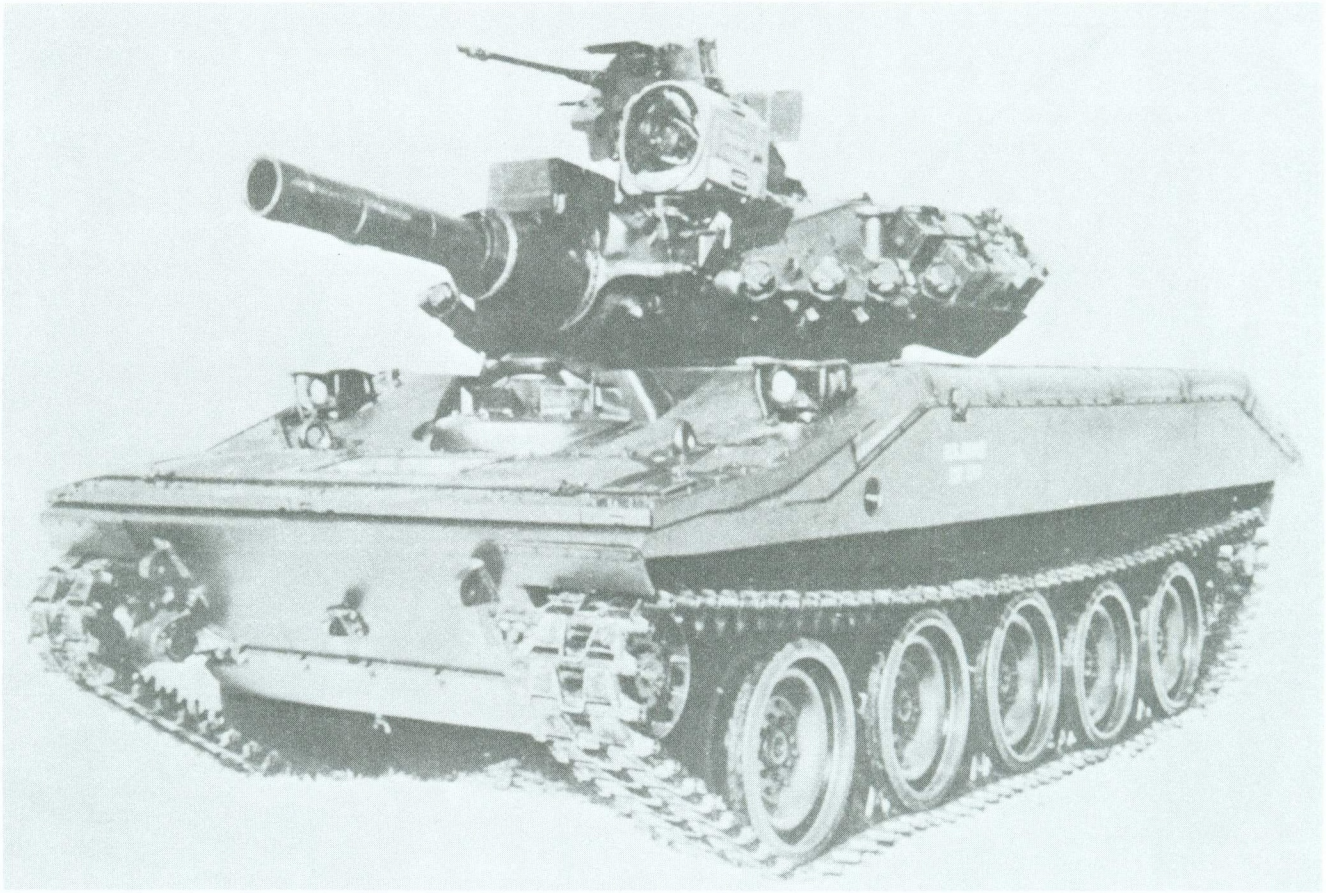


Figure 84. US reconnaissance vehicle, M551, General Sheridan.

2. Height: 8 feet.
3. Length: 18 feet 7 inches.
4. Width: 7 feet 6 inches.
5. Speed: 62 miles per hour (maximum).
6. Cruising range: 300 miles (approximate).

(*c*) *Armament.* Turret mounted twin 7.62-mm machineguns or one .50 caliber and one 7.62-mm machinegun.

(*d*) *Mobility characteristics.*
1. Slope ascending capability: 37°/60%.
2. Fording capability: amphibious.
3. Vertical obstacle climbing capability: 2 feet.

b. Great Britain.

(1) *Ferret (fig 86).*

(*a*) *General description.* The Ferret Mark 2 was developed as a high speed reconnaissance vehicle for wartime, or as a vehicle for implementing internal security measures. When antitank guided missiles are mounted on the Ferret Mark 2, the vehicle's name becomes the Vigilant Mark 2. Another Ferret, the Mark 1, is identical to the Mark 2 except for the fact that the Mark 1 has no turret. Recognition features are the four large wheels and the appearance of a double turret.

(*b*) *Vehicle characteristics.*
1. Weight: 4.8 short tons.
2. Height: 6 feet 2 inches.
3. Length: 12 feet 8 inches.
4. Width: 6 feet 4 inches.
5. Speed: 45 miles per hour.
6. Cruising range: 190 miles.

(*c*) *Armament.* One turret mounted .30 caliber machinegun.

(*d*) *Mobility characteristics.*
1. Slope ascending capability: 24°/41%.
2. Ditch crossing capability: 4 feet.
3. Fording capability: 5 feet.
4. Vertical obstacle climbing capability 1 foot 5 inches.

(2) *Fox (fig 87).*

(*a*) *General description.* The Fox is an aluminum armored four wheel reconnaissance vehicle mounting a 30-mm gun as main armament. The Fox can be recognized by the four wheels with the angled wheel wells, the compartment between the wheels and the turret, which is similar to the turret of the tracked Scorpion. The Fox is

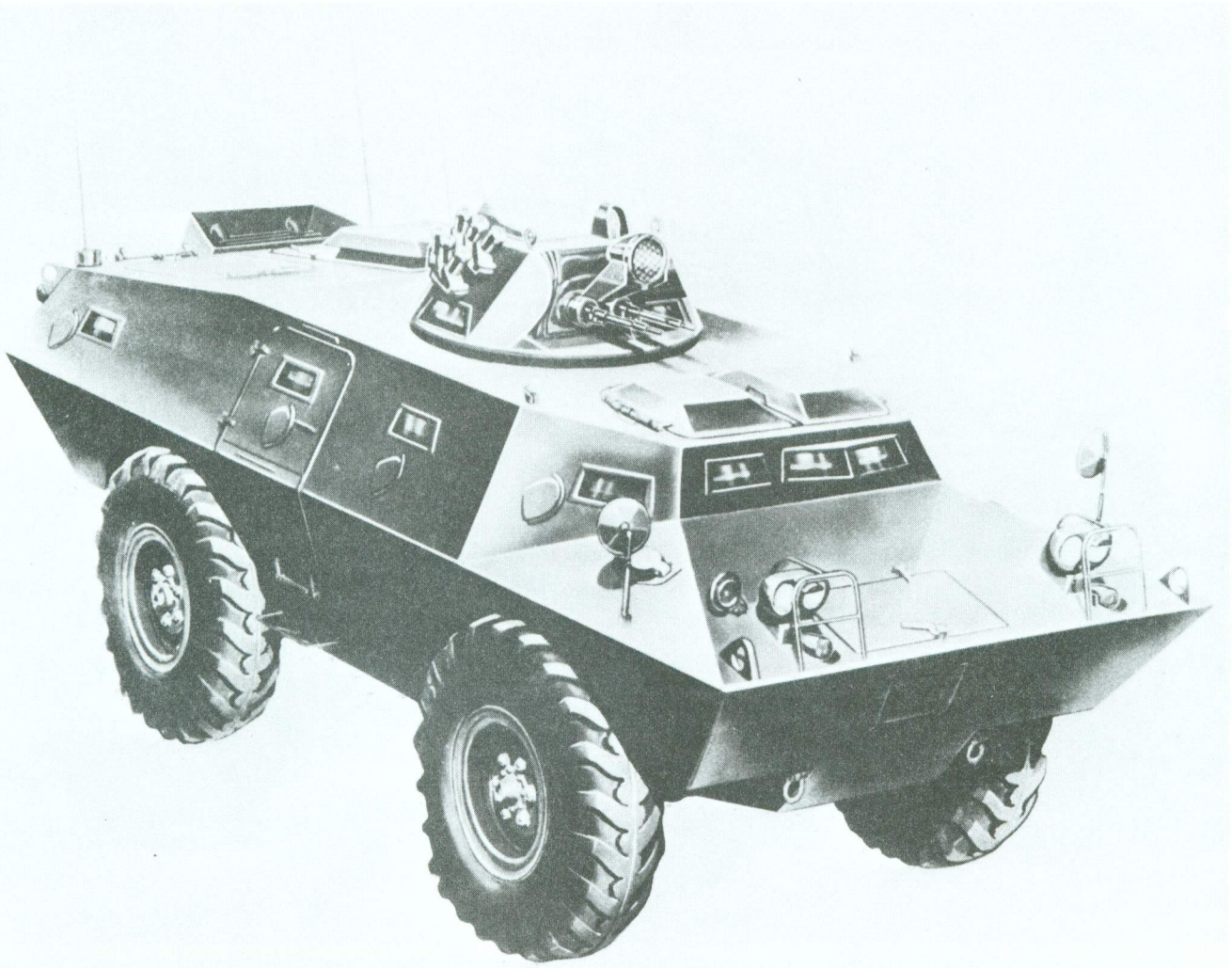


Figure 85. US Armored car, XM 706.

amphibious, using a flotation screen and wheel propulsion.

(*b*) *Vehicle characteristics.*

1. Weight: 6.8 short tons.

2. Height: 7 feet 2 inches.

3. Length: 13 feet 8 inches.

4. Width: 7 feet.

5. Speed: 65 miles per hour.

6. Cruising range: 270 miles.

(*c*) *Armament.* Main armament is a Rarden 30-mm cannon and 1 x 7.62-mm coaxial machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 27°/45%.

2. Ditch crossing capability: 2 feet 2 inches.

3. Fording capability: 3 feet.

4. Vertical obstacles climbing capability: 1 foot 8 inches.

(3) *Armored reconnaissance vehicle, tracked, Scorpion (fig 88).*

(*a*) *General description.* The Scorpion is a lightweight, aluminum armored vehicle used primarily as a reconnaissance vehicle and a fire support vehicle, but is planned for a variety of roles, such as armored personnel carrier, guided weapons carrier, command vehicle, ambulance, recovery vehicle, and an antiaircraft weapons system. Recognition features are its extremely short length for a tracked vehicle, the turret with the 76-mm gun which does not extend past the front of the vehicle, and the flat track suspension with five dual road wheels.

(*b*) *Vehicle characteristics.*

1. Weight: 8.75 short tons.

2. Height: 6 feet 11 inches.

3. Length: 14 feet 5 inches.

4. Width: 7 feet 2 inches.

5. Speed: 50 miles per hour.

6. Cruising range: 300 miles (approximately).

(*c*) *Armament.* 76-mm gun and one coaxial 7.62-mm machinegun.

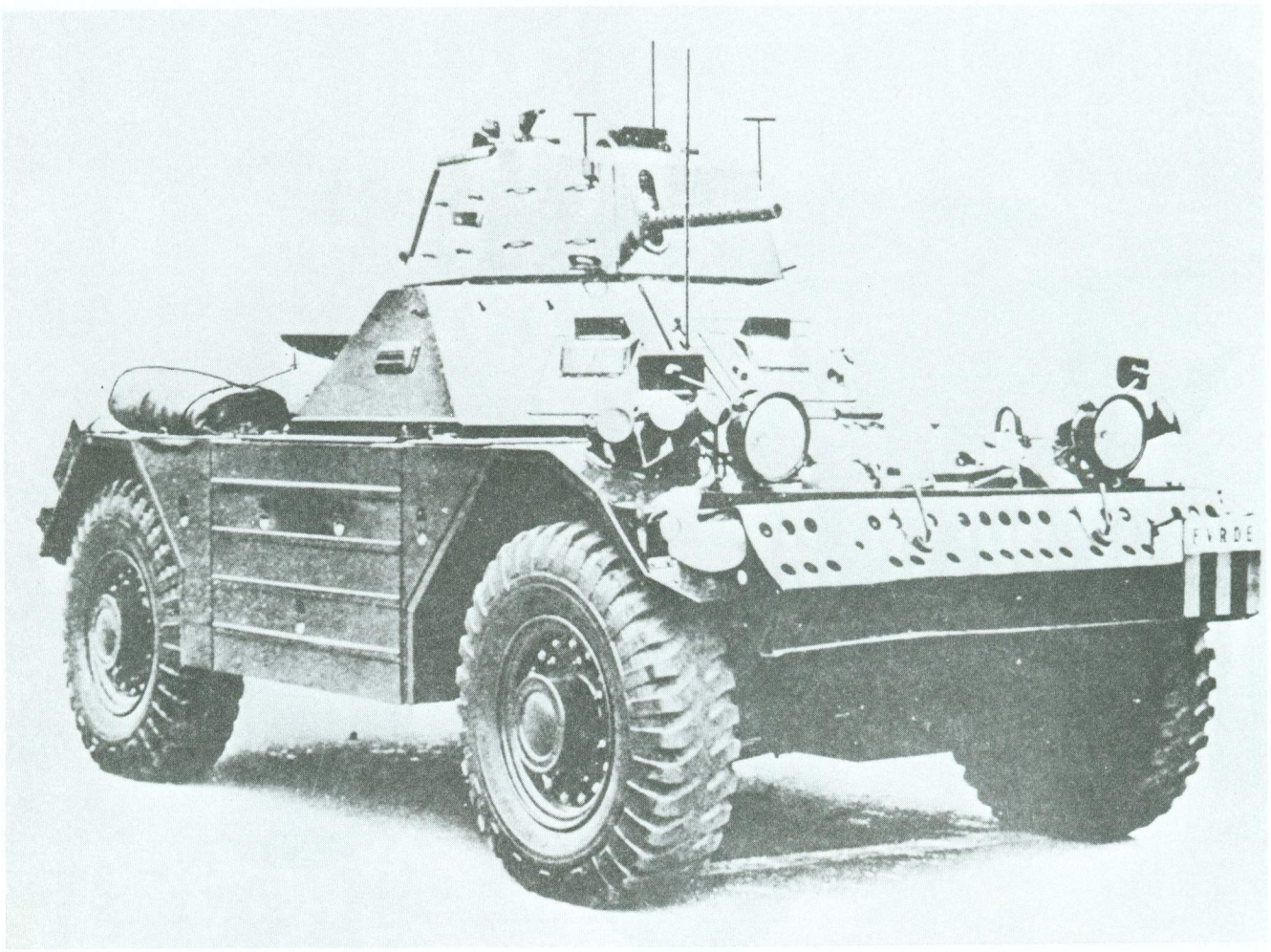


Figure 86. British armored reconnaissance vehicle, Ferret.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 35°/57%.

2. Ditch crossing capability: 6 feet 10 inches.

3. Fording capability: 3 feet 6 inches, unprepared; flotation capability with screen raised.

4. Vertical obstacle climbing capability: 1 foot 8 inches.

(4) *Saladin (fig 89).*

(*a*) *General description.* The Saladin armored car mounts a 76-mm gun as main armament and has two machineguns as secondary armament. This vehicle was developed for use by infantry and armored units and is used primarily for reconnaissance missions. The Saladin is easily recognizable by its six wheels, turret mounted 76-mm gun mounted in a high, practically straight-sided turret.

(*b*) *Vehicle characteristics.*

1. Weight: 12.3 short tons.

2. Height: 7 feet 10 inches.

3. Length: 17 feet 4 inches.

4. Width: 8 feet 4 inches.

5. Speed: 45 miles per hour.

6. Cruising range: 250 miles.

(*c*) *Armament.* Main armament is a 76-mm gun and two .30 caliber machineguns, model 1919A4, one mounted coaxially and the other on a ring mount on the turret roof.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 24°/41%.

2. Ditch crossing capability: 5 feet.

3. Fording capability: unprepared, 3 feet 6 inches; prepared, 7 feet.

4. Vertical obstacle climbing capability: 1 foot 8 inches.

c. France.

(1) *EBR90 model 51 (fig 90).*

(*a*) *General description.* The EBR90 MLE51 is an eight-wheeled reconnaissance vehicle mounting a 90-mm gun in the AMX turret. The four center road wheels can be raised for road driving and lowered for cross-country travel. The vehicle is unique in that it can be driven from either end, which greatly enhances

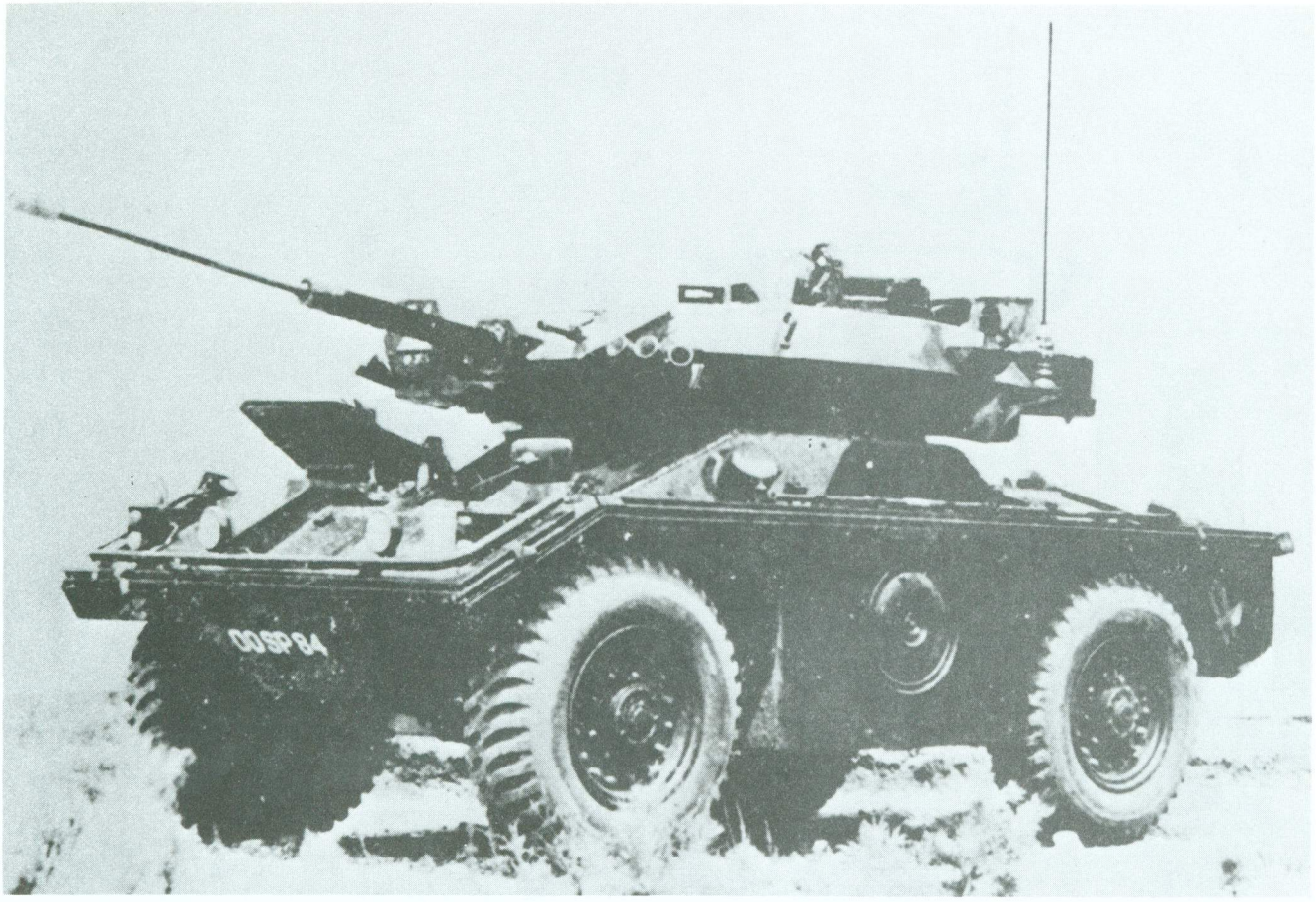


Figure 87. British armored reconnaissance vehicle, Fox.

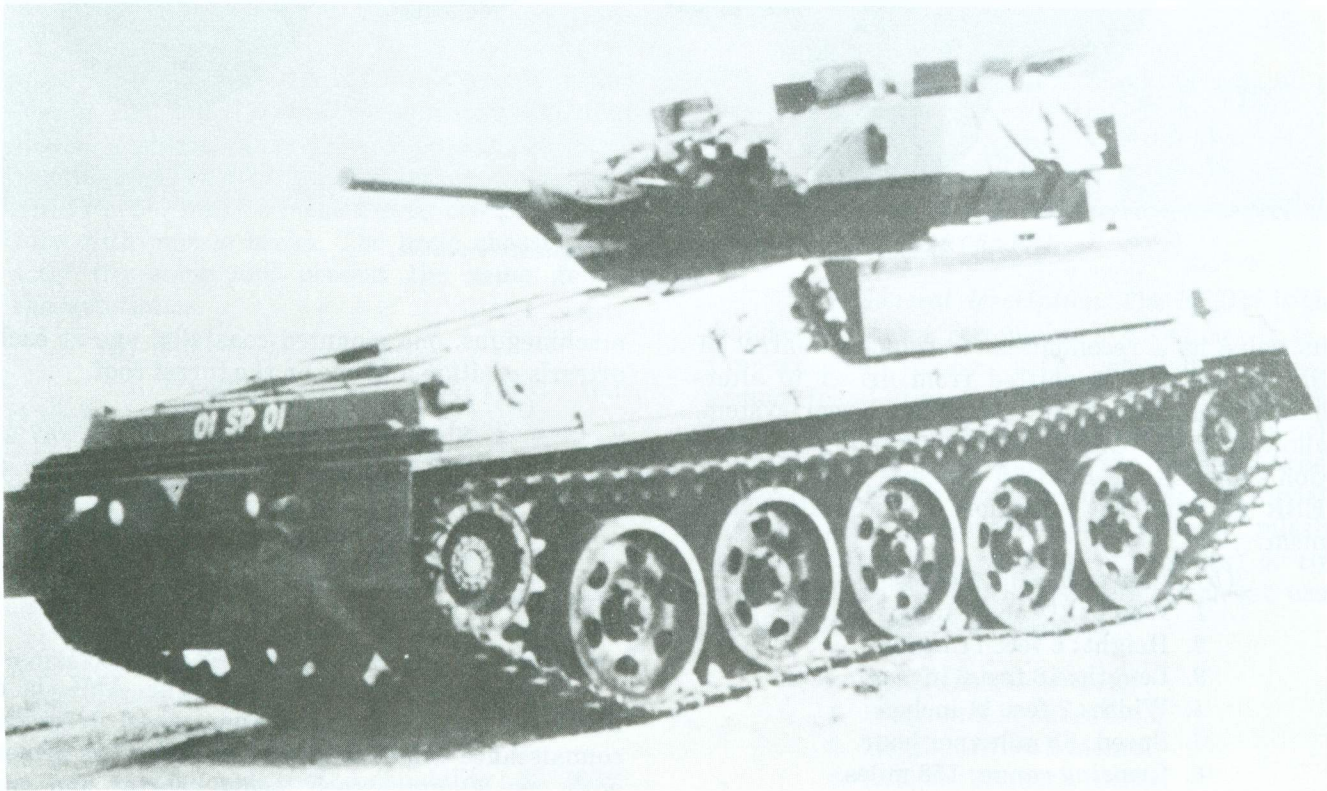


Figure 88. British armored reconnaissance vehicle, Scorpion.

Figure 89. British armored reconnaissance vehicle, Saladin.

its value as a reconnaissance vehicle. Control of the vehicle can be shifted from driver to alternate driver through its complicated gear system, allowing it to reverse direction rapidly. Illustration shown is the EBR 75 which is similar to the EBR 90 with the exception of the main armament.

(*b*) *Vehicle characteristics.*

1. Weight: 14 short tons.
2. Height: 6 feet 11 inches.
3. Length: 18 feet 6 inches.
4. Width: 7 feet 11 inches.
5. Speed: 63 miles per hour.
6. Cruising range: 158 miles.

(*c*) *Armament.* One 90-mm gun. 4 x 7.5 machineguns, one mounted coaxially, one at eac driver's position and one on the turret roof.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 28°/47%
2. Ditch crossing capability: 9 feet 4 inches.
3. Fording capability: 3 feet 8 inches.
4. Vertical obstacle climbing capability 1 foot 4 inches.

(2) *AML H.60–7 and H.90–7 (fig 91).*

(*a*) *General description.* The AML is family of light, highspeed, four wheel drive re connaissance vehicles. The AML H.60–7 is arme with one 60-mm breech loaded mortar and on 7.62-mm machinegun. Pistols are used for close

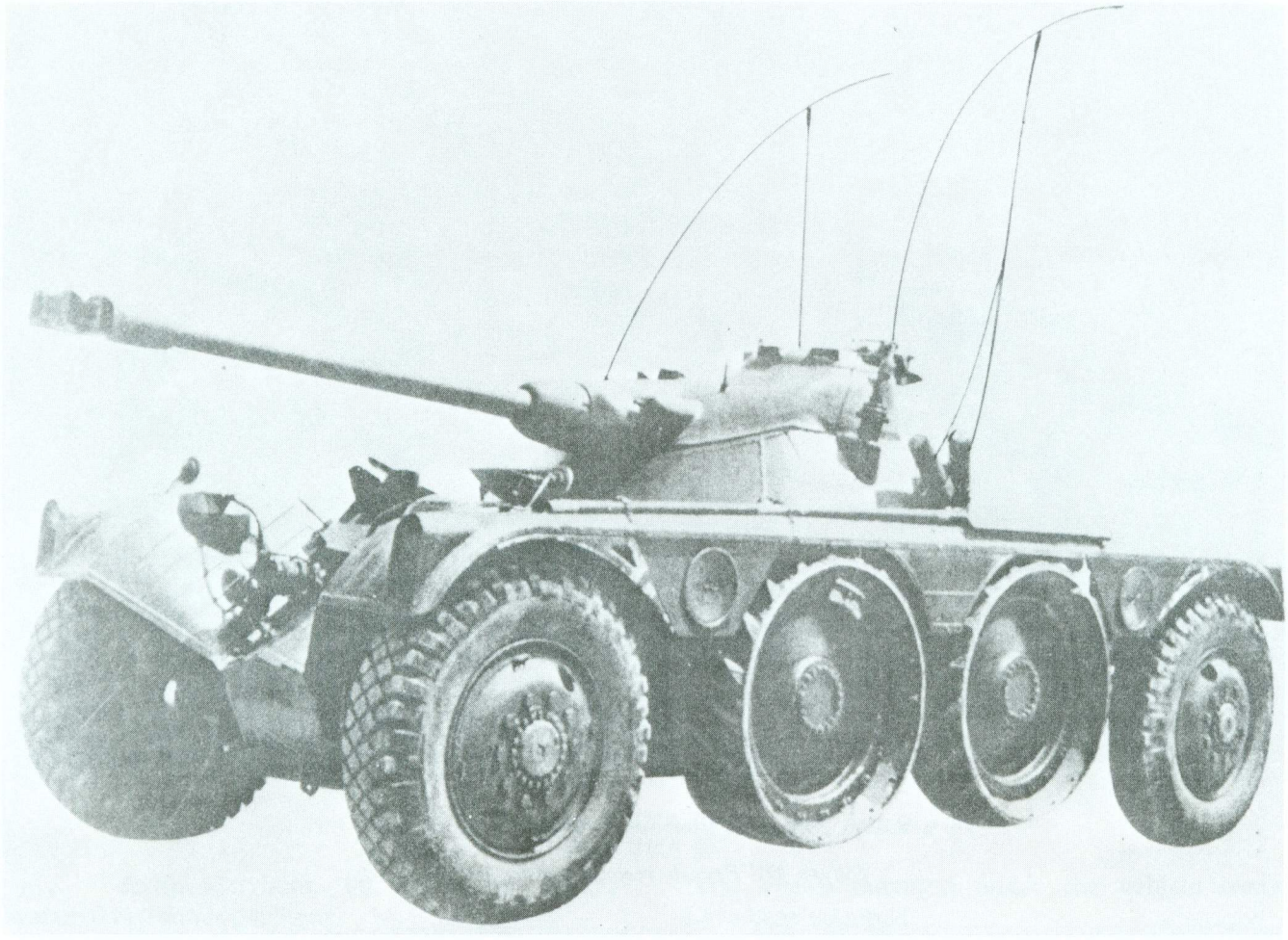


Figure 90. French reconnaissance vehicle, EBR90 MLE51.

in protection. The AML H.90–7 is armed with a 90-mm gun, one 7.62-mm machinegun, and individual weapons. The AML H.60 can be easily identified by the well rounded turret, whereas the AML H.90–7 may be identified by the long 90-mm tube with muzzle brake. The basic chassis is exactly the same and possess the same general characteristics.

(*b*) *Vehicle characteristics.*

1. Weight: H.60–7 5.3 short tons, H.90–7 6.1 short tons.

2. Height: 6 feet 6 inches.

3. Length: 12 feet 5 inches.

4. Width: 6 feet 5 inches.

5. Speed: 56 miles per hour.

6. Cruising range: 380 miles.

(*c*) *Armament.* AML H.60–7—one 60-mm mortar, one 7.62-mm machinegun. AML H.90–7—one 90-mm gun, one 7.62-m machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 37°/60%.

2. Fording capability: 3 feet 7 inches.

3. Vertical obstacle climbing capability: 1 foot 7 inches.

d. Soviet Union.

(1) *Amphibious armored reconnaissance vehicle, model BRDM (fig 92).*

(*a*) *General description.* The BRDM is the standard wheeled reconnaissance vehicle. It is a four-wheeled vehicle with complete overhead armor. In addition to the four main wheels, the BRDM has two sets of small wheels which help prevent bellying and add to the flotation when lowered. Although the basic armament is a machinegun, some vehicles have antitank missile launchers (for three versions of missiles) or two contamination pennant dispensers which are used during chemical reconnaissance.

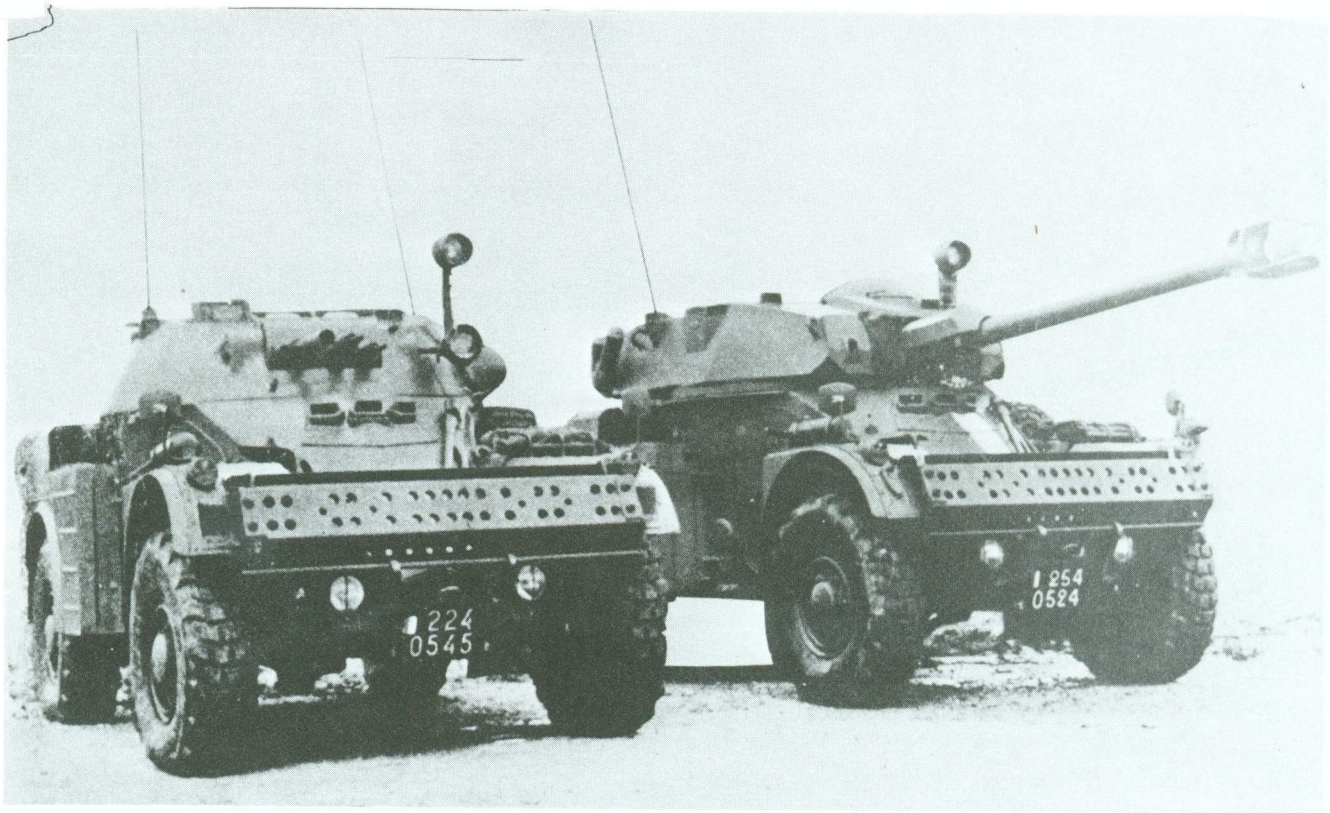
(*b*) *Vehicle characteristics.*

1. Weight: 6.17 short tons.

2. Height: 6 feet 2 inches.

3. Length: 18 feet 5 inches.

4. Width: 7 feet 1 inch.



① AML H. 60–7.
② AML H. 90–7.
Figure 91. French reconnaissance vehicles.

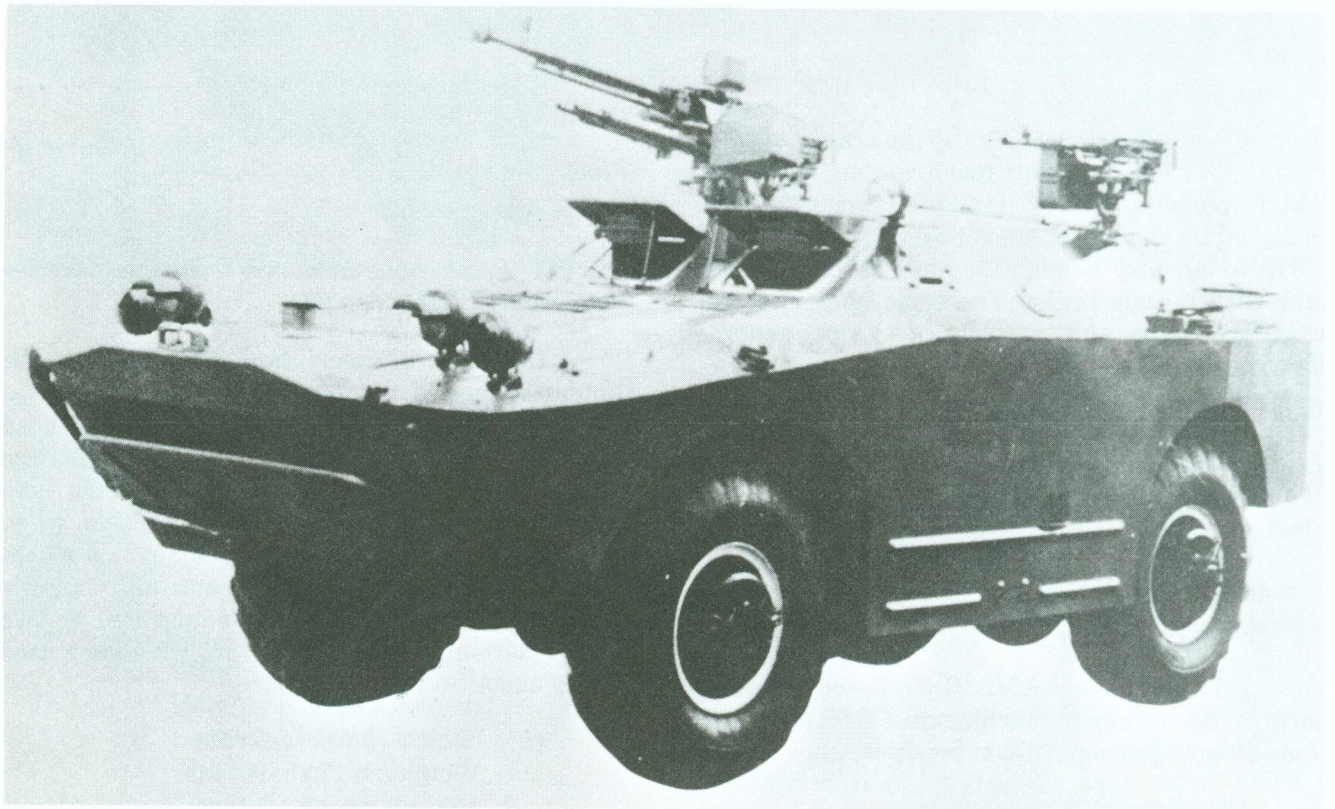


Figure 92. Russian amphibious scout car, BRDM.

Figure 93. Russian amphibious scout car, BRDM–2.

5. Speed: land, 60 miles per hour; water, 6 to 7 miles per hour.

6. Cruising range: 311 miles.

(*c*) *Armament.* One 12.7-mm machinegun and two 7.62-mm machineguns.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 4 feet.

3. Fording capability: amphibious.

4. Vertical obstacle climbing capability: 1 foot 4 inches.

(2) *Amphibious armored reconnaissance vehicle, model BRDM–2 (fig 93).*

(*a*) *General description.* The BRDM–2 is an improved version of the BRDM amphibious scout car. Armament consists of two machineguns mounted in a turret located midway on the vehicle. Chassis length has been increased to accomodate a more powerful rear mounted engine. The hydrojet water propulsion system and auxiliary wheels mounted under the vehicle center have been retained.

(*b*) *Vehicle characteristics.*

1. Weight: 7.38 short tons.

2. Height: 7 feet 7 inches.

3. Length: 19 feet 1 inch.

4. Width: 7 feet 4 inches.

5. Speed: land, 60 miles per hour; water, 6 to 7 miles per hour.

6. Cruising range: 466 miles.

(*c*) *Armament.* One 14.5-mm machinegun and one coaxially mounted 7.62-mm machinegun.

(*d*) *Mobility characteristics.*

1. Slope ascending capability: 30°/50%.

2. Ditch crossing capability: 4 feet (estimated).

3. Fording capability: amphibious.

4. Vertical obstacle climbing capability: 1 foot 4 inches (estimated).

CHAPTER 6

COMBAT EXAMPLES

104. General

This chapter consists of a series of examples selected and arranged to enable both the soldier and the junior leader to percieve the environment of armor-dominated combat. Since the effectiveness of an antiarmor weapon system is the product of its ability to destroy a single tank, and its ability to survive each engagement, the examples provided will both portray formations of massed and descriptions of single tank destruction. In reading this chapter, the soldier must seek to attain the participant's sense of urgency and need for decisive action. Once he has attained the feel of the situation the soldier must be able to see the deliberate logic of the tank fighter's action, the employment of available manpower and material resources, and identify those principles which were employed in successful antiarmor operations. The examples presented are categorized based upon the characteristics of armor fighting forces, to better enable the soldier to visualize himself in a similar situation.

105. Observations on Massed Armored Engagements

The largest scale armor operations were conducted on the German Eastern Front. It must be remembered that the following descriptions are based on, or directly quoted from, reports by the participants and may be presumed to be somewhat partial.

a. Source, DA Pam 20–230.

(1) "Areas of great importance were surrounded with heavy fortifications. For instance, the German armored units before Leningrad encountered fortification systems up to 6 miles in depth, including innumerable earth and concrete bunkers with built-in guns and other heavy weapons. There were even concrete pillboxes with disappearing armored cupolas for artillery and machineguns. They were constructed in the rear from standard concrete forms, assembled at the front, and equipped with the armored cupolas. The cupolas were raised and lowered by wooden levers, which had to be operated manually by the pillbox crew. A speedy elimination of these concrete pillboxes with the means available in mobile warfare was difficult.

(2) "The forward edge of such a defense system was generally situated behind an antitank ditch several miles long and up to 20 feet wide and 12 feet deep. Embedded in the rear wall of this ditch were dugouts housing the riflemen with their defense weapons. A second and third antitank ditch frequently would be located in the depth of the system, and connected by a cross ditch so as to prevent enemy tanks that had penetrated the position from rolling it up. A machinegun or antitank bunker in every bend of the antitank ditch afforded flank protection. It was not unusual to encounter dammed-up watercourses close to the fortified position. They were up to a hundred yards wide and several yards deep, and presented an obstacle difficult to overcome. The Russians eliminated all favorable approaches to their front (forests, under brush, tall grainfields, etc.) by laying extensive mine fields.

(3) "Behind the most endangered sectors, opposite Byelgorod and Orel, they constructed defensive systems of hitherto unknown depth, and strengthened them with all kinds of obstacles. To be prepared against surprise armored thrusts, all points susceptible to penetration were safeguarded up to a depth of 30 miles by fully manned antitank gun fronts, antitank ditches, minefields, and tanks in emplacements, in such numbers and strength that to overcome them would have called for great sacrifices and much time. Behind the pressure points north of Byelgorod and south of Kursk, sufficient local forces stood ready everywhere. Noteworthy were the numerous alternate firing positions, and the fact that the bulk of the numerous Russian artillery pieces were kept as far to the rear as their maximum range allowed, so as to escape counter-battery fire from German heavy howitzer batteries and to be able, in case of reverses, to support the infantry as long as possible. The Russian batteries preferred firing positions in forests, or in orchards adjacent to inhabited localities.* * *"

(4) "In 1944–45 the Russians, while on the move, also scattered mines around points of main

effort in order to block tank attacks. In the southern Ukraine, following a successful tank thrust, the Russians immediately protected the terrain they had gained with a belt of antitank mines blocking all roads and approaches. On 1 day alone, 20,000 such mines were laid. German counterattacks ground to a halt and collapsed in minefields of that type.

(5) "In 1943 new methods of tank and antitank warfare were introduced, though the methods of the infantry remained the same. Heavy machineguns and dug-in tanks frequently were encountered deep in the battle position. The latter were particularly dangerous because they were well-armored and difficult to hit. In sectors in which the terrain was passable for tanks, antitank gun fronts would be set up in nearly all instances. They were developed to extraordinary strength and foiled many a German armored attack. They were also used against infantry, in which case they fired high-explosive shells."

b. Source, Strategy and Tactics of the Soviet-German War.[1] "During the night Soviet scouts reported that German tanks were concentrated in a forest at two points previously under Soviet fire, ready to attack. At 3:30, 70 German tanks emerged from the forest and opened a hurricane of fire with artillery and machineguns. Soviet antitank guns held their fire without disclosing their position. Soviet supporting artillery, however, immediately opened up. After losing several tanks the Germans were compelled to launch the attack before they had adequately prepared it with artillery. They deployed and began firing indiscriminately as they advanced. In their path was an antitank ditch. A group of tanks skirted this, but, in doing so, came on a minefield. Seven tanks were blown up in several seconds. From the Soviet trenches the Nazi tank men could be seen jumping out through the hatches and being mowed down by machinegun fire. The remaining tanks skirted the ditch on two sides and appeared before the beginning of the defense zone. During this time the tanks in the center had rounded the antitank ditches and the minefield and had arrived within about four hundred yards of the Soviet infantry. Some of the infantry crouched on the rear of the tanks themselves under cover of their armor. Soviet antitank guns then opened fire, putting 10 tanks out of action, but being themselves partly put out of action. Captain Gavrushin opened fire with antitank guns and machineguns from the depth of the defense zone. Simultaneously Soviet infantry launched a counterattack.* * *"

c. Source, Panzer Battles.[2]

(1) "The light and medium tanks used during the first three years of the war had done a splendid job during that period. However, as Russian antitank weapons had become more effective and Russian tanks bigger and stronger, the earlier models were now obsolete. Heavy and super-heavy tanks had come to the forefront, and armored tactics had to be changed accordingly. Panzer leaders were in the best position to watch developments, as they had to adapt their tactics to the new weapons.

(2) "German antitank tactics of 1941 were no longer effective for they did not provide for the massive Russian attacks with great numbers of tanks. It soon became apparent that a single antitank gun or a cluster of them operating independently, were quickly discovered and knocked out. For this reason a new method was developed, which the German panzer troops called the Pakfront. Groups of guns up to a total of ten were put under the command of one man, who was responsible for concentrating their fire on a single target. Groups of antitank guns were thus welded into one unit, the groups were organized in depth and strewn all over the defended area. The idea was to draw the attacking armor into a web of enfilade fire. Fire discipline was of the first importance, and to open fire too early was the gravest mistake to be made.

(3) "The Russians copied these tactics and soon became past masters of them, as we learned to our cost in Citadel. It was a Russian specialty to fortify these Packfronts with minefields or antitank ditches, and to scatter mines haphazard among the minebelts. The rapidity with which mines were laid by the Russians was truly remarkable. Two or three days and nights were quite sufficient for the Russians to lay more than 30,000 mines and it was no rare thing to have to lift 40,000 mines a day in the sector of a German corps. During the Kursk offensive, and after penetrating to a depth of twelve miles, we still found ourselves in the midst of minefields and opposed by Pakfronts. In this connection mention should be made again of the masterly camouflage work of the Russians. Neither minefields nor Packfronts could be detected until the first tank blew up, or the first Russian antitank gun opened fire.

(4) "The question of how it was possible for the German armor to fight its way through these Russian antitank defenses is difficult to answer; the method chosen depended upon local conditions and on the forces available for the opera-

[1] "Strategy and Tactics of the Soviet-German War" by Officers of the Red Army and Soviet war correspondents, pp 76, 77, and 78.

[2] "Panzer Battles" by Major General F. W. Von Mellethin. Copyright 1956 by the University of Oklahoma Press, pp 230–232.

tion. The detailed preparations for Citadel and the exemplary coordination between ground and air forces were of course largely responsible for such success as was achieved. During Citadel the German armor moved and fought in wedge formation, the Panzerkeil, which up to then had proved very effective indeed; the spearhead of the wedge was formed by the heaviest tanks, and the Tigers proved their worth against the Russian antitank fronts organized in depth. The Tiger's 88-mm gun was superior to anything the Russians had, but as I have mentioned, the Panthers were still in their infancy and were a failure. Our Mark IV's were not good enough to effect a breakthrough against a deep antitank front, and the capture of so many Russian positions was due to the perfect cooperation of all heavy weapons.

(5) "Citadel and other operations proved that the fire of the antitank front can be neutralized by the concentric and expertly conducted fire of the attacking armor. To put this theory into practice called for changes in armored formations and tactics. The tank wedge was replaced by the Panzerglocke (Tank Bell). This Panzerglocke, with superheavy tanks in the center, medium tanks to the right and left rear in a widening arch, light tanks behind the center and held ready for pursuit, was the best formation to bring to bear against a wide fire front. The Panzer Commander, together with observers for all the heavy weapons, travelled in the Glocke immediately behind the leading medium tanks. He had to be in wireless communication with the commander of the fighter-bombers, and other aircraft supporting the ground troops. Engineers in armored vehicles travelled just behind the forward tanks of the Glocke, ready to clear gaps through minefields. An attack along these lines was generally successful if the attacking formations practiced close cooperation of all weapons.

(6) "Night attacks provided another means of breaking through deep antitank fronts, although a night attack was always regarded with some trepidation. The terrain has to be suitable for armor, and the weather had to be favorable; moonlit nights were preferred. The ground had to be reconnoitered during daylight by the officers concerned. As we had no suitable compasses for the tanks, a road clearly visible at night or a sand track were used to indicate direction. Even in night attacks the Panzerglocke proved its usefulness; the advance was made in closer formation and with shorter distances between tanks. Darkness seriously hampered the defending guns, and a well-prepared night attack usually went off without appreciable losses. Well-trained officers and experienced tank drivers were indispensable.

(7) "The success of attacks by armor against antitank fronts seems to depend on the following conditions:

(*a*) "Every opportunity must be taken for reconnaissance in the air and on the ground.

(*b*) "The armored formation carrying out the attack must be made as strong as possible by super-heavy tanks, brought to bear in the Schwerpunkt.

(*c*) "Fire concentrations by tank guns must be rapid and effective; the armor must keep moving and tanks should stop to fire their guns.

(*d*) "Observers for all heavy weapons supporting the attack must travel with the armor. Wireless communication between the tank leader and the air is most essential.

(*e*) "Engineers in armored vehicles must follow the armor.

(*f*) "Light tanks must be at hand to exploit success.

(*g*) "Fuel and ammunition for the armor must be assured during the battle, by armored supply carriers. Much experience is needed to carry out this difficult operation.

(*h*) "Tanks should be supplied with smoke gear to blind enemy antitank weapons, and with colored smoke grenades for unit commanders to indicate direction.

(*i*) "For night attacks tanks should be supplied with direction-finding equipment."

d. Source, DA Pam 20–269. "Composed of one tank regiment and one armored infantry battalion of the 6th and one tank company of the 23rd Panzer Division, Task Force Huehnersdorff, so named after its commander, moved out from Zalivskiy and ascended the gentle slopes of the Aksay Valley via Klykov. After reaching the eastern end of the enemy-held ridge, the tanks began to move westward along the crest of the ridge without encountering opposition. The Russian infantrymen, hiding in their deep foxholes and narrow trenches in groups of two to four men, permitted the tanks to pass over them. However, as soon as the German armored infantry at the tail end of the column had passed them, the Russians fired antitank grenades at the lightly armored vehicles at pointblank range, inflicting heavy losses. Repeatedly, the tanks had to stop and come to the assistance of the armored infantrymen who tried to flush out the Russian nests of resistance. But even the tanks were ineffective against the Russian infantrymen, who were so well concealed by the tall, brown steppe grass that they could not be discovered by the tankers or infantrymen from their armored vehicles. In most instances the German soldier was

hit by a sniper's bullet before he ever got close to his hidden opponent. German planes were as powerless as the tanks, whose ineffectiveness in this situation was only too obvious. Although the lead tanks were able to reach the opposite end of the ridge by midafternoon, the majority of the Russians were still in their positions. Having failed in its mission and suffered considerable losses, the task force had no other choice but to return to the bridgehead."

106. Group Actions

Generally, the larger the tank force to be engaged the more frequent will be the use of group actions to either engage a number of tanks simultaneously or to engage a series of tanks in rapid succession. For the purpose of this paragraph, a group action is the employment of a team in which each member accomplishes an individual task as opposed to a group of individuals performing similar roles in concert.

a. Regular Forces.

(1) Single Tank Ambush Team.[3] "The following information on the employment of magnetic mines by German infantry antitank squads has come from a credible German source. Six men are assigned as an antitank team, generally for night operation in positions offering possible avenues of tank approach. The team is deployed in the form of a 'V' at intervals of approximately 50 yards, adapting itself to the terrain for observation and field of fire (fig 94).

"All men are armed with machine pistols and antitank, magnetic, hollow-shaped charges. The team leader, No. 4, carries a pyrotechnic pistol. In addition, four Tellermines are carried for placing in the probable path of the tank, and are controlled by a 50-yard length of wire by which they can be pulled under the approaching tank.

"When a tank comes on, the team leader fires a pyrotechnic charge directly at the turret of the tank and momentarily blinds the crew. At the same time, Nos. 3 and 5 pull Tellermines into its path, and No. 2 rushes forward to place the magnetic charge on the side armor plate of the tank. Meanwhile, No. 4 covers the turret hatch to prevent the escape of the crew; Nos. 1 and 6 cover the ground behind the tank for possible infantry accompanying it. Each man is interchangeable with the others of the team and his duties are determined by the terrain."

(2) Infantry Use of Mortars to Close with Tanks.[4] "We find that enemy tanks in woods generally fire from prepared and camouflaged positions. We get as close as we can with our infantry and register our mortars with HE shell in the vicinity of the tanks. Then we change to smoke shell, and blind the tanks while we close in with bazookas and bayonets."

(3) Ambush-Delay of Armored Column.[5] "The 7th Armored Division has recently encountered a type of German delaying position designed to destroy the leading tanks of an armored column and cause confusion and delay. The particular set-up has been encountered repeatedly and the division has evidence that the Germans have been studiously practicing and perfecting the technique. As shown in figure 95, a covered and perfectly camouflaged foxhole for a two-man bazooka team is normally dug in a semicircular shape around the corner of a house or building near (5 to 50 yards) a road. A camouflaged escape trench leads from the rear of the bazooka emplacement to any nearby cover, such as woods, garden, shrubbery, or additional buildings. Machineguns are placed in a 'V' formation with the open end of the 'V' from 300 to 400 yards from the road in the direction from which our approach is expected. When the column is preceded by a dismounted point, fire is withheld until the bazooka team is certain of knocking out the lead vehicles. When the bazooka fires, all machineguns open up on the remainder of the column, not principally to cause casualties, but to cause confusion and make it difficult to ascertain from where the bazooka fire has come. Due to the excellent camouflage of the positions and escape trench and the confusion caused by the crossfiring machineguns, it has been found extremely difficult to determine the location of the resistance."

b. Irregular Forces. Guerrilla and partisan forces as a rule do not have the logistical and ordnance advantages of regular military forces. To a great extent they wage combat with either captured or locally produced weapons. It is in the application of expedient weapons that the ingenuity of the successful tank fighter is displayed.

(1) Russian Fire Belts.[6] "A barrier about a quarter of a mile in length of burning hay, straw, brushwood, and other materials was put in the way of fascist tanks. In some places the fiery bulwark reached the height of ten feet and burned fiercely for two and a half hours. Coming against this wall of fire, the enemy armored machines changed their route, thus exposing themselves broadside to the Soviet antitank guns; 25 of 40 enemy tanks were fastened to the spot."

[3] Tactical and Technical Trends #29 (Washington, D.C.: War Department, Military Intelligence Series, 15 July 1943) p 8.

[4] Battle Experiences 12th Army Group #71.

[5] Battle Experiences 12th Army Group #68.

[6] Cherkinov, Major N., "Incendiary Bottle and Fire Belt Field," Field Artillery Journal, November 1942. p 851.

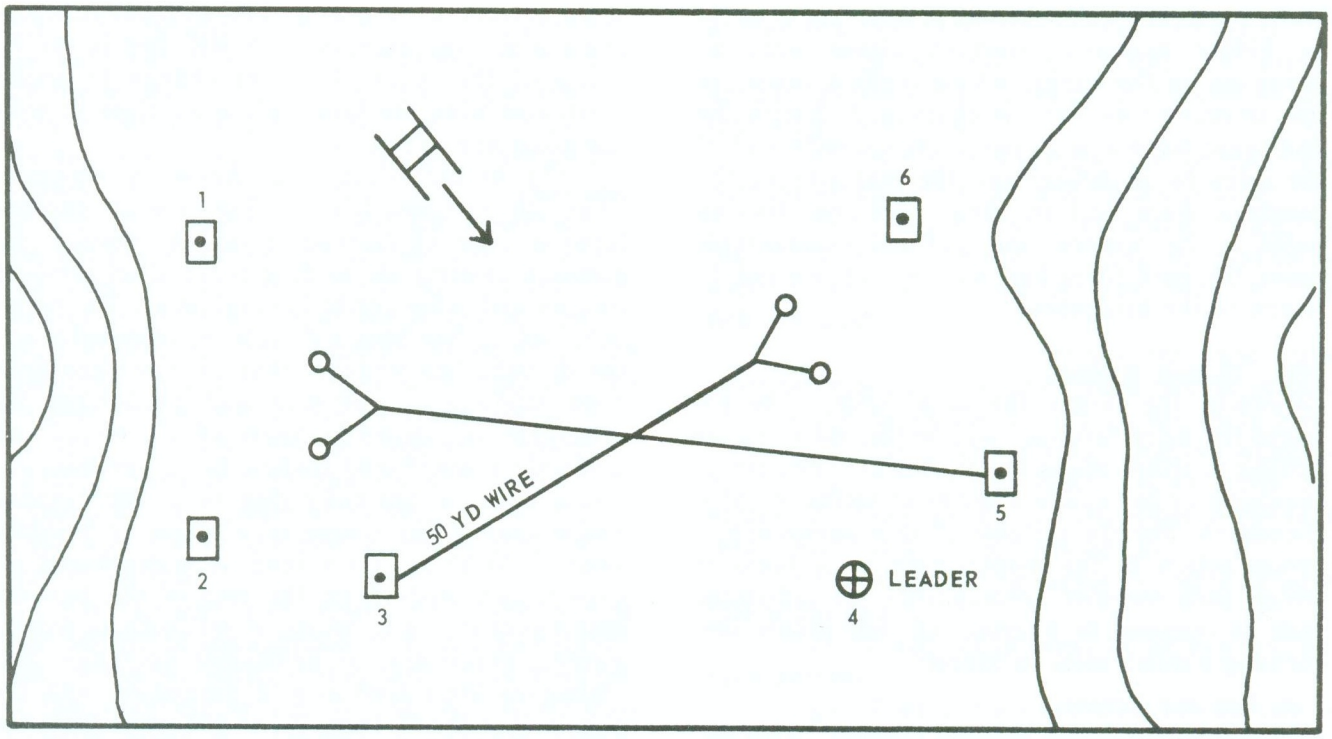


Figure 94. Single tank ambush team.

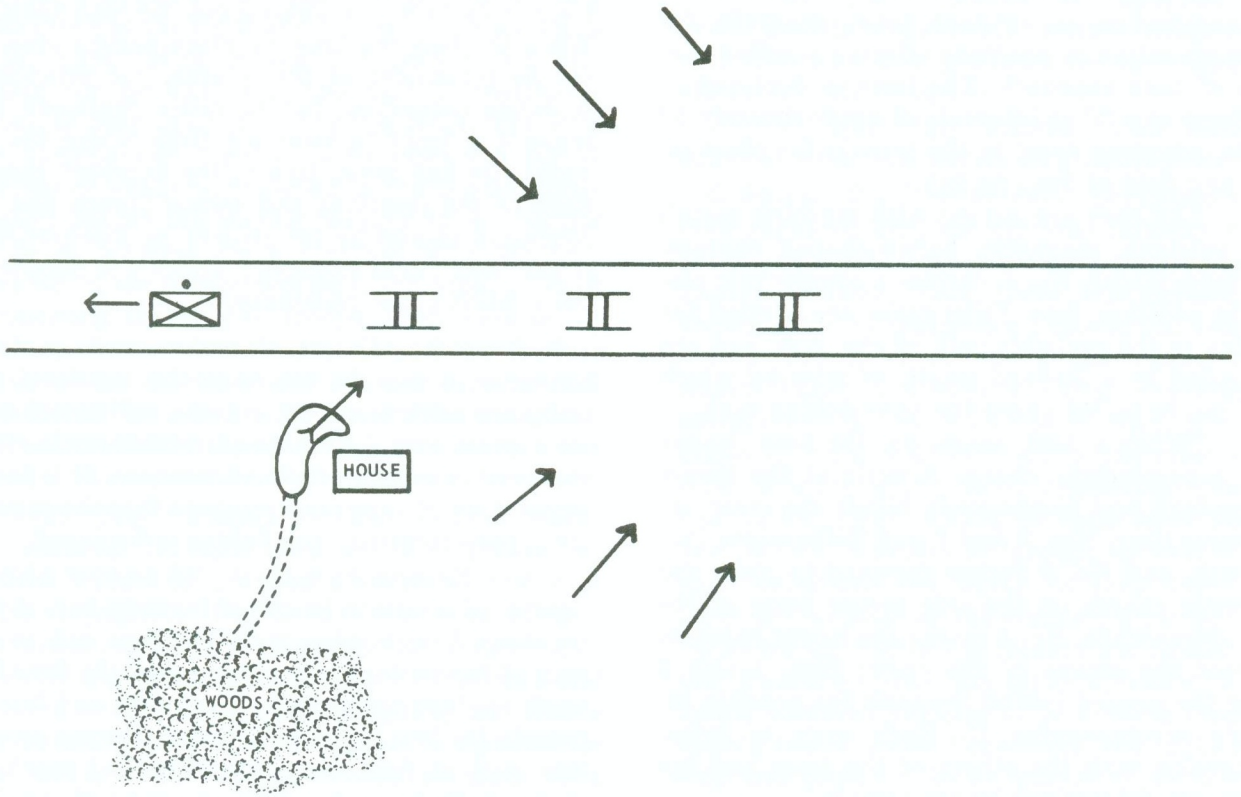


Figure 95. Ambush-delay of armored column.

(2) Guerrillas in Pinsk.[7] "When the tanks came to rest in a square they were immediately surrounded by guerrillas, who crept up to them, and put their machinegun barrels out of action with hammer blows. Guerrillas learned very early that the angle of fire of a tank machinegun

[7] Soviet War News #3, "We Are Guerrillas" (Hutchison & Co., Ltd.) p. 24.

makes it impossible to hit a man crawling on the ground nearby.

"Although the guns were now out of order, the Germans still remained protected by their armor. Thereupon, blacksmiths came up and hammered away at the tanks until their occupants were no longer able to stand the shattering noise and were forced to surrender."

(3) Tank Pits in Russia.[8] "Near a small town in Central Russia, a guerrilla group learned the route by which tanks were expected to pass on their way to a concentration point. The route led through a forest, and the Germans were moving at night.

"Tank pits were hastily dug, and an ambush was laid. The leading enemy tank fell straight into the trap. The second tank crashed into the first. The following tanks turned off the road, but three of them also fell into deep pits. When the rest of the tanks turned back, they were showered with hand grenades."

"* * * When several (armored cars) were reported to be approaching a bridge, guerrillas dug a pit in the road and camouflaged it. Not far from the pit they hid themselves with a machine-gun, grenades, and fire-bottles.

"The German cars drove up to the bridge. The first one fell into the pit. The Nazis got down and began hauling the machine out again. The hidden guerrillas then opened fire and hurled fire-bottles. Meanwhile, a few of the guerrillas had quickly laid a mine in the road along which the cars had come. When the Germans saw they were ambushed, they crowded into the two remaining armored cars and drove back. One of the cars then hit the hidden mine and blew up. The last machine was destroyed by hand grenades."

(4) Students in Szena Square, Budapest.[9] "A few minutes later we saw three tanks creeping slowly toward us from a side street. The young boys asked us to stop. They jumped down from the car and ducked into the shelter of a Catholic Church close to Szena Square.

"One of the boys carried a long rope. He suddenly darted across the street with it, his friends holding the other end. One of the other lads ran out into the middle of the street with three bottles in his hand. He fastened them to the rope which lay flat on the ground.

"In the shelter of the buildings, using the rope, they moved the bottles back and forth until the tank treads were directly in line with the bottles. The youngest boy lit a torch from a newspaper and passed it to his taller companion. As soon as the first tank tread scooped up one of the bottles, all three dashed out again into the 'dead' range of the tank's guns, and tossed burning paper at the bottles. They half ran, half stumbled back to the sidewalk and just managed to get into the church doorway as the first bottle exploded, then the second, and the third.

"The tanks, which had been moving along three abreast, suddenly caught fire and turned into blazing coffins for those inside. The 'Molotov cocktails' dazzled us with their effectiveness. Tank hatches quickly swung open, and the bandits who only minutes ago had killed innocent and unarmed Hungarians began to scramble out, waving white cloths."

(5) Soviet Tanks in Budapest.[10] "One evening I saw a column of T–34's with their turrets closed moving gingerly up a narrow street in the center of the city, the Sip Utca. Halfway up the street and hidden by a corner, two Freedom Fighters, young men of about 21, were hiding in a doorway with a supply of Molotov cocktails and a single bazooka. As the first Russian tank came abreast of them, they flung a gasoline bomb under its tracks.

"The result was chaos. The leading tank caught fire, and the crew started to open the turret in order to escape. As they did so, the man who had thrown the Molotov cocktail leapt onto the back of the burning tank and slipped a hand grenade inside the half open turret. At the same moment he fell, killed by a burst of fire from Russians in an armored car at the rear of the column which was firing furiously in all directions.

"The confusion now grew as the following tanks in the column tried to reverse back down the street. Their guns were too long to turn in the narrow street, so the only protection the Russians had was from the twin machineguns mounted in the armored troop carrier at the rear of the column where, nevertheless, a burst from hidden snipers on a nearby roof killed or wounded several Russians before the melee could be sorted out."

107. Individual Actions

It is in the action of the individual, one man versus one tank that the heroism, resourcefulness, and determination of the infantry soldier reaches its full magnitude. It is not surprising therefore that the majority of these examples are extracted from citations for heroism.

a. Antitank Weapons.

[8] Ibid. p 25.

[9] From "A Student's Diary" by Laszlo Beke, Leon Kossar and Ralph M. Zoltan, copyright 1967 by The Viking Press, Inc. Reprinted by permission of The Viking Press, Inc.

[10] Terry, Antony, "Soviet Tanks in Budapest," Ordnance, March-April 1957 p 796.

(1) SSG Clyde L. Choate, 601st Tank Destroyer Battalion vs. Mark IV and one company of German infantry.[11]

"He commanded a tank destroyer near Brugeres, France, on 25 October 1944. Our infantry occupied a position on a wooded hill when, at dusk, an enemy Mark IV tank and company of infantry attacked, threatening to overrun the American position and capture a command post 400 yards to the rear. Sergeant Choate's tank destroyer, the only weapon available to oppose the German armor, was set afire by two hits. Ordering his men to abandon the destroyer, Sergeant Choate reached comparative safety. He returned to the burning destroyer to search for comrades possibly trapped in the vehicle, risking instant death in an explosion which was imminent, and braving enemy fire which ripped his jacket and tore the helmet from his head. Completing the search and seeing the tank and its supporting infantry overrunning our infantry in their shallow foxholes, he secured a bazooka and ran after the tank, dodging from tree to tree and passing through the enemy's loose skirmish line. He fired a rocket from a distance of 20 yards, immobilizing the tank but leaving it able to spray the area with cannon and machinegun fire. Running back to our infantry through vicious fire, he secured another rocket, and advancing against a hail of machinegun and small arms fire, reached a position 10 yards from the tank. His second shot shattered the turret. With his pistol he killed two of the crew as they emerged from the tank; and then running to the crippled Mark IV while enemy infantry sniped at him, he dropped a grenade inside the tank and completed its destruction."

(2) PFC Dirk J. Vlug, 126th Infantry vs. five Japanese tanks.[12] Near Limon, Leyte, Phillippine Islands, on 15 December 1944.

"When an American roadblock on the Ormoc Road was attacked by a group of enemy tanks, Private Vlug left his covered position, and with a rocket launcher and six rounds of ammunition, advanced alone under intense machinegun and 37-mm fire. Loading singlehandedly, he destroyed the first tank, killing its occupants with a single round. As the crew of the second tank started to dismount and attack him, he killed one of the foe with his pistol, forcing the survivors to return to their vehicle, which he then destroyed with a second round. Three more hostile tanks moved up the road, so he flanked the first and eliminated it, and then despite a hail of enemy fire, pressed forward again to destroy another. With his last round of ammunition he struck the remaining vehicle, causing it to crash down a steep embankment. Private Vlug alone destroyed five enemy tanks."

(3) Blunting of three armor assaults with a long bazooka.[13]

"Armed with a bazooka, he defended a key road junction near Rocherath, Belgium, on 17 December 1944, during the German Ardennes counteroffensive. After a heavy artillery barrage had wounded and forced the withdrawal of his assistant, he heard enemy tanks approaching the position where he calmly waited in the gathering darkness of early evening until the five Mark V tanks, which made up the hostile force, were within pointblank range. He then stood up, completely disregarding the fire power that could be brought to bear upon him, and launched a rocket into the lead tank, setting it afire and forcing its crew to abandon it as the other tanks passed on before Private Soderman could reload. The daring bazookaman remained at his post all night under severe artillery, mortar, and machinegun fire, awaiting the next onslaught, which was made shortly after dawn by five more tanks. Running along a ditch to meet them, he reached an advantageous point and there leaped to the road in full view of the tank gunners, deliberately aimed his weapon and disabled the lead tank. The other vehicles, thwarted by a deep ditch in their attempt to go around the crippled machine, withdrew. While returning to his post, Private Soderman, braving enemy fire to attack an enemy infantry platoon from close range, killed at least three Germans and wounded several others with a round from his bazooka. By this time, enemy pressure had made Company K's position untenable. Orders were issued for withdrawal to an assembly area, where Private Soderman was located, when he once more heard enemy tanks approaching. Knowing that elements of the company had not completed their disengaging maneuver, and were consequently extremely vulnerable to an armored attack, he hurried from his comparatively safe position to meet the tanks. Once more he disabled the lead tank with a single rocket, his last; but before he could reach cover, machingegun bullets from the tank ripped into his right shoulder. Unarmed and seriously wounded, he dragged himself along a ditch to the American lines and was evacuated."

(4) "Beehive" Grenade.[14]

"We used the 'Beehive' the next night

[11] 90th Congress, Medal of Honor 1863–1968 (Washington, D.C., 1968) p 519.

[12] Ibid. p 698.

[13] Ibid. p 691.

[14] United States Army Tank Destroyer School, (Battle Experiences #2) 8 November 1943. p 2.

against German tanks trying to sneak out of the town. These grenades are too heavy to throw. They must be placed directly upon the tank.

"Our troops had driven German and Italian foot soldiers from the town, but German tanks were reported still hiding there. Our job was to knock out these tanks as they attempted to escape.

"Each of us selected for this mission was issued a 'beehive.' At dusk we crawled to our positions in the ditch bordering the only road leading inland from the town. We were not to attack until the last tank had cleared the town. That last tank would be hit first, and then the others in order from the rear of the column. I was assigned the third from the last tank.

"It was nearing midnight when we heard the tanks moving out of the town. I was counting the fifth to pass my position when I saw a tank blow at the edge of town. Then a second. The tanker in front of me heard the noise too, and tried to turn around to see what was going on. By that time I had crawled from the ditch, climbed up on the rear of the tank and planted my 'beehive' over the motor compartment. I heard the explosion as I ran for our rallying position in an orchard.

"The next morning seven tanks were found wrecked on the road. We had got all of them without suffering any losses to our troops. Quotation Pvt. Earl Crowder."

(5) Airborne versus Tanks.[15]

"Christmas morning, the Germans attacked our positions with tanks. I was back at the CP, and we received word that more bazookas and bazooka ammunition were needed up front. I took a bazooka and all the ammunition I could carry. When I got to the front, I saw one tank retreating and one Mark IV, with nine men riding on it, out in a field.

"When the tank was about 40 yards away and broadside on, I jumped up and fired, hitting the tank in the side just above the track. The rocket killed or stunned four of the men riding on the tank, and the tank immediately stopped and started to burn. The remaining men on the outside and the five crew members jumped off and out of the tank. We killed them with rifle and machinegun fire. The best place to get a tank with a bazooka is in the side above the track or the back side around the engine. The shell frequently has little effect on the front and often will not break a track."

(6) Hand-to-Armor Combat.[16]

"Award of the Distinguished Service Cross is made to Corporal Robert C. Carroll, Infantry, Company H, 9th Infantry, for action against the enemy in the vicinity of Yongsan on 15 August 1950. At approximately 0300 hours on 15 August 1950, four enemy tanks penetrated the defense perimeter of the 2d Battalion and succeeded in disrupting communications and destroying several company supply points. Obtaining a 3.5-inch rocket launcher, Cpl. Carroll crawled to within 50 yards of the lead tank and succeeded in immobilizing it. The three remaining tanks immediately withdrew. Armed with a hand grenade, Cpl. Carroll charged the disabled tank which was still firing its guns. Unable to locate an opening through which to drop his grenade, he removed an axe and sledge strapped outside the vehicle and used them to force open the turret hatch cover. As the hatch cover flew open, an enemy tanker stood up in the hatch, firing a submachinegun. In the face of this sudden and unexpected attack, Cpl. Carroll was forced off the tank, and the enemy tanker again fastened the hatch cover. Procuring a five-gallon can of gasoline from a nearby abandoned vehicle, Cpl. Carroll mounted the tank a second time and poured the gasoline around the turret and on the deck of the tank. Then, after climbing down to the ground, he made a rag torch which he threw on the tank, igniting the gasoline. The enemy tankers remained in the tank, firing all guns until they were burned to death."

(7) Tank Assault Against the Inchon Beachhead; Sosa-ri, Korea, 17 and 20 September 1950.[17]

"Dug in on a hill overlooking the main Seoul highway when six enemy tanks threatened to break through the battalion position during a predawn attack on 17 September, Private First Class Walter C. Monegan, Jr., 1st Marines, promptly moved forward with his bazooka under heavy hostile automatic-weapons fire and engaged the lead tank at a range of less than 50 yards. After scoring a direct hit and killing the sole surviving tankman with his carbine as he came through the escape hatch, he boldly fired two more rounds of ammunition at the oncoming tanks, disorganizing the attack and enabling our tank crews to continue blasting with their 90-mm guns. With his own and an adjacent company's position threatened by annihilation when an overwhelming enemy tank-infantry force bypassed the area and proceeded toward the battalion com-

[15] "Bazooka and AT Guns," Armed Forces Headquarters European Theater of Operations #780 p 3.

[16] Munroe, Lt. Clark C., "The Second United States Infantry Division in Korea." 1950–1951 (Tokyo, Japan: Toppan Printing Co., Ltd.) p 10.

[17] 90th Congress, op. cit. p 756.

mand post during the early morning of September 20, he seized his rocket launcher and, in total darkness, charged down the slope of the hill where the tanks had broken through. Quick to act when an illuminating shell lit the area, he scored a direct hit on one of the tanks as hostile rifle and automatic-weapons fire raked the area at close range. Again exposing himself he fired another round to destroy a second tank."

(8) 7th Cavalry versus North Korean T–34 Tanks.[18]

"As the first T–34 appeared, Sgt. Sheppard swung the .50 machingegun around and fired at its treads at a range of 150 yards. The T–34 opened up with one round of 76-mm and its machinegun. Sgt. Sheppard was shot from the jeep with a leg wound * * *"

"The leading T–34 engaged the single M–4 just beyond the railroad track in a brief, but hot exchange of volleys with neither tank scoring a hit.

"Cpt. Flynn (Co K) in the meantime had maneuvered the two 3.5-inch rocket launchers (jeep mounted machineguns and 3.5 teams from 1st Bn.) into a position to fire. Cpl. Herbert Krushensay and Pvt. 1st Class Billy L. Davis scored smashing hits on the rear of both tanks from about 25 yards range. In the explosion of the bazooka rockets, Cpt. Flynn was wounded in the chest by fragments.

"The North Koreans who were not killed by the bazooka rockets abandoned their tanks.

"The enemy T–34's were burning. The machinegun ammunition in their turrets crackled like giant fire crackers and there were loud explosions from the 76-mm ammunition."

b. Expedient Weapon. Stopping a Tank with a Burning Shirt.[19]

"One of my sergeants came face to face with an enemy tank as he was standing by a 45-mm gun which he was repairing. As soon as the tank saw the gun, it advanced immediately, firing its machineguns at the gun and the sergeant. He jumped into a slit trench just as the tank ran over the gun. However, after running over the gun, the tank started skidding, and its speed was reduced, which gave the sergeant time to jump on top of it. There ensued a running fight between the crew of the tank and the sergeant, whose sole weapon was a pistol. He first leaned over and fired into the vision slit, but it was protected by bulletproof glass. This increased the sergeant's rage, so he tore off his blouse and set fire to it with his cigarette lighter. As soon as it was ablaze, the smoke rapidly spread over the tank and started seeping in through the slits. The tank was soon so full of smoke that the driver could no longer see where he was going. The underbelly of the tank struck a rock, half mounted it, and left the tank threshing the air with its tracks. The crew, sneezing and coughing, threw open the turret and surrendered."

[18] Webel, Major James B., "Scratch Two T–34's," Combat Forces Journal, September 1952, p 33.

[19] Romanowsky, Cpt Arkady, "Individual Antitank Combat," Military Review (digested from The Irish Defense Journal) January 1952 p 78.

APPENDIX A

REFERENCES

DA Pam 20–230	Russian Combat Methods in World War II.
DA Pam 20–233	German Defense Tactics Against Russian Breakthroughs.
DA Pam 20–269	Small Unit Actions During the German Campaign in Russia.
DA Pam 108–1	Index of Army Motion Pictures and Related Audio-Visual Aids.
DA Pam 310-series	Military Publications Indexes.
FM 3–2	Tactical Employment of Riot Control Agents.
FM 3–10	Employment of Chemical Agents.
FM 5–15	Field Fortifications.
FM 5–20	Camouflage.
FM 5–25	Explosives and Demolitions.
(C) FM 5–31	Boobytraps (U).
FM 5–34	Engineer Field Data.
FM 7–10	The Rifle Company, Platoons, and Squads.
FM 7–20	The Infantry Battalions.
FM 17–1	Armor Operations.
FM 17–15	Tank Units, Platoon, Company and Battalion.
FM 20–32	Landmine Warfare.
FM 20–33	Combat Flame Operations.
FM 20–60	Battlefield Illumination.
FM 21–26	Map Reading.
FM 21–40	Chemical, Biological, Radiological and Nuclear Defense.
FM 21–60	Visual Signals.
FM 21–75	Combat Training of the Individual Soldier and Patrolling.
FM 23–11	90-mm Recoilless Rifle, M67.
FM 23–30	Grenades and Pyrotechnic Signals.
FM 23–32	3.5-Inch Rocket Launcher.
FM 23–33	60-mm High Explosive Antitank Rocket, M72A1, M72A1E1, and M72.
FM 23–82	106-mm Recoilless Rifle, M40A1.
FM 31–10	Denial Operations and Barriers.
FM 31–50	Combat in Fortified and Built-Up Areas.
FM 31–100 (Test)	Surveillance, Target Acquisition, and Night Operations (STANO).
TM 3–1055–218–12	Operator's and Organizational Maintenance Manual: Launcher, Rocket, 66-mm, 4-tube, M202.
TM 5–280	Foreign Mine Warfare Equipment.
TC 23–23	TOW Heavy Antitank Weapon System.

APPENDIX B

SAMPLE SOP FOR ANTIARMOR WEAPONS

1. Dissemination of Information

a. Squad leader keeps all crew members informed of mission, enemy situation, likely direction of enemy attack, locations of friendly troops, location of alternate and supplementary positions, sectors of fire of adjacent weapons.

b. Crew members inform squad leader of all enemy activity observed. Squad leaders inform platoon leader or the commander of the unit to which you are attached.

2. Instructions When Attached to Unit

When attached to a unit, report to the unit leader for instructions and make recommendation and reports on your employment.

3. Selection of Positions and Routes

a. Ground reconnaissance unless specified or prohibited by enemy action.

b. Primary position. Must cover assigned sector. Should provide flanking fire on approaching armor. Avoid prominent terrain features. Should have natural cover and concealment.

c. Alternate position(s). Must cover same sector as primary position. Should have concealed route from primary position.

d. Supplementary position(s). Should protect flanks and rear and add depth to antiarmor defenses.

e. Routes. Covered and concealed between primary, alternate and supplementary positions, and for resupply, medical evacuation, and withdrawal.

4. Occupation of Positions

a. Use covered and concealed route. Maintain noise and light discipline. Infiltrate if necessary.

b. Initially site weapon on principal direction of fire, covering most dangerous armor approach. Place out local security. Immediately prepare weapons for firing. Prepare range card.

c. If weapon is dismounted, move carrier to defilade.

d. Prepare range cards for alternate and supplementary positions.

5. Preparation of Positions and Routes

a. Primary Position. Dig in weapon, gunner's and loader's position. Camouflage weapon to break up silhouette. Improve and camouflage routes. Continually improve position to include overhead cover.

b. Alternate Position. Dig weapon, gunner's and loader's position. Improve and camouflage route between primary position. Continually improve.

c. Supplementary Position. Dig weapon, gunner's and loader's position. Improve and camouflage route. Continually improve.

d. Maintain alertness and firing capability while positions are being prepared.

6. Action During Engagement

a. Clear assigned sector first. Squad leader must approve firing in other sectors.

b. Engage most dangerous target first. Aim for oblique or flanking shot. Let target approach to "sure kill" range.

c. Engage secondary targets on order of squad leader or as specified by Fire Plan.

d. Occupy alternate position when forced by enemy fire or assault. Inform platoon headquarters.

e. Occupy supplementary position on orders.

f. Withdraw on order, or as forced by enemy action. If communications are lost, use alternate means to inform platoon headquarters.

g. Displace by prearranged signal or on order, or if communications fail, when you can no longer support from present positions.

7. Action When Overrun
   a. If possible, notify higher headquarters.
   b. Remove ammunition from containers.
   c. Destroy weapon and ammunition to prevent capture.

8. Care of Weapon and Ammunition
   a. Clean and inspect weapons every day. Report immediately any malfunctions.
   b. Remove from containers only as needed. Keep dry and free from dirt. Protect from enemy fire and the elements.

APPENDIX C

ANTIARMOR CLOSE COMBAT COURSE

1. This appendix contains a sample design of an antiarmor close combat course (fig 96). The size of the area is dependent upon the number of stations included. As a minimum, an area 200 meters by 200 meters is required. An area this size will permit the training of an entire company at the same time. For control, an observation tower should be positioned which permits observation of the entire course.

2. A brief description of each station in the course follows:

Station 1—Introduction to course. This station provides brief introduction of the entire course. Characteristics and limitations of armored vehicles are discussed and demonstrated, to include vision deadspace, weapons deadspace, and vulnerable areas of tanks. Differences in fields of view between US and enemy tanks should be pointed out at this point. Tracing tape on two tanks illustrates vision and weapons deadspace. Students are allowed to enter the tanks to observe firsthand the feeling of protection experienced by

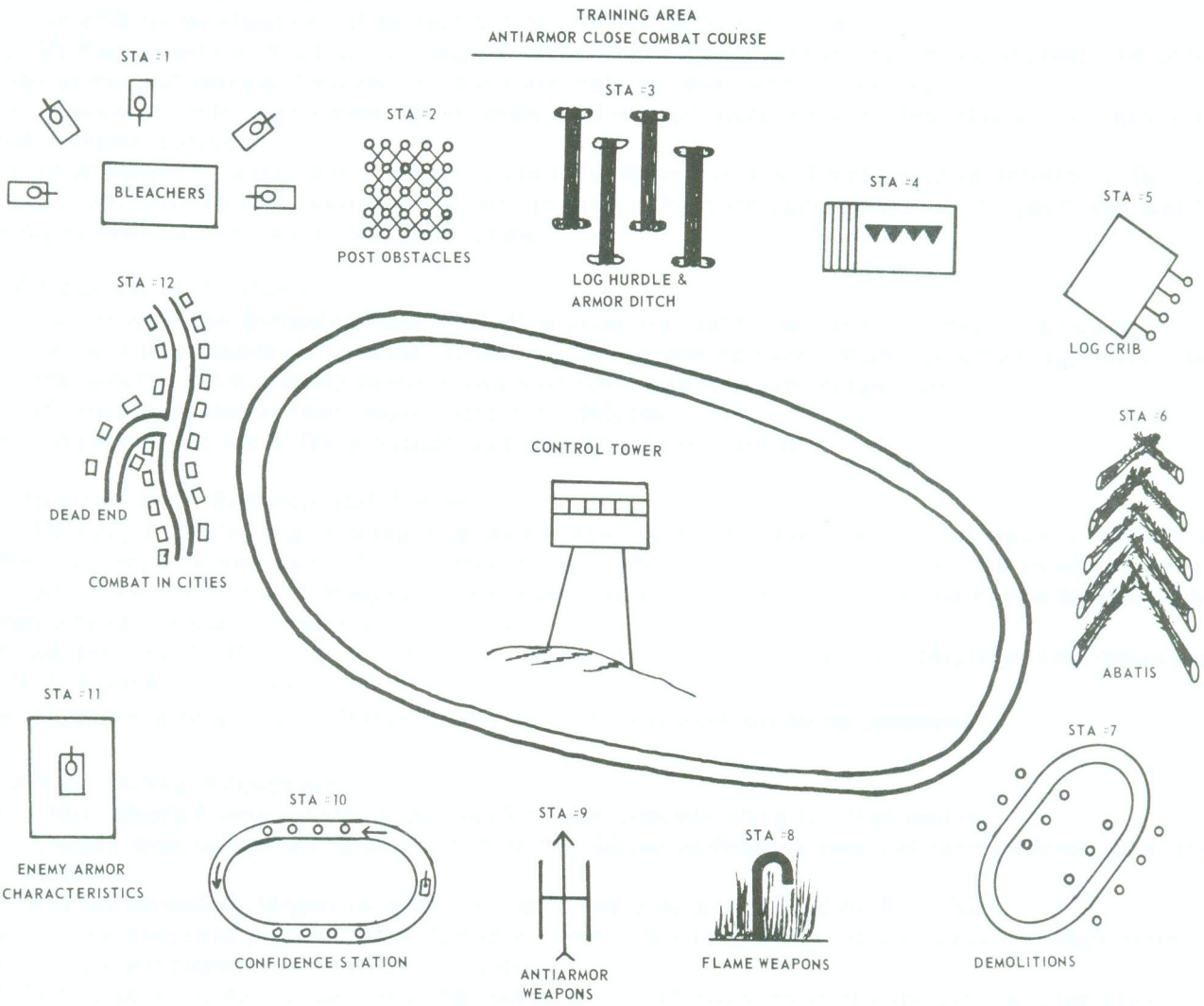


Figure 96. Antiarmor close combat course.

tank crew members when buttoned up. After this station, students are broken down into 11 groups and are rotated in a county fair manner throughout the remainder of the course.

Station 2—Post Obstacles. Explanation and demonstration of the construction of post obstacles to stop, impede, or canalize the movement of armored vehicles.

Station 3—Log Hurdles and Armor Ditch. Explanation and demonstration of the construction of log hurdles and an armor ditch to stop, impede, or canalize the movement of armored vehicles.

Station 4—Antiarmor Minefield. Explanation of how a small antiarmor minefield is emplaced. Practical work follows the explanation.

Station 5—Log Crib. Explanation and demonstration of the construction of log crib obstacles.

Station 6—Abatis. Explanation and demonstration of the construction of log abatis to stop or canalize the movement of armored vehicles.

Station 7—Demolitions. Explanation and demonstration of the use of demolitions to destroy or damage tanks. Students are required to employ dummy sled charges, Daisy Chain mines, saddle charges, and projectile charges against moving tanks.

Station 8—Flame Weapons. Explanation and demonstration of the use of flame weapons against armored vehicles. Weapons demonstration of the use of flame weapons against armored vehicles. Weapons demonstrated include the flamethrower, M74 incendiary rocket, molotov cocktail, and fire bomb. Students are shown how to improvise flame weapons using material found on the battlefield. Studnet are permitted to throw live or dummy molotov cocktails dependent on safety regulations and their status of training.

Station 9—Antiarmor Weapons. Explanation and demonstration of those antiarmor weapons assigned or attached to infantry units. Students are shown those areas of armored vehicles each weapon is most effective against.

Station 10—Confidence Station. Explanation and demonstration of the construction of individual fighting positions for protection against tanks. Students are required to occupy prepared individual positions while tanks are driven over them.

Station 11—Characteristics of Enemy Armor. Explanation and demonstration of the characteristics of enemy armored vehicles displayed. The use of mockups or large size armor flash cards will assist in the identification of vehicle vulnerabilities and visual deadspace.

Station 12—Combat in Cities. Explanation and demonstration of combat against armored vehicles in cities. This station should include permanently constructed block houses for student practical work, but instruction can be presented using sand tables and mockups.

APPENDIX D

SUMMARY OF ARMORED VEHICLE DATA CHART

Type vehicle	Nation	Weight (short tons)	Height	Length	Width	Speed (MPH)	Cruising range	Armament	Slope ascending capability	Ditch crossing capability	Fording capability	Vertical obstacle climbing capability
Tanks:												
M48A3	US	52	10′ 2″	28′ 6″	11′ 11″	30	310	1 90-mm 1 7.62-mm 1 .50 cal	37°/60%	8′ 6″	4′ 8′ Fording Kit 13′ 6″ Snorkel	3′
M60A2	US	57.2	10′ 8″	24′ 1″	11′ 11″	30	310	1 152-mm 1 7.62-mm 1 .50 cal MSL—classified	37°/60%	8′ 6″	4′	3′
Centurion Mark 9	Great Britain	51	9′ 10″	25′ 8″	11′ 2″	21.5	150	1 105-mm 1 .50 cal 2 .30 cal	35°/57%	11′	4′ 8″ 15′ Snorkel	3′
Vickers	Great Britain	42.5	8′	23′ 11″	10′ 5″	35	325 420-Aux tanks	1 105-mm 1 .50 cal 1 .30 cal	35°/57%	8′	3′ 8″	3″
Chieftain	Great Britain	57.9	9″	25′ 1″	11′ 10″	25.3	250	1 120-mm 1 .50 cal 2 7.62-mm	35°/57%	10′ 4″	3′ 6″	2′ 11″
AMX–13	France	16.4	9′ 9″	15′	8′ 3″	37	211	See para 100*c*(1)	31°/52%	6′ 2″	2′ 7″	2′ 1″
AMX–30	France	35.8	8′ 3″	20′ 11″	10′ 2″	40	260–300	1 105-mm 1 12.7-mm or 1 20-mm 1 7.62-mm	31°/52%	9′ 7″	7′ 2″ 13′ 2″ Snorkel	3′
PZ–61	Swiss	40.7	8′ 11″	21′ 11″	10′	31	186	1 105-mm 1 20-mm 1 7.5-mm	36°/59%	9′ 2″	3′ 7″ 15′ Snorkel	2′ 6″
Leopard	West Germany	39.3	7′ 10″	22′ 10″	10′ 8″	43.5	310	1 105-mm 1 .50 cal 1 7.62-mm	30°/52%	9′ 6″	3′ 11″ 15′ Snorkel	3′ 6″
T34/85	Soviet Union	35	8′ 6″	20′ 4″	9′ 10″	35	190 310-Aux tanks	1 85-mm 2 7.62-mm	30°/50%	8′ 3″	4′ 4″ 18′ Snorkel	2′ 4″

Type vehicle	Nation	Weight (short tons)	Height	Length	Width	Speed (MPH)	Cruising range	Armament	Slope ascending capability	Ditch crossing capability	Fording capability	Vertical obstacle climbing capability
T54	Soviet Union	40	7′ 11″	21′ 4″	10′ 9″	30	250 420-Aux tanks	1 100-mm 1 12.7-mm 2 7.62-mm	30°/50%	8′ 10″	4′ 7″ 18′ Snorkel	2′ 7″
T55	Soviet Union	40	7′ 9″	21′ 2″	10′ 7″	30	250 375-Aux tanks	1 100-mm 2 7.62-mm	30°/50%	8′ 10″	4′ 7″ 18′ Snorkel	2′ 7″
T62	Soviet Union	40.2	7′ 10″	22′	10′ 11″	30	250	1 115-mm 1 7.62-mm 12.7-mm optional	30°/50%	9′ 2″	4′ 7″ 18′ Snorkel	2′ 7″
PT76	Soviet Union	15.4	7′ 2″	22′ 7″	10′ 3″	27— 1 and 6— water	160	1 76-mm 1 7.62-mm	38°/62%	9′ 2″	Amphibious	3′ 7″
JS–3	Soviet Union	51	8′	22′ 4″	10′	23	112	1 122-mm 1 12.7-mm 1 7.62-mm	36°/59%	8′ 1″	4′ 2″	3′ 4″
T10	Soviet Union	53.9	7′ 10″	23′ 5″	11′ 7″	22	137	1 122-mm 2 12.7-mm	32°/53%	9′ 10″	4′	3′
T–10M	Soviet Union	53.1	7′ 10″	23′	11′ 8″	22	137	1 122-mm 2 14.5-mm	32°/53%	9′ 10″	4′ 18′— Snorkel	3′
Assault Guns:												
Kanonen Jagdpanzer	West Germany	25.3	6′ 7″	29′ 6″	9′ 10″	50	320	1 90-mm 2 7.62-mm	30°/50%	8′ 4″	4′ 11″	2′ 7″
ASU–57	Soviet Union	3.7	4′	11′	6′	28	155	1 57-mm	30°/50%	4′ 7″	2′ 4″	1′ 7″
SU–76	Soviet Union	12.3	6′	16′	8′	28	225	1 76-mm	30°/50%	6′ 7″	3′	2′ 2″
SU–85	Soviet Union	32.5	7′ 6″	20′ 3″	9′ 10″	35	186	1 85-mm	35°/57%	7′ 6″	4′ 2″	2′ 4″
ASU–85	Soviet Union	15.4	6′ 9″	19′ 8″	9′ 2″	27	155	1 85-mm 1 7.62-mm	38°/62%	9′ 2″	4′ 3″	3′ 7″
SU–100	Soviet Union	33	7′ 6″	20′ 3″	10′	35	186	1 100-mm	30°/50%	8′ 3″	4′ 2″	2′ 4″
JSU–152	Soviet Union	50.7	8′ 1″	22′ 4″	10′ 3″	23	112	1 152-mm 1 12.7-mm	36°/59%	8′ 2″	4′ 2″	3′ 4″

Armored Personnel Carriers:												
M113A1	US	11.4	7′ 2″	15′ 11″	8′ 9″	38	250	1 .50 cal	37°/60%	5′ 6″	Amphibious	2′
FV–432	Great Britain	16.6	6′ 2″	16′ 9″	8′ 9″	32	300	1 7.62-mm	35°/57%	6′ 8″	3′ 6″	2′
AMS VTT	France	15.4	7′ 10″	18′ 2″	8′ 3″	38	220	1 7.62-mm	31°/52%	6′ 9″	2′ 6″	2′ 2″
Light APC	West Germany	7	6′ 7″	14′ 7″	7′ 5″	40	218	1 20-mm or 1 7.5-mm	32°/53%	5′	2′ 5″	2′ 4″
HS30	West Germany	14.6	6′ 1″	18′ 2″	8′ 4″	36	168	1 20-mm	31°/52%	5′	2′ 4″	2′ 6″
Marder	West Germany	30.3	9′ 6″	21′ 11″	10′ 4″	43.5	373	1 20-mm 2 7.62-mm	31°/52%	6′ 7″	5′	2′
BTR–40	Soviet Union	5.8	5′ 8″	16′ 5″	6′ 3″	50	404	2 14.5-mm or 1 7.62-mm	30°/50%	2′ 4″	3′ 7″	1′ 6″
BTR–50P	Soviet Union	16	6′ 5″	22′ 6″	10′ 4″	27— land 6— water	174	1 12.7-mm or 1 7.62-mm	38°/62%	9′ 2″	Amphibious	3′ 7″
BTR-60P	Soviet Union	11	7′	24′	9′	45— land 6— water	311	1 12.7-mm 2 7.62-mm	30°/50%	6′ 6″	Amphibious	1′ 4″
BTR–152	Soviet Union	9.7	6′ 8″	22′ 5″	7′ 7″	40	404	1 12.7-mm or 1 7.62-mm or 2 14.5-mm	30°/50%	2′ 7″	2′ 7″	1′ 11″
BMP	Soviet Union	14	6′ 3″	22′ 1″	9′ 8″	35— land 5— water	311	1 7.6-mm 1 7.62-mm 1 AT Guided Missile	38°/62%	9′	Amphibious	3′
M114A1E1	US	7.7	6′ 9″	14′	7′ 8″	36	300	1 20-mm 1 7.62-mm	37°/60%	5′	Amphibious	1′ 6″

Type vehicle	Nation	Weight (short tons)	Height	Length	Width	Speed (MPH)	Cruising range	Armament	Slope ascending capability	Ditch crossing capability	Fording capabil.ty	Vertical obstacle climbing capability
General Sheridan M551	US	16.5	8′	20′	9′ 2″	43	373	1 152-mm 1 .50 cal 1 7.62-mm	37°/60%	8′ 3″	Amphibious	3′
Armored Car XM706	US	8.2	8′	18′ 7″	7′ 6″	62	300	Twin 7.62-mm or 1 .50 cal 1 7.62-mm	37°/60%	.....	Amphibious	2′
Ferret	Great Britain	4.8	6′ 2″	12′ 8″	6′ 4″	45	190	1 .30 cal	24°/41%	4′	5′	1′ 5″
Fox	Great Britain	6.8	7′ 2″	13′ 8″	7′	65	270	1 30-mm 1 7.62-mm	27°/45%	2′ 2″	3′	1′ 8″
Scorpion	Great Britain	8.8	6′ 11″	14′ 5″	7′ 2″	50	300	1 76-mm 1 7.62-mm	35°/57%	6′ 10″	3′ 6″	1′ 8″
Saladin	Great Britain	12.3	7′ 10″	17′ 4″	8′ 4″	45	250	1 76-mm 2 .30 cal	24°/41%	5′	3′ 6″	1′ 8″
EBR90 Model 51	France	14	6′ 11″	18′ 6″	7′ 11″	63	158	1 90-mm 4 7.5-mm	28°/47%	9′ 4″	3′ 8″	1′ 4″
AMLH 90–7	France	6.1	6′ 6″	12′ 5″	6′ 5″	56	380	1 90-mm 1 7.62-mm	37°/60%	.....	3′ 7″	1′ 7″
BRDM	Soviet Union	6.2	6′ 2″	18′ 5″	7′ 1″	60—land 7—water	311	1 12.7-mm 2 7.62-mm	30°/50%	4′	Amphibious	1′ 4″
BRDM–2	Soviet Union	7.4	7′ 7″	19′ 1″	7′ 4″	60—land 7—water	466	1 14.5-mm 1 7.62-mm	30°/50%	4′	Amphibious	1′ 4″

INDEX

By Order of the Secretary of the Army:

BRUCE PALMER, JR.
General, United States Army,
Acting Chief of Staff.

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

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