Chapter 2

The Threat

This chapter addresses offensive mechanized doctrine and armored vehicles used by potential adversaries. Many Third World countries were trained and equipped by the former Soviet Union. The former Soviet offensive capability remains a useful yardstick by which to measure the MAGTF's capability against potential land forces. However, this chapter presents a generic enemy doctrine that is influenced by but not solely restricted to the former Soviet doctrine. While many of our potential enemies are not completely organized as combined armed forces, some possess the capability to concentrate battalion or regimental-sized armored formations against the MAGTF. Armor equipment presented in the second section includes vehicles manufactured by traditional allies. Future weapon sales and shifting alliances could result in equipment traditionally viewed as *friendly* being employed against the MAGTF. Due to these uncertainties, a basic understanding of mechanized doctrine and weapon system capabilities and limitations is essential for successful antiarmor operations.

Section 1. Threat Offensive Doctrine

2101. Threat Offensive Philosophy

Threat forces consider the offense the basic form of combat action. Threat forces plan on overwhelming the enemy with numbers coupled with speed and firepower at critical times during the battle. They also assume that there will be high losses early in the battle that are ultimately justified by the short duration of combat resulting from this mass-speed combination.

Offensive action will normally begin with simultaneous artillery and air attacks combined with tank and mechanized infantry formations to break through the enemy's tactical (division and below) defense. The mechanized formations then drive rapidly and forcefully into the depth of the enemy's operational rear.. The assumption is that a disorganized, demoralized, and isolated enemy would be unable to reestablish an effective and coordinated defense (FM 100-2-1).

Threat forces may attempt to maintain a rapid tempo of operations by echeloning their formations. Echeloning occurs at the operational and tactical level. (See fig. 2-1.)

Threat Planners desire an aggregate ratio of combat power of approximately 3:1 for conducting an attack. This 3:1 ratio refers to more than just cumulative numbers of first echelon troops and weapons relative to enemy troops and weapons in a given sector. When the attack begins, his actual strength advantage at the FEBA could be as small as 2:1. The remainder of the force may not be readily visible to defending enemy units (FM 100-2-1).

A combined-arms force will emphasize some or all of the following concepts:

- Rapid concentration and dispersal of combat power on the battlefield.
- Attacking on multiple axes.
- Exploitation of weak points in an enemy defense.

- Flexibility and speed in shifting combat power.
- Surprise.
- Speed.
- Independent action by commanders.
- Attacking deep into the enemy's rear.

2102. Types of Offensive Action

Offensive actions are divided into three subcategories which focus on enemy actions and disposition.

- Attack against a defending enemy.
- Meeting engagement (enemy is also on offense).
- Pursuit (enemy is withdrawing).

2103. Tactical Formations and Movements

Threat forces emphasize rapid column movement in the *march formation* and successive deployment into the *prebattle formation* and the *attack formation.* These formations are designed for a rapid transition into combat while maintaining maximum security, speed, and firepower.

a. March Formation. A march is an organized troop movement conducted in column formation on roads or cross country. It is planned and conducted with expectation of contact. A regiment is normally assigned two routes and a battalion one route. See figure 2-2 for a battalion march formation. A march formation consists of the following elements:

- Reconnaissance.
- Advance guard.
- Flank security.
- Main force.
- Rear security element.

MARCH RATES

Average March Rates for Mixed Columns

Day, on roads	**20 - 30** km/h
Night, on roads	**15 - 20** km/h
Cross Country	**5 - 10** km/h

The march is completed when the unit enters a new assembly area or when it enters prebattle formation or combat.

b. Prebattle Formation. The enemy will shift from a march formation to lateral deployment only when combat is imminent. The next successive lateral deployment out of the march formation is normally into a prebattle formation (also known as *approach march formation).* (See fig. 2-3.) The unit advances dispersed laterally and in depth.

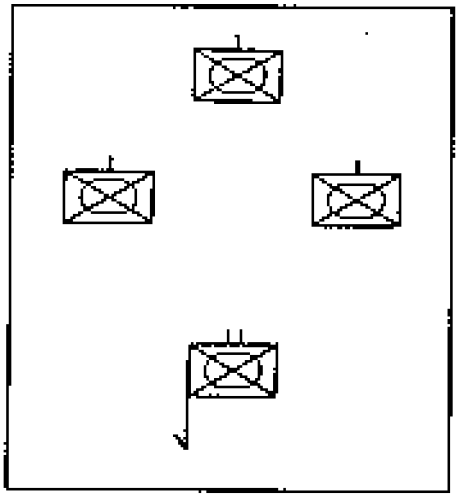


Figure 2-3. Battalion Prebattle Formations.

This formation is used when approaching the battlefield, moving into the enemy's rear, and attacking an enemy that has been severely degraded by artillery preparatory fires. A battalion advances with its companies deployed on line, in a wedge, or an echelon. Each company moves in march column within the formation.

c. Attack Formation. The attack formation is assumed immediately before combat (1,000 meters from objective). (See fig. 2-4.) Platoons disperse laterally into line formations. A battalion may attack with all (three companies on line.

As depicted, tanks on line normally precede APCs or IFVs. If troops dismount, they normally follow closely behind the tanks. APCs or IFVs normally follow between 100 to 400 meters behind the tanks. While the enemy may attempt to overrun the position mounted, any defensive position must be prepared to engage dismounted enemy infantry with tanks and Ifs firing in support.

2104. Forms of Maneuver

Former Soviet-bloc forces use three basic forms of maneuver: the frontal attack, flank attack, and envelopment. The flank attack and envelopment are normally done in conjunction with a frontal attack. (See fig. 2-5.)

a. Frontal Attack. The frontal attack was previously the most frequently employed form of maneuver. However, it is now the least preferred form of maneuver.

b. Flank Attack. Flank attacks are conducted through gaps or breaches in enemy formations and are normally a shallow attack against the enemy's flank or rear. Fire support is coordinated between forces simultaneously conducting frontal and flank attacks.

c. Envelopment. Envelopment is a deeper attack designed to get the enemy to fight in a new direction. It does not require coordination of fires with a force simultaneously conducting a frontal attack. It is the most desired form of maneuver because it exploits enemy gaps and allows attacks to the full depth of the enemy defense.

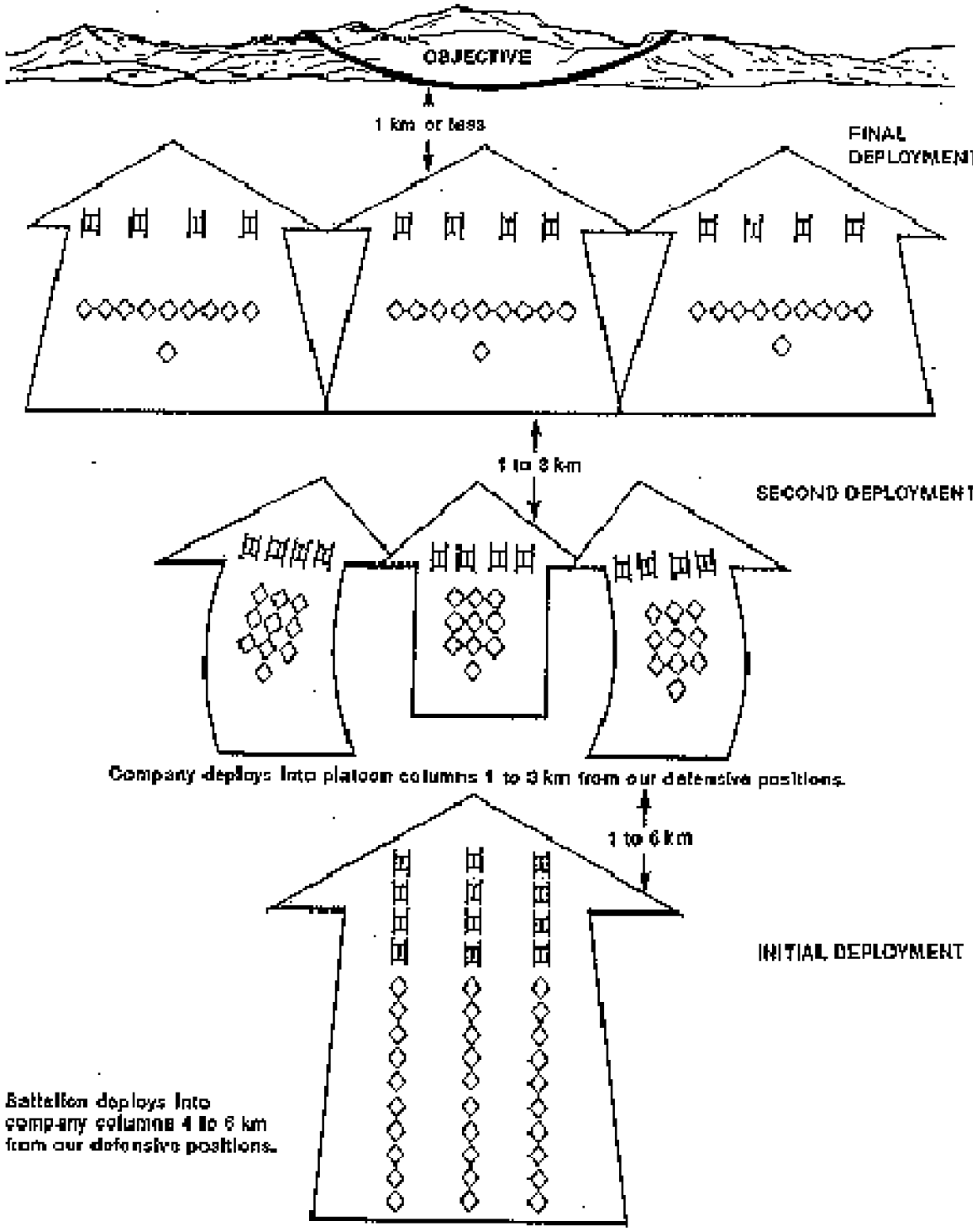


Figure 2-4. Deployment of a Battalion and Company.

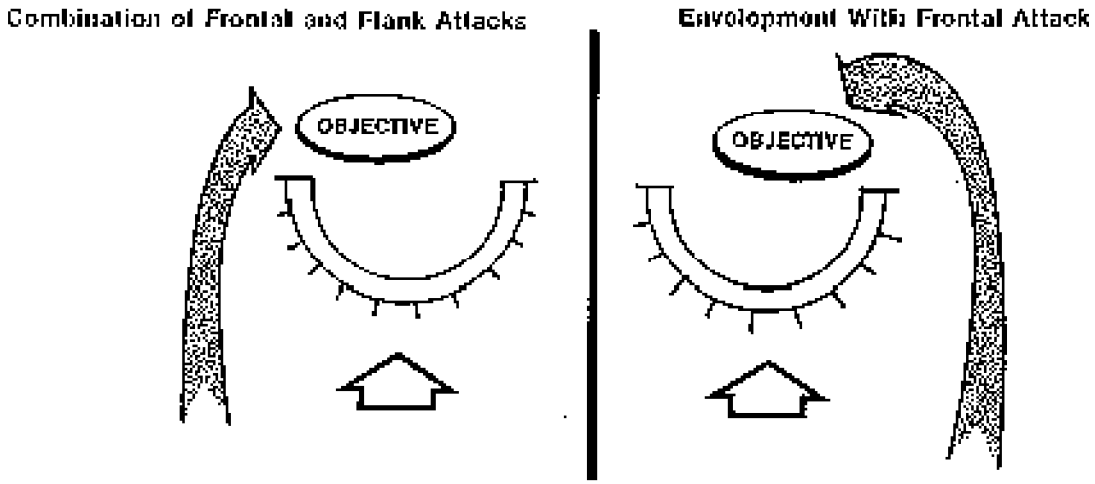


Figure 2-5. Forms of Maneuver.

Section II. Threat Armor

2201. Armor Improvements

During the 1980's, the M-l Abrams, Leopard 2, T-72, and T-80 model tanks were introduced with state-of-the-art armor protection. The emergence in NATO and the Warsaw Pact of increasingly sophisticated armor--composite and *reactive*--resulted in reduced effectiveness of chemical energy rounds such as high explosive (HE) shaped-charge-type antiarmor weapons (antitank guided missiles and hand-held infantry weapons) and kinetic energy rounds (the tank cannon's primary armor defeating projectile).

Reactive armor is applied to the existing armor hull and turret. *Reactive* armor is simply explosive charges attached to the front and sides of armored vehicles that explode when hit, thereby negating the effects of shaped-charge-type rounds. Composite armor is plating made of layered steel and ceramic with empty air spaces. Composite and *reactive* armor, either separately or in combination, severely decrease the probability of kill (P_k) for frontal shots. *Reactive* armor can be easily and inexpensively applied to upgrade existing T-54/55 and T-62 models, all plentiful in the Third World. Additionally, the T-72 and T-80 tanks with composite armor are being exported in greater numbers.

The 1990s have seen the emergence of *countermeaure systems* mounted on armored vehicles. This is primarily due to the proliferation of ATGMs and smart-submunitions on the battlefield. Countermeasure and signature reduction are the most significant trends in armor survivabilitly being fielded today.

Countermeasure Systems

The most abundant of theses systems are referred to as Defensive Aid Suites (DAS) . These systems are designed to intercept, destroy, or confuse attacking enemy munitions. These countermeasure systems fall into two categories: Active and Passive

Active Countermeasures

Hard Kill Systems or Active Protective Systems (APS). APS engage and destroy enemy missiles and projectiles before they impact their intended target. APS are a close-in system of antimissile defense that creates an active fire zone of protection at a safe distance around the vehicle by launching countermunitions. However, a major vulnerability of this type of system is the risk of potential fratricide caused when an active system is employed in close proximity to supporting dismounted troops due to the blast effects of exploding countermunitions. Current generation APSs do not possess the capability to engage and destroy kinetic energy projectiles. However, as technological advances in fire control and detection increase, APSs systems in the near future may be capable of engaging both Antitank Guided Missiles (ATGM), tank fired chemical (HE) or kinetic energy munitions. See figure (2-5a)

Soft kill systems confuse and divert inbound missiles with the use of munitions (obscurants), jammers, and decoys. Examples include Multi-spectral smoke or aerosols that are used to defeat lasers and thermal sights and IR jammers to defeat inbound missiles .

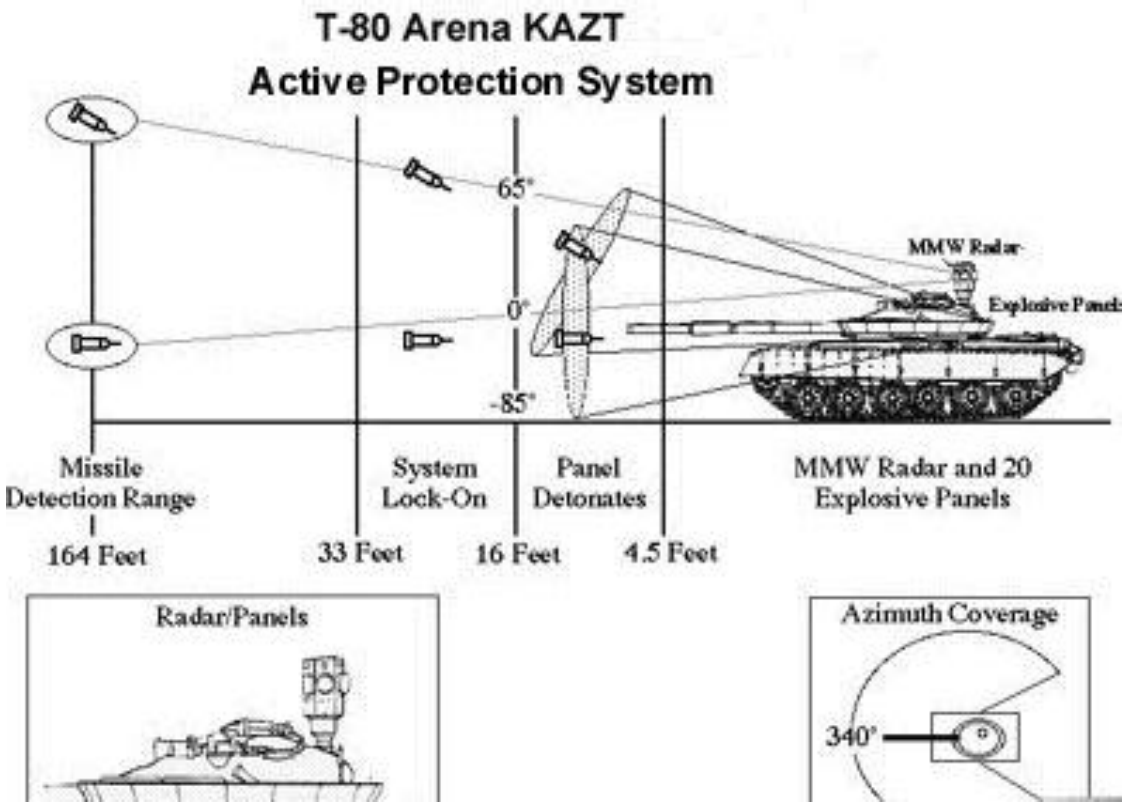


Figure 2-5a Arena APS example

Signature Reduction

Due to the fielding of improved target acquisition devices within the battlespace, armored vehicles are incorporating signature reduction measures to improve their survivability. These would include techniques or applications that would not only reduce the vehicle's signature in the visual, infrared (IR) and millimeter wave length (MMW) spectrum, but also the overall radar cross section, magnetic signature strength, and acoustic levels as well.

These measures would include the use of:

Camouflage appliqué, laser absorbing/diffusing paint.

Noise management through the use of rubber track or electric motors.

Exhaust plume reduction through venting techniques.

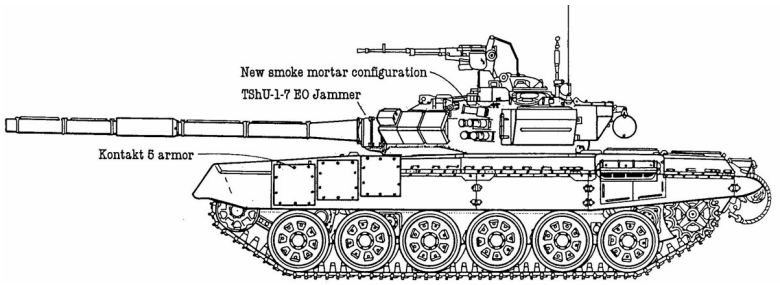
Use of side skirts to mask the heat signature given off by hot track and road wheels.

Magnetic signature reduction using non-metallic materials in the structure, armor, and engine components.

The Marine commander must be aware of the technical capabilities of his current antiarmor weapons systems relative to the type of tank he may encounter. He must remember that any advantages gained by technological advancement are only temporary for the enemy will always find a countermeasure, tactical or itself technological, which will lessen the impact of technology. Previously, a commander only considered the *size* of the tank force. He must now be equally concerned with the *type* of tanks he is fighting. Generally, a force of T-80 tanks presents a much greater challenge than a force of T-54 tanks without reactive and/or composite armor. However, varying technological enhancements which upgrade tank and armored vehicle capabilities such as countermeasure systems, improved fire control systems or main guns retrofitted to fire ATGMs can alter tactics and techniques employed by the MAGTF to defeat such an armored or mechanized force. Later sections will present technical and tactical options in the defense that account for differences in the *size* and *type* of enemy armored forces.

2202. Threat Armored Vehicles

The following identification guide is provided to assist the reader in understanding the individual characteristics of specific mechanized weapons. The reader should remember that many of these systems are found in Third World forces. Even equipment manufactured by US Allies might confront us. In each example shown below, the *maximum effective range* refers to the maximum range at which a weapon may be expected to achieve a high single-shot probability of hit (50%) and required level of destruction against assigned targets. This figure may vary for each specific munition and by type of target (such as infantry, armored vehicles, or aircraft). The maximum effect range figures shown below are daylight figures, night ranges are considerably less in most cases due to the capabilities of target acquisition systems.



Crew	3
Weight	44.5 tons
Armament	125mm smoothbore tank gun (also fires ATGM)
	MER APFSDS-T (Sabot) 2000 to 3000m
	HEAT range 3000m
	Frag- HE range 4000m
	AT-11/SVIR ATGM range 5000m
	2.7mm turret MG range 1500m
	7.62 Coaxial MG range1500m
Basic Load	39 main gun rounds and 6 ATGMs

Figure 2-5B T-90

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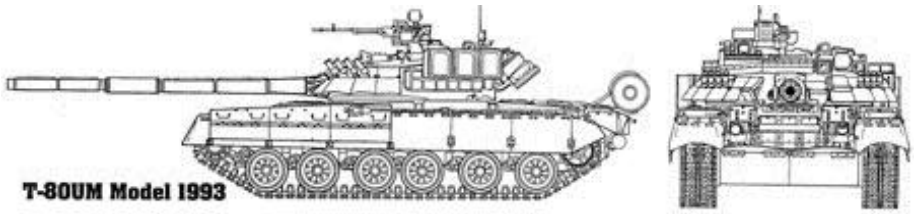
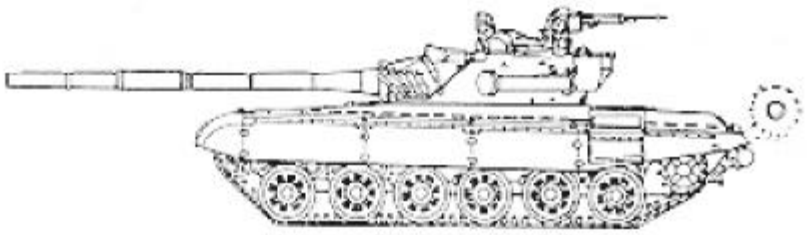


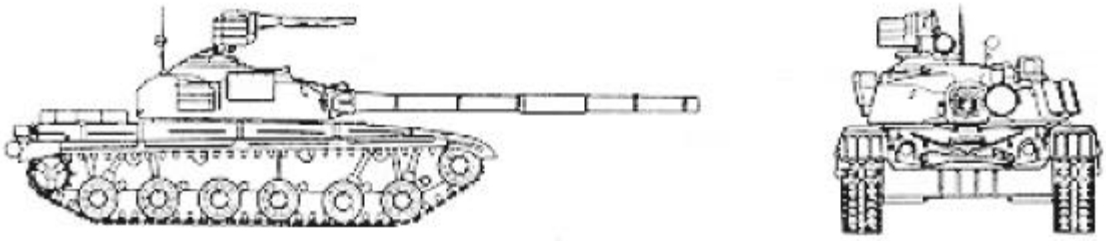
Crew	3
Weight	46 tons
Armament	125mm smoothbore tank gun (also fires ATGM) MER APFSDS-T 2000 to 3000m HEAT range 3000m Frag HE range 4000m AT-11/SVIR ATGM range 5000m MER 12.7mm turret MG range 1500m 7.62 Coaxial MG range1500m
Basic Load	39 main gun rounds and 6 ATGMs

Fig 2-6 T-80U



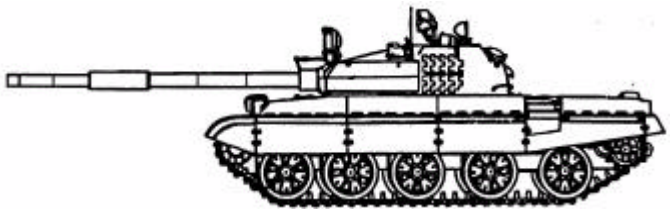
Crew	3
Weight	41 tons
Armament	125 mm smoothbore tank gun Maximum effective range 50% P_h 2,000 m 7.62 Coax MG-maximum effective range 1,000 m 12.7 mm Turret MG-maximum effective range 1,500 m
Basic Load	40 rounds main gun

Figure 2-7. T-72.



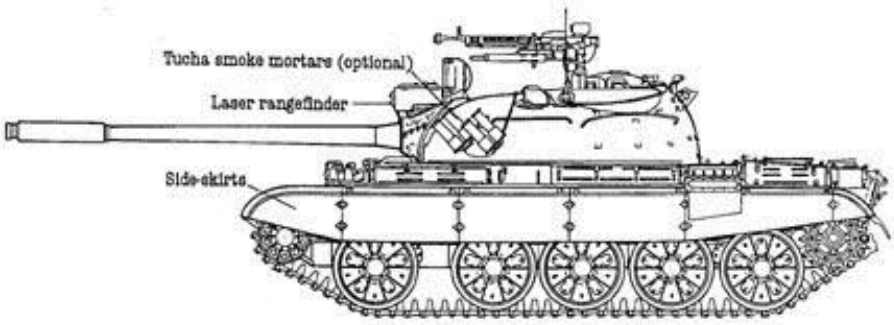
Crew	3
Weight	38 tons
Armament	125 mm smoothbore tank gun Maximum effective range 50% P_h 2,000 m 7.62 Coax MG-maximum effective range 1,000 m 12.7mm Turret MG-maximum effective range 1,500 m
Basic Load	40 rounds main gun

Figure 2-8. T-64.



Crew	4
Weight	41.5 tons
Armament	115mm rifled gun MER APFSDS-T 1200-2000 est HEAT range 1200m Frag-HE range 1500-2000m ATGM AT-10/Sheksna range 4000m 7.62mm coax PKT MG range 1000m
Basic Load	40 rounds

Figure 2-9 T-62M

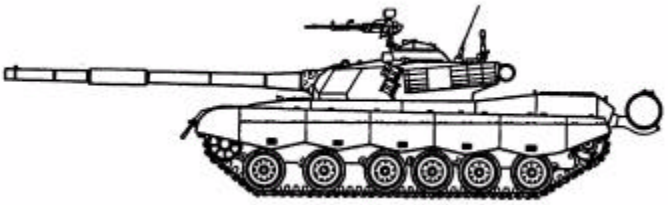


Crew	4
Weight	40.5
Armament	100mm rifled gun APFSDS-T range 2500m MER HEAT range 1000m Frag-HE range 2500m+ AT-10/ Bastion ATGM range 4000m
Basic Load	34 (T-54), 43 (T-55)

Figure 2-10a T-55M

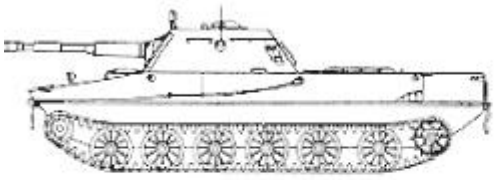
Crew	4
Weight	37 tons
Armament	105mm rifled gun MER APFSDS range 2000-3000m est. HEAT range 1500-2500m est. HESH range 2000-3000m est.
Basic Load	34 rounds

Figure 2-10b Chinese MBT Type 59-II



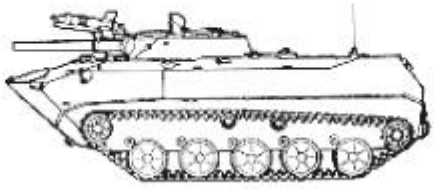
Crew	3
Weight	41.0 tons
Armament	125mm smoothbore gun MER APFSDS-T range 2000-3000m HEAT range range2000m est Frag-HE-T range 4000m est 12.7mm cupola AAMG range 1500m 7.62mm coax-MG range 1000m
Basic Load	42

Fig 2-10c Chinese MBT Type 85-IIM



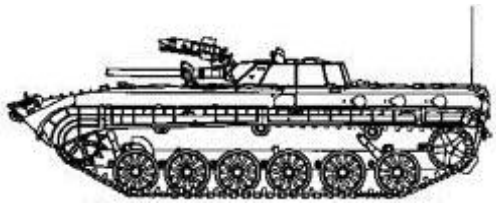
Crew	3
Weight	14 tons
Armament	76 mm tank gun
	Maximum effective range 50% P_h 650 m
	7.62 Coax MG-maximum effective range 1,000 m
Basic Load	40 rounds main gun

Figure 2-11. PT-76 (Light Amphibious Tank).



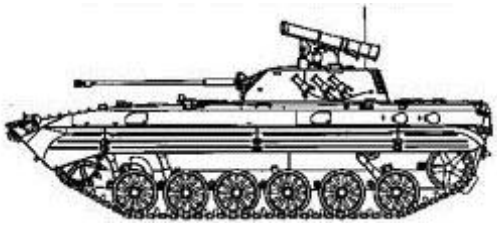
Crew	2, 5 passengers
Weight	13.3 tons
Armament	73mm gun
	MER HEAT range 1000m
	HE range 1300m
	AT3 ATGM range 3000m
	7.62 coax and 2x 7.62 box MG range 1000m
Basic Load	40 AT rounds and 4 ATGMs

Figure 2-12 BMD



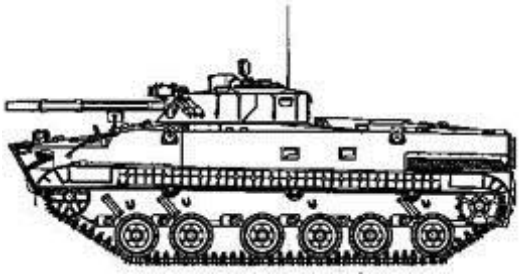
Crew	3, 8 passengers
Weight	13.5 tons
Armament	73 mm AT gun MER HEAT range 1000m HE range 1300m AT-4 Spigot range 2,000m AT-5 Spandrel range 4,000m 7.62 Coax MG-maximum effective range 100 1000m
Basic Load	40x 73mm rounds and 4 xATGMs

Figure 2-13. BMP-1



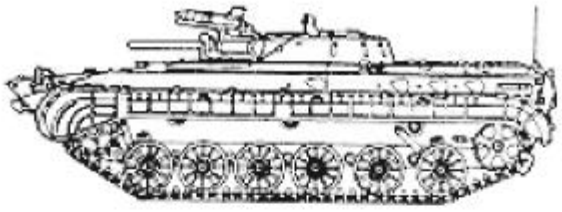
Crew	3, 7 passengers
Weight	14.3 tons
Armament	30 mm gun MER APFSDS-T range 2000+m AP-T range 1500m Frag HE 4000m AT-4 Spigot range 2000m AT-5 Spandrel range 4000m 7.62 Coax MG-MER 1000m
Basic Load	500 x 30mm rounds and 5 x ATGMs

Figure 2-13a BMP-2



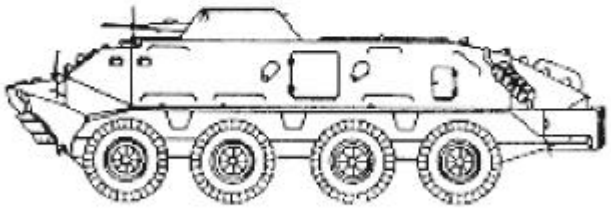
Crew	3, 7 passengers
Weight	18.7 tons
Armament	100mm rifled gun and 30mm auto gun MER AT-10 ATGM Basnya 4000m 100mm HE-Shrapnel range 5200 30mm APFSDS-T range 2000+ m 30mm AP-T 1500m MER 30 mm Frag-HE 4000m
Basic Load	40x100mm with 8 ATGMs and 500x30mm rounds

Figure 2-13b BMP-3



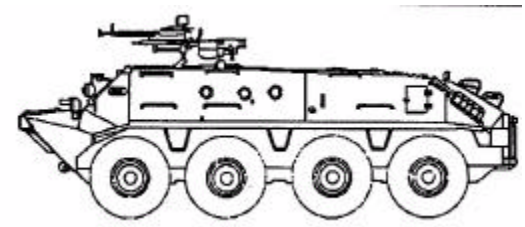
Crew	3, 8 passengers
Weight	13.5 tons
Armament	73 mm AT gun
	Maximum effective range 50% P_h 800 m
	AT-3 Sagger range 3,000 m
	7.62 Coax MG-maximum effective range 1,000 m
Basic Load	40 AT rounds and 4 ATGMs
Amphibious	

Figure 2-13. BMP.



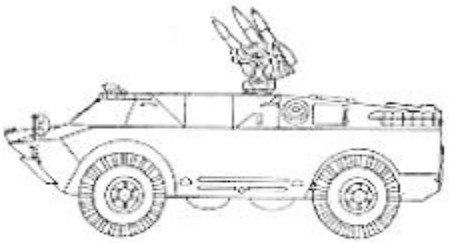
Crew	3, 8 passengers
Weight	10.2 tons
Armament	14.5 mm Turret MG
	7.62 Coax MG-maximum effective range 1,000 m
Amphibious	

Figure 2-14. BTR-60PB.



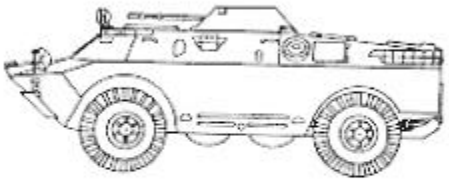
Crew	2, 12 passengers
Weight	10.1 tons
Armament	12.7mm MG MER 1500m 7.62 PKT MG MER 1000m
Basic Load	500 rounds 12.7mm and 3000 rounds 7.62mm

Figure 2-14b BTR-60PA



Crew	3
Weight	7 tons
Armament	AT-5 Spandrel
	AT-5 range 4,000 m
Basic Load	14 ATGMs

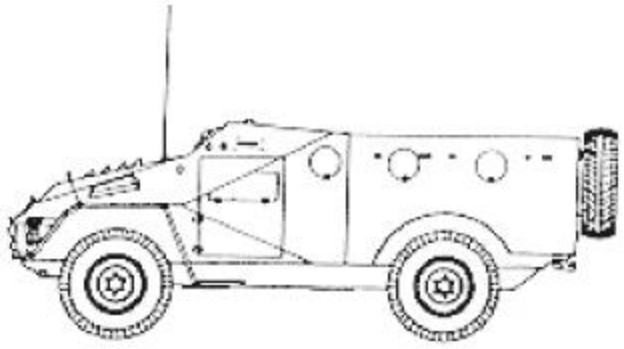
Figure 2-15. BTR-40P2 ATGM Carrier.



Crew	2-5 depending on mission
Weight	7 tons
Armament	14.5 mm Turret MG
	7.62 Coax MG-maximum effective range 1,000 m

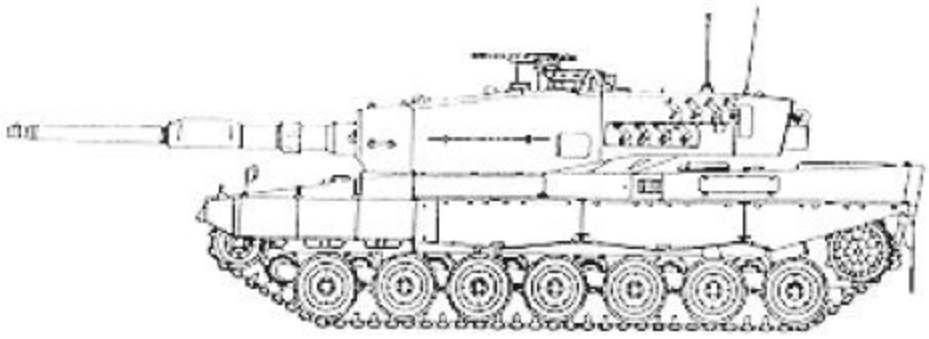
Amphibious Recon Vehicle

Figure 2-16. BTR-40P2 (BRDM-2).



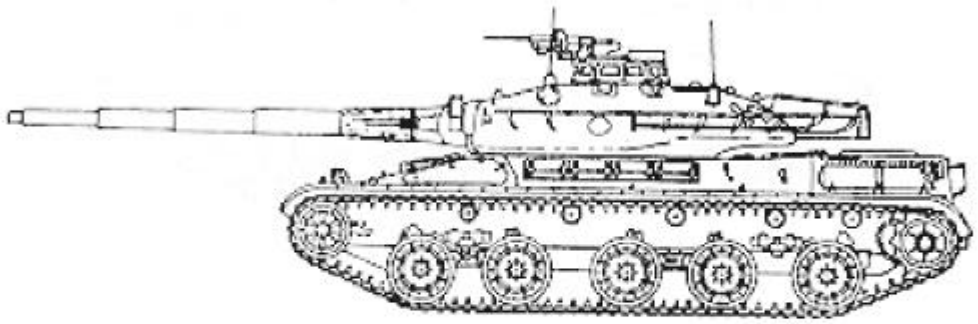
Crew	2 + 6
Weight	5,600 Kg

Figure 2-17. BTR-40 (4 × 4) Without Armament.



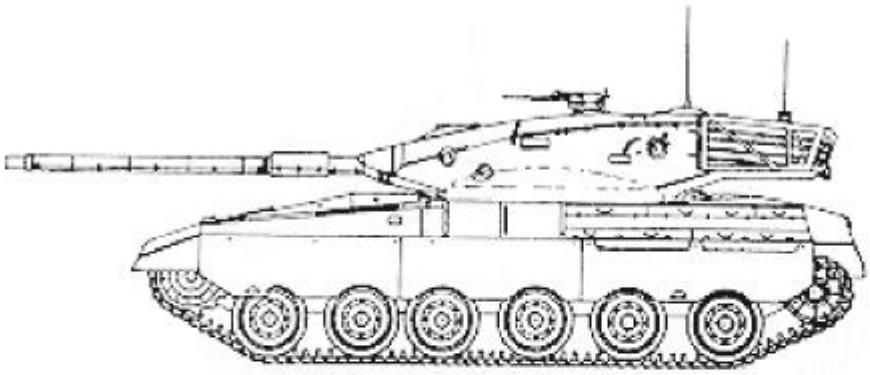
Crew	3
Weight	16 tons
Armament	105 mm main gun, 20 mm cannon, 7.62 mm MG
Basic Load	47 rounds main gun

Figure 2-18. AMX-30 MBT (France).



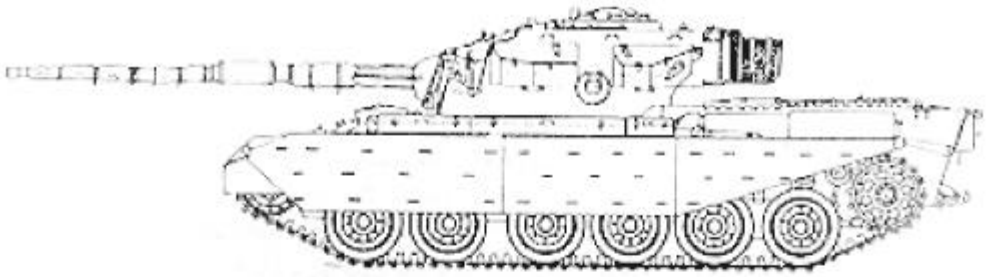
Crew	4
Weight	44.3 tons
Armament	120 mm main gun, 7.62 mm MG (coax), and 7.62 mm (loader)
Basic Load	42 rounds main gun

Figure 2-19. Leopard 2 MBT (Germany).



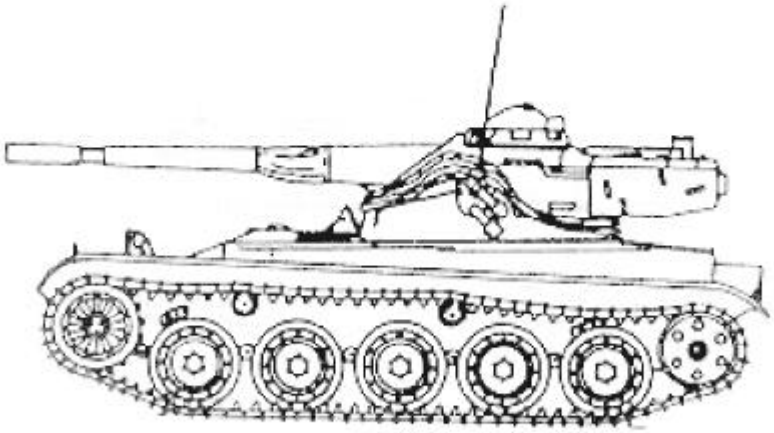
Crew	4
Weight	60,000 Kg
Armament	105 mm main gun, 7.62 mm MG (coax), and two 7.62 mm MG turret
Basic Load	62 rounds main gun

Figure 2-20. Merkava MBT (Israel).



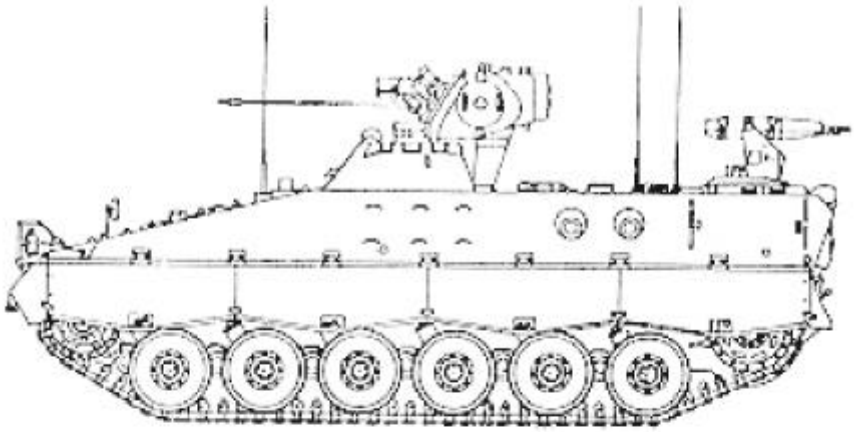
Crew	4
Weight	55,000 Kg
Armament	120 mm main gun, 7.62 mm MG (coax), and 7.62 mm MG turret
Basic Load	40 rounds main gun

Figure 2-21. Centurion Mk 10 MBT (Great Britain).



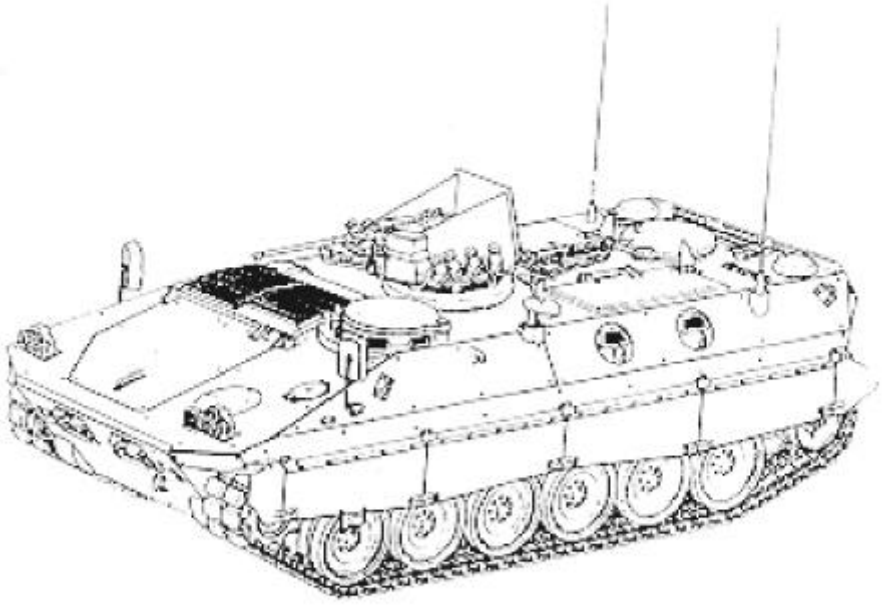
Crew	3
Weight	15,000 Kg
Armament	90 mm main gun, 7.62 mm MG (coax), and 7.62 mm MG turret
Basic Load	32 rounds main gun

Figure 2-22. AMX-13 Light Tank (France).



Crew	9
Weight	30,000 Kg
Armament	20 mm cannon, 7.62 mm MG
Basic Load	1,200 rounds 20 mm

Figure 2-23. Marder ICV Infantry Combat Vehicle (Germany).



Crew	12
Weight	14,650 Kg
Armament	12.7 mm MG
Basic Load	800 rounds 12.7 mm

Figure 2-24. OTO Melara C13 APC (Italy).

2203. Armor Vulnerability

The tank is the backbone of a mechanized force. At some point in any antiarmor defense, the tank must be engaged and destroyed. Whether protected by homogenous steel armor, composite armor, or augmented with reactive armor or countermeasure systems, there are inherent strengths and weaknesses common to all tanks and armored vehicles. An understanding of the tank and other armored vehicles' vulnerabilities is prerequisite for the selection and positioning of antiarmor weapons and, ultimately, the destruction of the enemy armored force.

a. Dead space. *Visual deadspace* refers to the areas surrounding a tank that the tank crewman cannot see due to the design of the tank and/or the location of the turret in relation to the hull. Any discussion of visual dead space involves the issue of if and when an enemy tank crew *"buttons-up"* or closes all hatches. Generally, tank crews only button up when they expect to receive the bursting effects of air and surface delivered fires (friendly and enemy) The tank is not *blind* when buttoned up, but it still lacks *constant* 360-degree visibility. *Weapon deadspace* refers to areas surrounding the tank that cannot be fired upon with the tanks armament due to the elevation and depression of the guns. The combination of deadspace and the size of the target renders the tank especially vulnerable in close-in terrain. (See figs. 2-25 and 2-26.)

b. Armor Protection. Currently homogeneous steel and composite (spaced) armor can't to be constructed in sufficient thickness throughout a tank to protect it completely from armor-defeating ammunitions. The reason for this weight restriction is a technological one. Increased weight results in decreased automotive performance due primarily to strain on suspension systems Currently, the greatest degree of protection on tanks and other armored vehicles is on the front of the hull and the turret. The least protection is on the rear, sides, top, and undercarriage. This general rule applies to all types or models of armored vehicles. A flank, rear shot, or top attack shot provides the highest probability of kill (P_k). The necessity of firing these types of shots is further underscored by the advent of composite (spaced) and *reactive* armor, and countermeasure systems found on some threat tanks.

d. Engine Compartment. The engine compartment is a particularly vulnerable area. A tank can be stopped by targeting the engine with incendiary devices such as a thermite grenade or napalm. It is unnecessary to destroy the entire engine. Sufficient damage to any critical component will prevent the engine from running. A disabled tank may still have full access to it's weapons systems, however it is less difficult to destroy.

e. Suspension System. The suspension system (including the track) is a susceptible area. Mines or log cribs may immobilize a tank. It should be pointed out that destruction of road wheels or support rollers may slow down or hinder tank movement; however, in most instances, loss of one or two road wheels or support rollers will not stop a tank.

f. Fuel System. Many threat tanks use both internal and external auxiliary fuel tanks. The auxiliary tanks, which are approximately the size of 55-gallon drums, are mounted on the side and rear of the tank. Though normally jettisoned prior to contact, if caught in an ambush, these fuel tanks make the tank considerably more vulnerable by causing fire damage to the tanks externally mounted systems, reducing crew visibility due to smoke, and increasing the chance of separating tanks from their supporting dismounted infantry.

2204. Lightly Armored Vehicles

Although main battle tanks are the most dangerous armored vehicles on the battlefield, they are not the most numerous. All armies that have tanks (and many that do not) field lighter armored vehicles with significantly less armor protection. As a general rule, this means that these lighter vehicles are vulnerable to a wider variety of

weapons than tanks and are thus easier to defeat. For example, the armored sides of these vehicles can be pierced by heavy machine gun (.50 caliber) fire. The sides of some lightly armored vehicles can also be penetrated by even smaller caliber bullets. As is the case with tanks, each model has its own particular vulnerabilities.

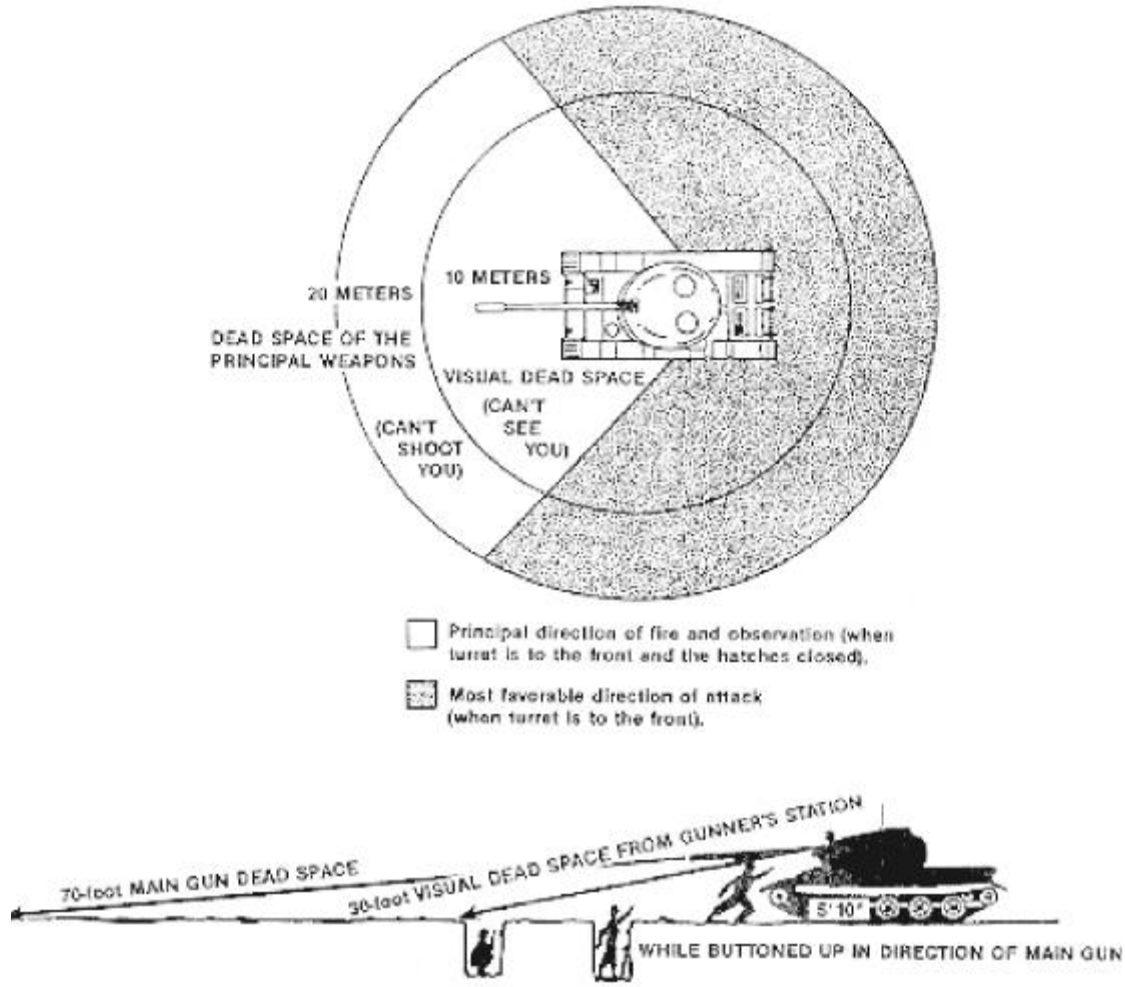


Figure 2-25. Tank Deadspace.

a. Armored Personnel Carriers. APCs carry from six to twenty infantrymen from one point on the battlefield to another. APCs provide mobility and limited armored protection. When armed with light (approximately 7.62 mm or .30 caliber) or heavy (12.7 mm, 14.5 mm, or .50 caliber) machine guns, empty APCs can provide a base of fire for the maneuver of their dismounted infantry. While the APC protects its occupants against shell fragments and other small projectiles, it also puts them at greater risk from mines, antitank rockets and missiles, and direct hits from artillery and air delivered munitions. This is due to a combination of troop density. inside the vehicle and because armor has a tendency to contain (and thus greatly increase the effect of) the explosion of a rocket, mine, or shell. Because of these dangers, troops will often ride on the outside of the APC. This, in turn, makes them more vulnerable to small arms and indirect fire. A major limitation of APC is that mounted infantryman cannot engage targets with small arms from inside the vehicle. Many variants of the infantry fighting vehicle however provides this capability.

b. Infantry Fighting Vehicles. The Soviet BMP and the US Army's Bradley Fighting Vehicle are two examples. IFVs carry a small caliber (25-35 mm) high velocity or medium caliber (approx. 75 mm) low velocity gun as well as a small squad (four to eight men) of infantry. Some IFVs are also equipped with antitank guided missiles. Although they tend to have marginally better armor protection, IFVs have the same vulnerabilities as APCs. Their main guns have the same vulnerabilities due to dead spots.

c. Fire Support Vehicle (FSV). FSVs are armored personnel carriers that have been modified to carry a 25 mm to 105 mm gun. Their purpose is to provide a base of fire for the maneuver of infantry and lightly armored vehicles, to attack bunkers and other point targets, and to engage enemy lightly armored vehicles.

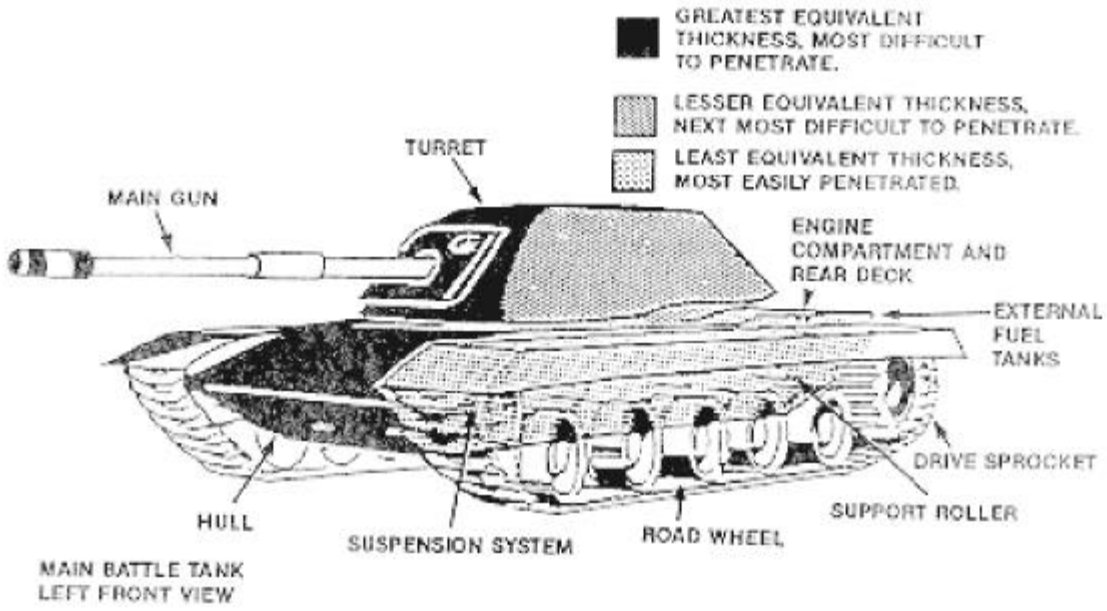


Figure 2-26. Armor Vulnerability.

Because of their thin armor relative to tanks and the fact that their guns are rarely able to penetrate the frontal armor or modern main battle tanks, FSVs cannot effectively fight long range duels against tanks. FSVs can use their weapons to fire through or destroy cover and concealment found in close, terrain such as urban or woodland terrain. For this reason FSVs are often positioned to deliver fires during narrow engagement windows at short range. While FSVs have roughly the same vulnerability as tanks in regard to weapon deadspace, they are vulnerable to a wider variety of weapon systems.

d. Reconnaissance Vehicles. These tend to be smaller and even less well protected than other types of lightly armored vehicles. Some, in fact, are little more than modified scout cars. Armed with a machine gun or a light (25-35 mm) cannon, they are dangerous to infantry in the open and to other lightly armored vehicles. Reconnaissance vehicles are particularly vulnerable to dismounted infantry close, broken or urban terrain.

e. Specialized Vehicles. The chassis of APCs and tanks are often used as the basis for a variety of specialized vehicles. These can be used as mobile command posts, artillery observer vehicles, electronic warfare vehicles, mortar carriers, antitank guided missile carriers, antiaircraft weapons carriers, or long-range missile carriers. Although many carry machine guns for local defense, these vehicles were not intended to engage in close combat and thus are very vulnerable to ground forces. Vehicles carrying antiaircraft guns provide a notable exception to this general rule. Due to a high rate and volume of firepower delivered by antiaircraft guns, these vehicles are often employed in the direct fire mode against dismounted infantry and lightly armored vehicles..