Chapter 3

Short Range Air Defense

This chapter provides information on short range air defense (SHORAD), systems currently in the force. SHORAD weapons are employed in support of maneuver forces. They defend personnel and assets against attack by enemy aerial platforms. They are also employed in rear areas to defend air bases, forces, key installations, and other vital assets. SHORAD systems include: Stinger (MANPADS), Bradley Stinger Fighting Vehicle (BSFV), Linebacker, and the Avenger system.

MANPADS STINGER

3-1. Stinger missiles are deployed as the missile component of the Avenger missile system, as the missile component of MANPADS teams, and as the missile component of the Linebacker. A MANPADS team is also part of the Bradley Stinger Fighting Vehicle.

3-2. The Stinger MANPADS team carries a manportable, shoulder-fired, infrared or IR/NUV seeking missile that requires no control from the gunner after firing. It has an identification, friend or foe (IFF) interrogator that aids the gunner and team chief in identifying targets. The team consists of a gunner and team chief.

WEAPON ROUND

3-3. The Stinger Man Portable Air Defense System (MANPADS) is a shoulder-fired, self-contained, close-in air defense weapon used by the United States and many foreign countries. Stinger is an infrared (IR) or infrared/negative ultraviolet (IR/NUV) seeking, fire-and-forget weapon, allowing the gunner to engage another target or take cover immediately after launch (figure 3-1, page 3-2). The system is self-contained, including its own electrical power, argon coolant, and IFF system. There are three versions of the missile: Basic, POST (Passive Optical Seeker Technique), and RMP (Reprogrammable Microprocessor). Basic Stinger has limited countermeasure capabilities, Stinger-POST has improved countermeasure capabilities, and Stinger-RMP has further refinements to its countermeasure capabilities. The RMP version has the ability to be reprogrammed to meet an ever-changing threat without hardware redesign or replacement. The RMP missile uses a two color, infrared and ultraviolet, detector and advanced algorithms to help acquire targets. This advanced capability allows the missile to effectively discriminate between targets, flares, and background clutter thereby preventing false engagements. Unlike the basic Stinger missile, the RMP has the capability to track and destroy high-performance, fixed-wing aircraft, unmanned aerial vehicles, and cruise missiles in clutter and at tactical ranges.

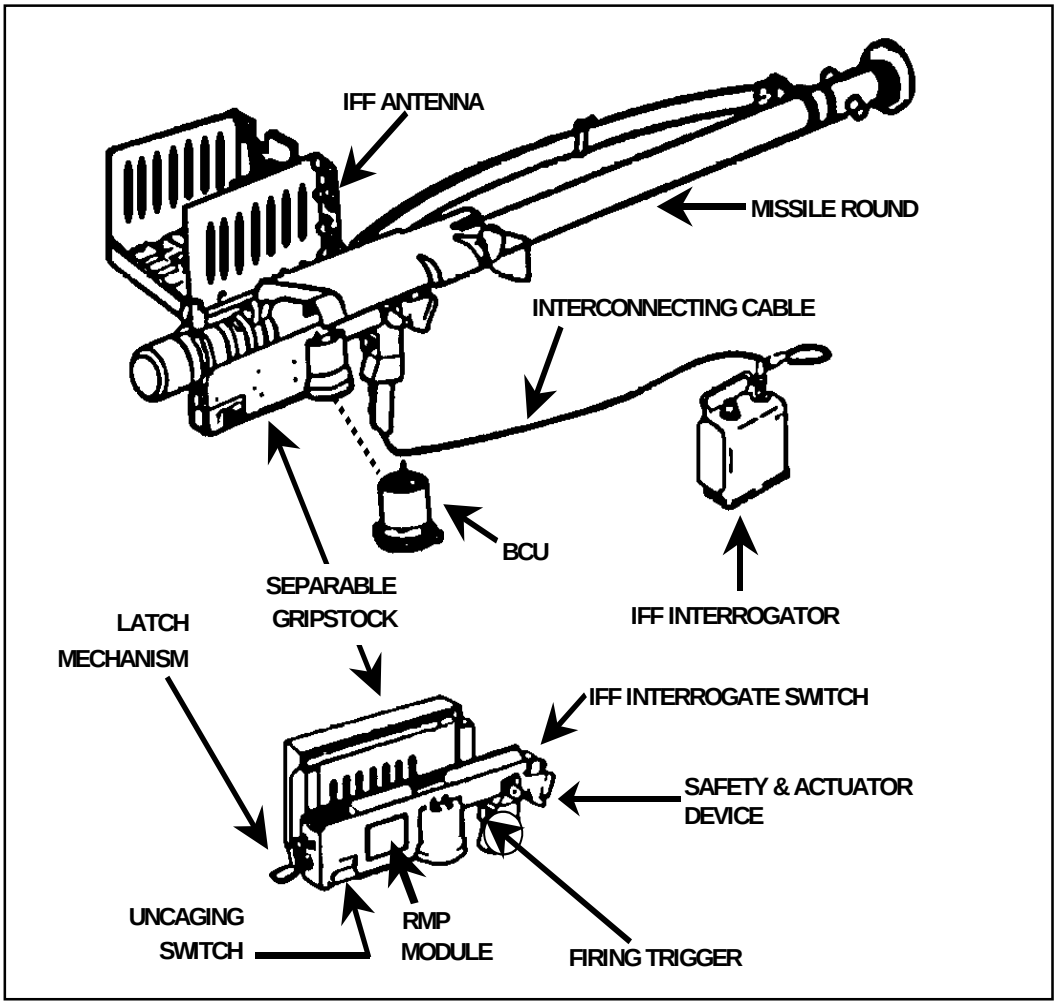


Figure 3-1. Stinger Weapon Round

MISSILE ROUND

3-4. The Stinger missile round is composed of a missile, a launch tube, and a gripstock assembly. They are described in the following paragraphs.

3-5. **Missile**. The missile consists of three sections. They are guidance section, warhead section, and propulsion section (figure 3-2, page 3-3).

3-6. The **guidance section** of the missile consists of a guidance assembly, a control assembly, a missile battery, and four controls surfaces. The guidance assembly processes target infrared/ultraviolet (IR/UV) radiation sources and provides guidance commands for the missile during flight. The seeker tracks the IR /UV source automatically after the gyro is uncaged and during missile flight. The control assembly converts the guidance commands into movement of control surfaces that direct the flight of the missile. The missile battery provides the flight power for the Stinger guided missile.

3-7. The **warhead section** consists of a fuse assembly and a quantity of explosives, all within a cylindrical case. After the flight motor ignites, the fuse arms the warhead. The fuse can detonate the warhead in three ways: by means of a low impact switch, by a hard target sensor, or by self-destructing (should target intercept not occur after launch).

3-8. The **propulsion** for the missile is provided by a separable launch (eject) motor and a dual thrust flight motor. The launch motor provides initial thrust that ejects the missile from the launch tube. It allows the missile to coast a safe distance (28 feet or 8.53 meters) from the gunner prior to ignition of the flight motor. The launch motor is expended and separated from the flight motor and falls a safe distance forward of the gunner. At separation, a lanyard attached to the launch motor pulls the shorting plug from the flight motor ignition circuit to ignite the flight motor. The flight motor provides propulsion during missile flight. Part of the propulsion system is the tail assembly. The tail assembly consists of four folding tail fins that provide roll and missile stability.

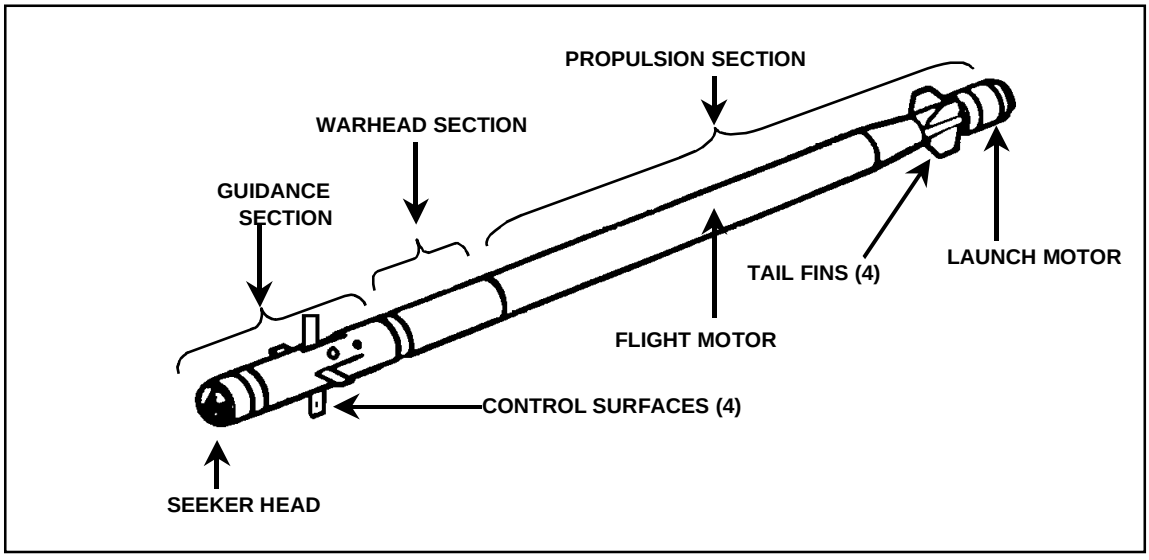


Figure 3-2. Stinger Missile

3-9. **Launch Tube Assembly**. The launch tube assembly (figure 3-3, page 3-4) is a fiberglass tube that houses the missile. It provides the means to transport, aim, and fire the missile. The launch tube provides the main support for all other parts of the weapon round. Both ends of the launch tube are sealed with breakable disks. The front disk is transparent to IR radiation, allowing the radiation to reach the heat-sensitive missile seeker. The front disk breaks outward at launch, and the aft disk blows out as the launch motor ignites. A desiccant cartridge and humidity indicator measures the humidity level in the sealed tube. The hinged sight assembly attached to the launch tube allows the gunner to sight the weapon, determine target range, superelevate the weapon, and hear the audible tones through the acquisition indicators. The eye shield attached to the sight frame protects the gunner's

left eye during launch. The launch tube is destroyed and discarded after the missile is fired.

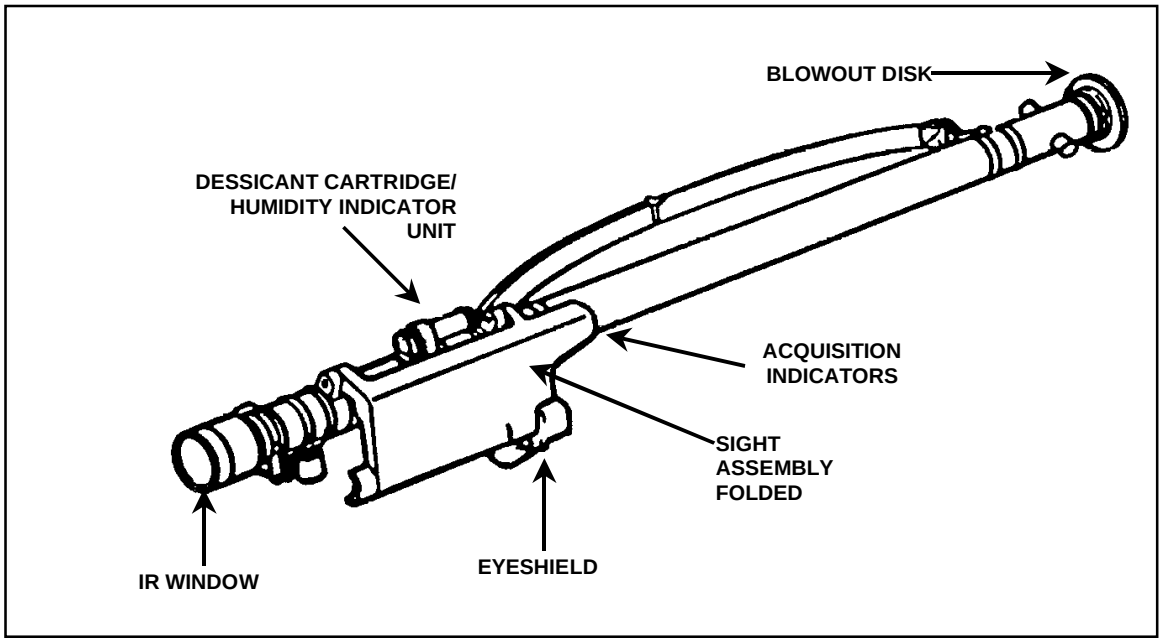


Figure 3-3. Stinger Launch Tube

3-10. **Gripstock Assembly**. The gripstock is attached to and removed from a launch tube by means of a latch (figure 3-1, page 3-2). Located on the gripstock assembly are the safety and actuator device, uncaging switch, firing trigger, IFF antenna assembly, IFF INTERROGATE switch, IFF interrogator connector, and Battery Coolant Unit (BCU) receptacle. After a missile is launched, the separable gripstock is removed from the launch tube for reuse. It can be reused until failure.

3-11. When the IFF antenna assembly is deployed and the interrogator is connected to the gripstock, it is capable of interrogating aerial platforms and receiving coded replies. After a missile is fired the IFF antenna assembly folds into a holder on the right side of the gripstock assembly.

3-12. The BCU is used to energize the weapon's electrical circuits and to cool the IR detector in the missile's seeker prior to launch of the missile. It contains a thermal battery to provide power for preflight operation, and pressurized argon gas coolant.

INTERROGATOR FRIEND OR FOE SYSTEM

3-13. Stinger is equipped with an AN/PPX-3 A/B IFF subsystem to aid in the identification of aerial platforms. The IFF system classifies aerial platforms as either friendly or unknown. It does not identify hostile aerial platforms. IFF components include the IFF interrogator and an interconnecting cable.

3-14. The gunner initiates the IFF sequence by pressing the IFF INTERROGATE switch on the gripstock assembly. The interrogator attached

to the gunner's belt sends a coded signal to the aerial platform. Once the gunner issues a challenge, the rest of the sequence is automatic.

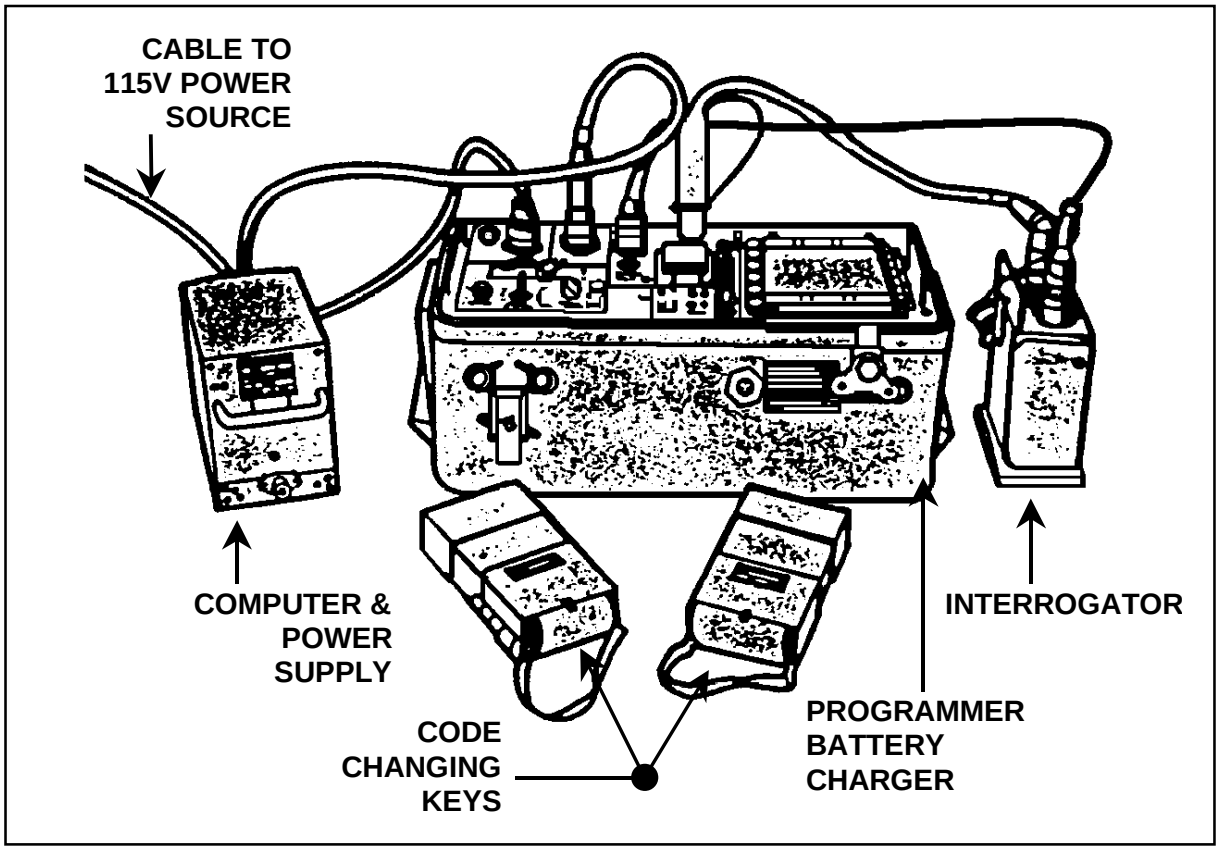


Figure 3-4. IFF Support Equipment

3-15. The aerial platform's transponder then prepares and sends a coded reply. The reply is received by the Stinger IFF antenna and is routed to the interrogator for decoding. The interrogator converts the reply into an audible tone that is then routed via the interconnecting cable to the gunner as a friendly tone. If the aerial platform's transponder sends an incorrect reply to the IFF challenge, the reply is processed by the IFF system into an unknown tone. Aerial platforms not equipped with transponders will not reply to the challenge, and this is interpreted as an unknown tone. The gunner hears the friendly or unknown tone immediately after challenging the aerial platform.

3-16. The IFF challenge is coded in Mode 4 form or Mode 3 form. A friendly Mode 4 reply is considered a true friend reply. A friendly Mode 3 reply is considered only as a possible friend reply.

3-17. Support equipment for the IFF (figure 3-4) includes a programmer battery charger AN/GSX-1, computer KIR-1C/TSEC (with power supply model ZAC A/1), and two code changing keys KOI-18/TSEC. The computer and code changing keys, when set with classified code, are classified CONFIDENTIAL, and must be safeguarded as outlined in TB 380-41. The interrogator (specifically, the reply evaluator module within the interrogator)

is also classified CONFIDENTIAL, and proper security measures must be taken for it. An IFF subsystem training set is available for training purposes. See TM 9-1425-429-12 for IFF support equipment operation instructions.

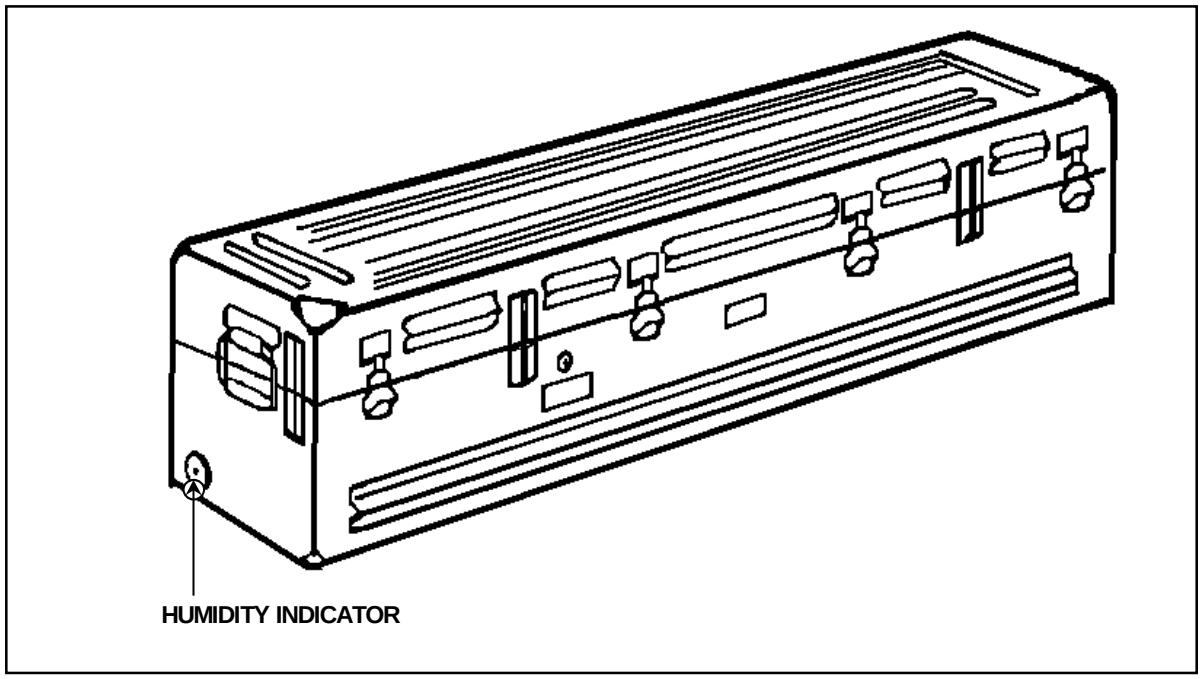


Figure 3-5. Weapon Round Container

WEAPON ROUND CONTAINER

3-18. A weapon round container provides environmental protection during shipping and storage. The container is equipped with one set of ear plugs, four latches, handles for two-man carry, a pressure relief valve, a humidity indicator, and a BCU storage area for 3 to 5 BCUs (figure 3-5).

EMPLOYMENT OF STINGER

3-19. The Stinger operates by the gunner sighting on a target. The gunner centers the target in the sight range ring. The gunner interrogates the target by pressing the IFF interrogator switch and listens for an IFF response. If the response is not a friend, he continues tracking and ranging the target. When the target is within range, he operates a safety and actuation device. When a distinct acquisition tone is heard, he presses and holds the uncaging switch. After identifying the target as hostile (aided and assisted by the team chief) the gunner will superelevate the weapon. He will then place the target in proper lead reticule and, if IR tone is still distinct, squeeze and hold the firing trigger. The gunner continues to track the target for three to five seconds. The BCU must be removed in less than three minutes after firing to prevent damage to the reusable gripstock.

3-20. Stinger's primary role is to provide Air Defense for forward combat elements against aerial platforms. Stinger defends HIMAD units, high-

priority maneuver units, and high-priority critical assets (such as command posts, trains, ammunition storage point (ASP) and POL). Stinger complements other ADA systems when priorities and the situation permit.

Employment Considerations

3-21. The following must be considered when employing Stinger:

- Aerial targets must be visually acquired.
- Aerial targets must be identified prior to firing.
- Missile back blast requires 45 meters (150 ft) of clearance behind the weapon for personnel safety.
- All personnel within 125 meters (400 feet) must wear hearing protection devices.
- To minimize the possibility of injury from flying debris do not fire with the launcher elevated more than 65 degrees or less than 10 degrees or with the aft end of the launch tube closer than 30 inches from the ground.

Stationary Point Defense

3-22. Stinger's ability to engage approaching aerial platforms makes it valuable for stationary point defenses. Its effectiveness is significantly enhanced when other ADA systems are allocated to the same defense. Teams should normally be positioned so that the engagement capability of one team overlaps that of an adjacent team. Positioning teams from two to three kilometers apart will provide this capability. In cases where more than one weapon system is employed in the same defense, overlapping fires should be achieved between weapons systems. When permitted by the tactical situation, teams must be positioned far enough out from the asset being defended to permit threat aerial platform engagement prior to ordnance release.

Mobile Point Defense

3-23. Stinger provides the ADA commander with an excellent capability to protect mobile assets to include moving maneuver units. MANPADS teams will often provide air defense for units moving in convoy or march column along roads behind the line of contact. Stinger defense of such convoys may be conducted by either pre-positioning teams along the route of march at key points such as choke points and bridges or integrating teams into the march column. When integrated into the convoy the positioning of MANPADS will depend on convoy length and available MANPAD weapons.

3-24. Early engagement by placing the gunner out and away from the defended asset is desired whenever possible. This is done so that the gunner can engage and destroy the target prior to the aerial platform reaching its ordnance release line. Gunners must be provided sufficient time to ready their weapons. When not alerted, they must have their MANPAD weapons close by, even when they are performing their own security and maintenance duties. System effectiveness largely depends on gunner reaction time. The team needs to know the weapons control status (WCS) in effect and be trained on expected threat aerial platform tactics.

BRADLEY STINGER FIGHTING VEHICLE

3-25. The Bradley Stinger Fighting Vehicle (BSFV) consists of a Bradley Fighting Vehicle transporting a Stinger MANPADS team (figure 3-6). The primary role of the BSFV is to protect forward area maneuver combat forces, combat support elements, and other critical assets from attack by hostile RW and FW aerial platforms operating at low altitudes. The BSFV can deliver effective fire against ground targets such as lightly armored vehicles and tanks using the Bradley Fighting Vehicle turret weapons.

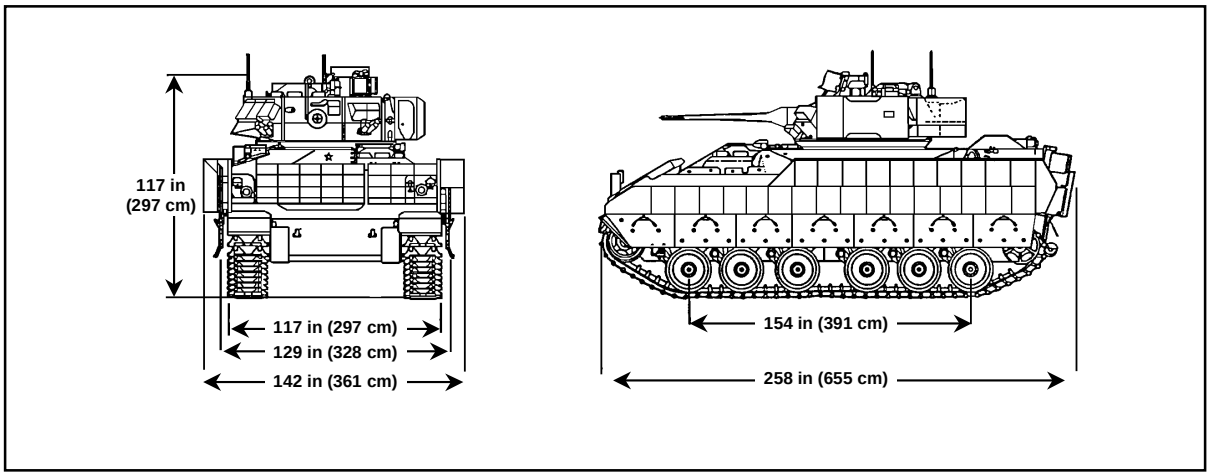


Figure 3-6. Bradley Stinger Fighting Vehicle (BSFV)

SYSTEM DESCRIPTION

3-26. The BSFV is a fully tracked, diesel-powered, lightly armored vehicle. The turret on the BSFV is equipped with a 25mm main gun, 7.62mm coaxial machine gun, externally mounted tube launched, optically tracked, wire guided (TOW) missile launcher, and two M257 smoke grenade launchers. The fire control system features an integrated day or night sight incorporating a thermal-imaging infrared device. The recommended load for missiles on the BSFV is six Stinger and five TOW missiles. Two TOW missiles are ready and three stored. All six Stingers are stored in a ready rack. Five soldiers man the BSFV (figure 3-7, page 3-10).

Table 3-1. BSFV System Characteristics

Missiles	TOW: 2 ready; 3 stowed
	Stinger: 6 stowed
Ammunition (25mm)	Armor-piercing discarding sabot-tracer (APDS-T): 70 Ready; 140 stowed
	High explosive incendiary-tracer (HEI-T): 230 Ready; 460 stowed
GENERAL	Weight (combat loaded): M2A2: 50,261 LB (22,798 kg)
	Weight (less fuel, crew, and OVE): M2A2: 43,500 LB (19,732 kg)
	Weight (air transportable): 40,775 LB (18,495 kg)
	Ground pressure (combat loaded): 7.7 psi (0.54 lg./cm^2)

Table 3-1. BSFV System Characteristics (Continued)

PERSONNEL	5 crewmembers (2 MANPADS members)
PERFORMANCE	Speed on land 41 MPH: (66/n)
	Cruising range: 300 miles (483 km)
	Turning radius: Pivot to infinite
	Slope climbing: 60%
	Side slope: 40%
	Trench crossing: 8 ft, 4in (2.5m)
	Vertical wall climbing: 36 in (9lcm)
	Gross horsepower-to-weight ratio: 20.62 hp/ton
	Ground clearance: 18 in (45.7/cm)
ENGINE	Make and model: Cummins VTA-903T
	Displacement: 903 cu in (14.8 liters)
	Type: 4 cycle
	Fuel: Diesel
	Gross horsepower: 600
SWIM FORDING	Can ford to a water depth of 36 inches

Main Gun, 25mm Automatic Gun, M242

3-27. The main armament for the BSFV is the 25mm automatic, externally powered gun. When maneuvering in the offense, the 25mm gun is used as the initial AD weapon. It is used to destroy hostile RW and slow flying FW aerial platforms, lightly armored vehicles, and to suppress enemy fortified positions. The 25mm gun is a dual-feed weapon system that allows the crew to select two types of ammunition: APDS-T and HEI-T. The 25mm gun has three rates of fire: single shot, low rate (l00 rounds per minute), and high rate (200 rounds per minute). Six basic types of ammunition are used with the 25mm gun with effective ranges up to 3,000 meters. Further information can be found in FM 23-1.

TOW Missile

3-28. TOW is a command-guided surface attack weapon that has a very limited air defense role but can be a useful alternative to Stinger for stationary and slow-moving aerial targets. TOW is used as a self-defense weapon against tanks, fortified positions, gun emplacements, and vehicles at ranges from 65 to 3750 meters (depending on type of missiles in use).

3-29. The TOW missile comes in five versions:

- Basic TOW (BGM-7lA1 extended range)
- Improved TOW (BGM-7lC)
- TOW2 (BGM-7lD)
- TOW2A (BGM-7lE)
- TOW2B (BGM-71F)

3-30. Each version is an improvement over the previous missile. Primary improvements are in the areas of penetration, effective range, and usability in adverse firing conditions. Additional information can be found in FM 23-1.

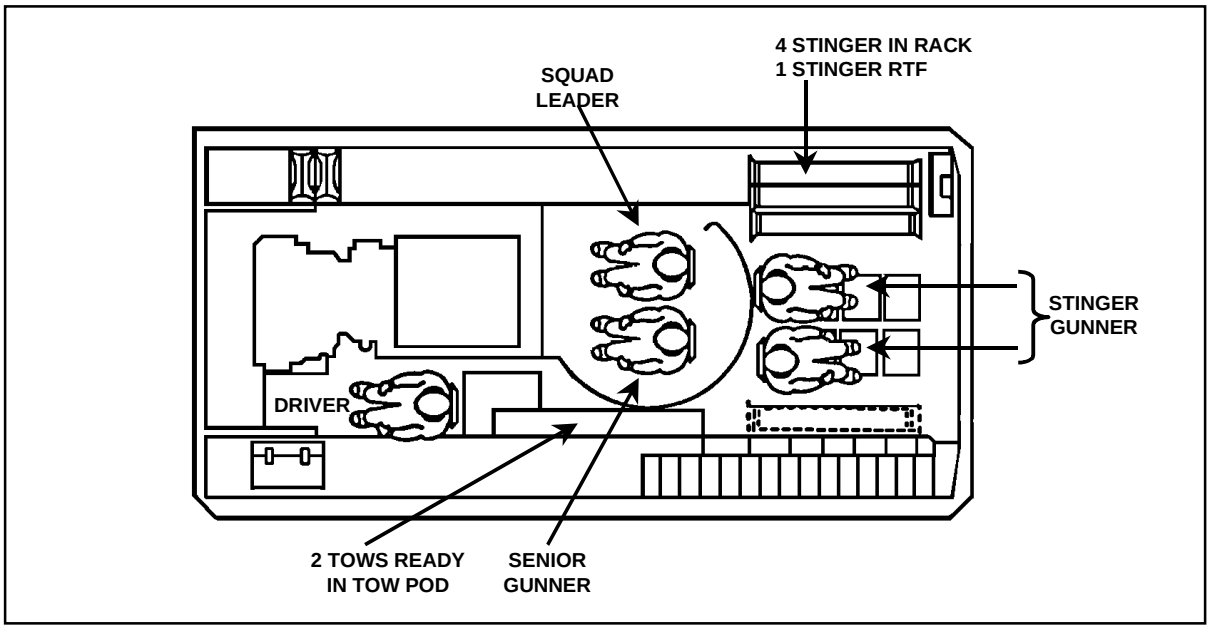


Figure 3-7. BSFV Crew

M240C 7.62 Coaxial Machine Gun

3-31. The M240C 7.62mm machine gun is a coaxial, belt-fed, gas operated, fully automatic weapon that can be used against fixed and rotary wing aerial platforms, UAVs, and unarmored vehicles. However, its maximum range of 900 meters limits its usefulness as an air defense weapon. Further information can be found in FM 23-1.

EMPLOYMENT OF BSFV

3-32. The primary mission of the BSFV squad is to defeat multiple aerial threats both moving and stationary. See table 3-2, page 3-11, for weapon usage guidelines.

Offensive Employment

3-33. BSFV units will accompany the main attack in offensive situations. When moving, or in situations with brief halts, the 25mm chain gun is the initial weapon with an effective range of two kilometers against aerial attack. Consequently, BSFVs should maneuver no further than 1000 meters apart to provide mutual support.

3-34. The Stinger team should be dismounted to provide air defense of the forces when the attacking forces are stalled or at the objective. Dismounting a Stinger team is a squad leader's decision based on the artillery threat, the ability of the FU to overwatch the maneuver force, and anticipated future movements. The Stinger can overwatch from up to one kilometer to the rear

of the defended unit. While the range of the Stinger and TOW give the platoon the ability to cover more area, they should remain within two kilometers of each other to enhance their survivability through mutual support and to mass their fires in the offense.

Table 3-2. BSFV Weapon of Choice in Tactical Employment

WEAPON	ROTARY WING		FIXED WING/CM/UAV	LIGHT ARMOR	HEAVY ARMOR
	>2000M	<2000M			
STINGER	1	1	1	NA	NA
25MM	NA	2	2	1	NA
COAX	NA	3	3	NA	NA
TOW II	2	4	NA	2	1

Defensive Employment

3-35. Bradley Stinger Fighting Vehicles establish ADA battle positions based on the IPB and the commander's scheme of maneuver in defensive situations. These positions are planned and prepared in depth to enable the use of decisive fires against attacking enemy helicopters or FW aerial platforms. Squads are positioned to maximize the Stinger's capabilities in the defense, approximately two kilometers apart.

LINEBACKER SYSTEM

3-36. The Bradley Linebacker provides the air defender with shoot-on-the-move engagement capabilities against aerial threats over the full spectrum of terrain and maneuver force operating speeds (figure 3-8, page 3-12). The Bradley Linebacker system can engage low-altitude, high-speed fixed-wing and rotary-wing aerial platforms, unmanned aerial vehicles and cruise missiles. The standard vehicle mounted launcher (SVML) for Stinger missiles replaces the TOW launcher found on the BSFV.

SYSTEM DESCRIPTION

3-37. The Linebacker crew consists of a driver, gunner, assistant gunner, and commander. The assistant gunner can reload the outer two missiles from the inside of the Bradley without being exposed to enemy fire. If the turret becomes disabled, the crew has the capability to convert to a Stinger MANPADS team.

Stinger Control Box

3-38. The Stinger control box (SCB) is the primary operator interface for the Bradley Linebacker system. It provides the controls and indicators needed to perform aerial engagements with missiles.

Bradley Control Electronics

3-39. The Bradley control electronics (BCE) is the main computer that monitors and controls all Stinger-related system functions. The primary function of the BCE is to interface between the Linebacker systems and the

operator. Through this interface, the operator provides input to the BCE that controls the Stinger system. The BCE also monitors input from the system, including built-in-test (BIT) status. If a system failure is detected, the BCE will cause the system fault indictor on the SCB to illuminate and display an error message on the control display terminal (CDT).

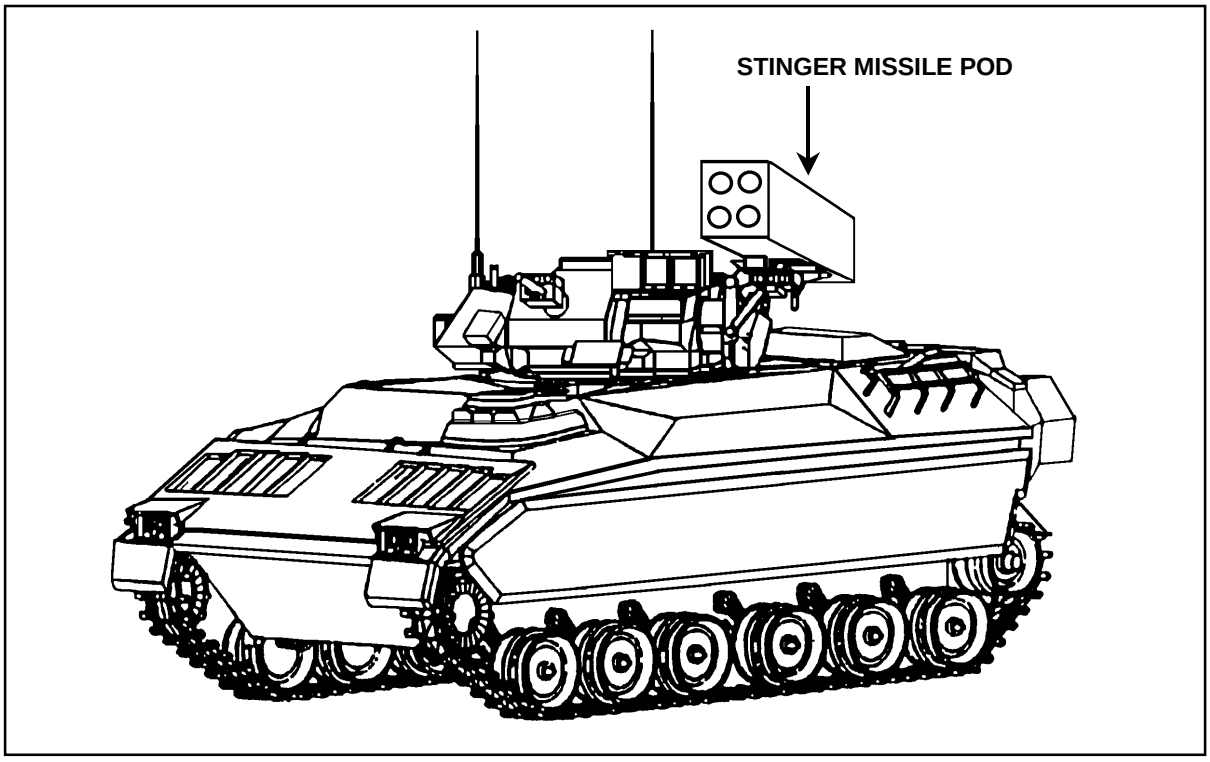


Figure 3-8. Linebacker System

Control Display Terminal

3-40. The Control Display Terminal (CDT) is a hand-held terminal mounted between the commander and gunner positions. It has an 80-character black-light liquid crystal display (LCD) and a function keypad for data input. The CDT displays essential operational information and allows the gunner or commander direct interface with the BCE.

Sighting System

3-41. The sighting system consists of a Stinger vision module (SVM) and the Stinger vision module electronics (SVME). The SVM mounts directly to the existing Bradley Integrated Sight Unit (ISU) and displays the missile status, target data, and system status to the gunner. The SVME interfaces the SVM to the BCE and displays symbology generated by the BCE.

IFF System

3-42. The IFF system components include the IFF antenna, interconnecting box, and the IFF interrogator. Targets are interrogated by pressing either

inner thumb switch forward on the gunner's hand station. The IFF antenna transmits signals from the IFF interrogator and receives the response signals from the subject target. The result of the interrogation is announced over the intercom system as a series of tones. The IFF interrogator is an AN/PPX-3B interrogator. The IFF can be dismounted to support MANPADS Stinger operations.

Missile System

3-43. The missile system consists of the SVLM and the Interface Electronic Assembly (IEA). The missile launcher holds up to four ready-to-fire Stinger missiles. It contains two argon bottles to cool down missile seeker heads, and two Launcher Electronic Assemblies (LEA) that control missile selection, gyro drive, coolant control, cycling, signal processing, and firing. Loading and unloading missiles is accomplished through upper and lower access doors. The missile launcher is mounted on a retractable platform. The platform contains an erector motor and a latch solenoid/sensor combination to ensure the platform is locked in place prior to missile firing. The launcher is mounted in an armor protective box that also provides an alignment plate for azimuth boresighting.

Command and Control

3-44. The Linebacker is equipped with the single channel ground and airborne radio system (SINCGARS), enhanced position, location and reporting system (EPLRS), precision lightweight global positioning system receiver (PLGR), simplified handheld terminal unit (SHTU) or handheld terminal unit (HTU), and slew-to-cue capability. This allows the Linebacker to receive early warning information and enables the Linebacker to accomplish early engagement.

Missile Countermeasure Device

3-45. The Missile Countermeasure Device (MCD) system is mounted on top of the turret forward of the gunner's hatch. It generates infrared radiation (IR) and directs it through the front window of the MCD unit. When the turret is turned toward an incoming antitank guided missile (ATGM), the IR causes the operation of the missile to lose electronic guidance control by sending inaccurate course correction signals. The inaccurate signals cause the missile to fly off course and crash. The MCD can defeat a variety of current first and second generation ATGMS (TOW, Dragon, HOT, Milan, AT-4-5-6-7 and Swingfire). The system effectiveness can be limited by the angle of coverage, the battlefield's haze, and any dust or mud accumulated on the system window.

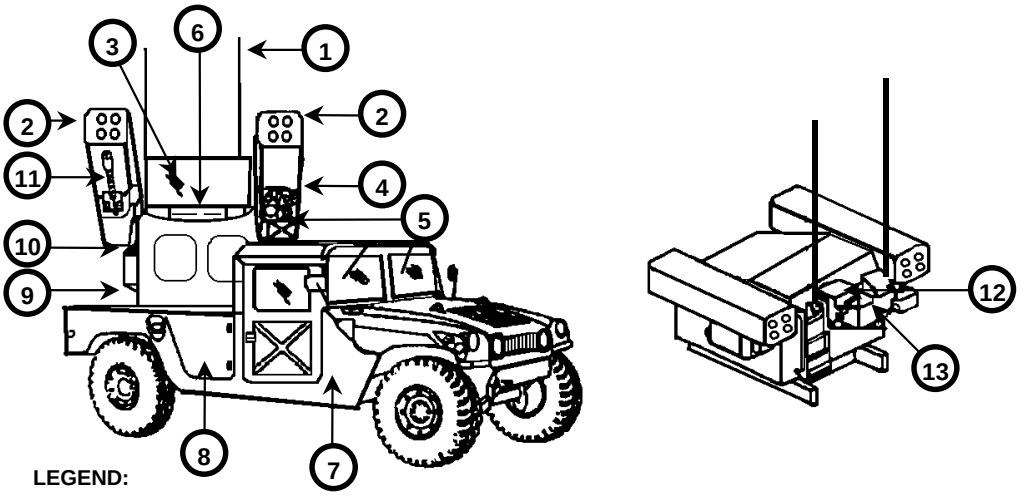
Digital Compass System

3-46. The Digital Compass System (DCS) can operate in conjunction with the PLGR or as a stand-alone system. It provides the crew with directional prompts allowing them to navigate from one point to another point more efficiently. A liquid crystal display indicates range and direction to the target, along with directional prompts. The DCS, when used in conjunction with the

laser range finder, provides the commander with the information needed to call for fire.

AVENGER SYSTEM

3-47. The Avenger weapon system is a lightweight, day or night, limited adverse weather fire unit employed to counter enemy RSTA efforts and low-level aerial threats. The Avenger plays an integral role in the combined arms team, especially with winning the information war.



LEGEND:

1. RADIO ANTENNA
2. MISSILE POD
3. CANOPY
4. LASER RANGE FINDER
5. FLIR
6. IFF ANTENNA
7. HMMWV
8. BATTERY BOX
9. AMMUNITION BOX
10. AMMUNITION CHUTE
11. MACHINE GUN
12. HEATER/VENTILATOR
13. ELEVATION DRIVE MOTOR

Figure 3-9. Avenger Fire Unit

SYSTEM DESCRIPTION

3-48. The Avenger fire unit has eight ready-to-fire Stinger missiles in two turret-mounted standard vehicle missile launchers (SVML), an M3P .50-caliber machine gun, a sensor package with forward-looking infrared receiver (FLIR), laser range finder (LRF) and IFF. It has an optical sight and digital fire control system. The Avenger is capable of firing basic, post, and RMP versions of the Stinger missile. The electrically driven gyro stabilized turret is mounted on the M1097 HMMWV. The Avenger can launch a Stinger missile or fire the machine gun while on the move or from a remote fighting position 50 meters from the fire unit (figure 3-9).

3-49. The Avenger firing sequence is entirely automated after the firing trigger is pulled. The gunner, after receiving an unknown IFF response and

having visually identified the target as hostile, will activate a missile, uncage the seeker, and, if the target is within range, fire a missile. Immediately upon firing the missile, the next missile is already spinning up its gyro and cooling down. This is done without the gunner activating the next missile. The Avenger system has the unique ability of having a backup capability of performing it's mission. Should the Avenger become disabled, the missiles in the pods can be removed, gripstocks attached, and then fired in the MANPADS configuration. Gripstocks and BCUs are stored on the Avenger during combat missions.

3-50. Onboard communications equipment consists of the Enhanced Position Location Reporting System (EPLRS) and the Single Channel Ground and Airborne Radio System (SINCGARS). The Avenger can be transported in C-130 and larger aerial platforms.

Turret (Gunner's Station)

3-51. The Avenger turret provides the gunner with unobstructed fields of fire. It can rotate through 360° degrees of azimuth and from negative 10 degrees to positive 68 degrees in elevation. The SVML pods are mounted on each side of the turret and contain four Stinger missiles each. Reload time is less than six minutes.

3-52. The Avenger turret is gyro-stabilized. A gyro is attached to the turret floor that senses changes in azimuth of the HMMWV and provides error signals to the Electronic Control Assembly (ECA) to maintain weapon pointing when in the stabilized mode of operation.

M3P .50-Caliber Machine Gun

3-53. The M3P .50-caliber machine gun is mounted on the right launch beam. It provides air defense coverage inside the missile's dead zone, and fire unit self-defense against hostile ground fire. Linked ammunition (200 rounds) is stored in the ammunition box and fed to the gun via a flexible feed chute.

Remote Control Unit

3-54. The Avenger gunner can operate the system remotely from up to a distance of 50 meters using the Remote Control Unit (RCU). The hand control switches and indicators on the RCU are the same as those on the gunner's console. Adjustments to the FLIR console cannot be made from the RCU. As the environment or weather changes, it is critical that the FLIR be kept properly adjusted at all times so that the RCU remains effective.

Sensor

3-55. The Avenger FU is equipped with a sensor system for target acquisition. The sensor system includes the Forward Looking Infrared Receiver (FLIR), the optical sight, and the Laser Range Finder (LRF)

3-56. **Forward Looking Infrared Receiver**. The Forward Looking Infrared Receiver (FLIR) provides enhanced acquisition capability in various environments: night, smoke, rain, background clutter, and haze. Once the gunner has detected and acquired the target with the FLIR, he may choose to manually track the target using the hand station, or select FLIR auto-track by pressing and releasing the right thumb switch on the hand station.

3-57. The two auto-tracking functions on Avenger are FLIR and missile. In missile auto-track, the missile seeker will lock onto the target and the turret will follow the target in azimuth and elevation, providing the Operate Mode – Track switchlight is set to Auto. In FLIR auto-track, the target must be inside the FLIR track box before pressing and releasing the right thumb switch on the hand station.

3-58. **Optical Sight**. To conduct a heads-up engagement using the optical sight, the gunner looks at the sight symbology that is being super-imposed onto the combining glass and out through the canopy. This is the same symbology that appears on the FLIR monitor, but without the auto-track reticule and NFOV fixed reticule.

3-59. **Identification Friend or Foe**. The Avenger IFF subsystem is activated by the gunner. It permits the gunner to identify aerial platforms equipped with Mode 3 or Mode 4 programmed transponders as friend, possible friend, or unknown. In normal operation the system provides a coded interrogation signal for transmission from the FU to the unidentified aerial platform. A reply is automatically generated and transmitted by a friendly aerial platform. Based on the IFF response and visual identification, the gunner either continues the engagement sequence or goes back to search/scan.

3-60. **Laser Range Finder**. Range data from the laser range finder is processed by the on-board computer and is displayed to the gunner on the Control Display Terminal in meters. The computer uses this range data to determine fire permit and lead angle information for missile and gun use. A fire permit symbol is not required to launch a missile, however it is required to fire the machine gun in the Air or Ground (Auto) mode.

OFFENSIVE EMPLOYMENT

3-61. A decision to employ Avenger fire units in support of maneuver forces requires a thorough understanding of the supported commander's intent and the establishment of disengagement criteria. Avengers may follow the brigade in zone, providing overwatch, and protecting command and control assets, reserve units, and artillery units. Planning should include the following risk considerations when deploying Avenger in support of maneuver forces. Avengers are light-skinned vehicles with a distinct high profile and are extremely vulnerable to direct fire, small arms, and indirect fire. The vehicle is unable to negotiate rugged terrain with side slopes exceeding 22 degrees.

3-62. Avengers are normally placed in a GS or GS-R supporting role. However, Avenger may be used in the direct support role, especially in light and special divisions. At night, in adverse weather and when no other ADA system can perform the ADA mission, the Avenger can be integrated into a light battalion's scheme of maneuver.

DEFENSIVE EMPLOYMENT

3-63. The Avenger platoon leader must perform a mission analysis, ensuring he understands the commander's intent and the supported unit's concept of the operation. The Avenger platoon leader must clearly understand how

Avengers will contribute to the force's air defense coverage. Based on these considerations, the platoon leader will develop a coverage plan to support the defensive concept of operations.