MCWP 3-25.10

Low Altitude Air Defense

Handbook

US Marine Corps

Coordinating Draft

LOW ALTITUDE AIR DEFENSE HANDBOOK

TABLE OF CONTENTS

APPENDICES

DEPARTMENT OF THE NAVY

Headquarters United States Marine Corps

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04

FOREWORD

Marine Corps Warfighting Publication (MCWP) 3-25.10, *Low Altitude Air Defense Handbook*, complements and expands on the information in MCWP 3-25, *Control of Aircraft and Missiles*, MCWP 3-25.3, *Marine Air Command and Control System Handbook*, and Fleet Marine Force Manual (FMFM) 5-50, *Antiair Warfare*, to show how low altitude air defense (LAAD) supports and implements warfighting.

Designated for Marine air-ground task force (MAGTF), naval expeditionary force, and Combined joint task force (CJTF) commanders, their staffs, and MAGTF officers and noncommissioned officers, MCWP 3-25.10 provides doctrinal principles, tactics, techniques, and procedures for execution of the LAAD aspect of antiair warfare. It discusses the planning, execution, operations, and employment of LAAD assets, and their integration into the MAGTF or joint/multinational integrated air defense system.

This publication also describes the LAAD battalion—the sole provider of LAAD assets in the Marine Corps—and its role, functions, organization, and potential command relationships.

By investigating these areas, MCWP 3-25.10 provides the requisite information needed by commanders and staffs to understand and evaluate the operational principles and capabilities of LAAD employment options.

MCWP 3-25.10 supersedes FMFM 5-52, *Employment of the Low Altitude Air Defense Battalion*, dated 22 October 1990.

Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

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CHAPTER 1
FUNDAMENTALS

Maneuver warfare fundamentals dictate that the Marine Corps' fighting units be able to move rapidly in the Marine air-ground task force (MAGTF) battlespace. Often, this need for battlespace mobility cannot support large, long-range weapons systems to engage the threat. Man portable, surface-to-air missile systems evolved to provide the MAGTF with close-in, low altitude defense against air attack. These weapons and their operators are organic to the low altitude air defense (LAAD) battalion.

MISSION

The mission of the LAAD battalion is to provide close-in, low altitude surface-to-air weapons (SAW) fires in defense of MAGTF assets defending forward combat areas, maneuver forces, vital areas, installations, and/or units engaged in special or independent operations.

TASKS

The LAAD battalion—

- Provide for the effective command, administrative, communications, supply, and logistics support of subordinate batteries.
- Maintain a primary capability as a highly mobile, vehicle-mounted , and man portable, surface-to-air weapons component of the MAGTF, with the ability to rapidly that can deploy in the assault echelon of an expeditionary operation.
- Provide surface-to-air weapons support for units engaged in special or independent operations.
- Provide for the separate deployment of subordinate batteries and platoons to accommodate special tactical situations and task organization.
- Plan and coordinate requirements for liaison and communications with appropriate commands to ensure the most effective integration of LAAD units within the integrated air defense system.
- Provides early warning of hostile air threats to other elements of the air defense system.

BATTALION ORGANIZATION

The LAAD battalions are subordinate units of the Marine air control group (MACG). All Marine aircraft wings (MAW) have one LAAD battalion except 1st MAW, which has a LAAD battery vice battalion. The LAAD battalion is comprised of a battalion headquarters, headquarters and service (H&S) battery, and two firing batteries. See figure 1-1.

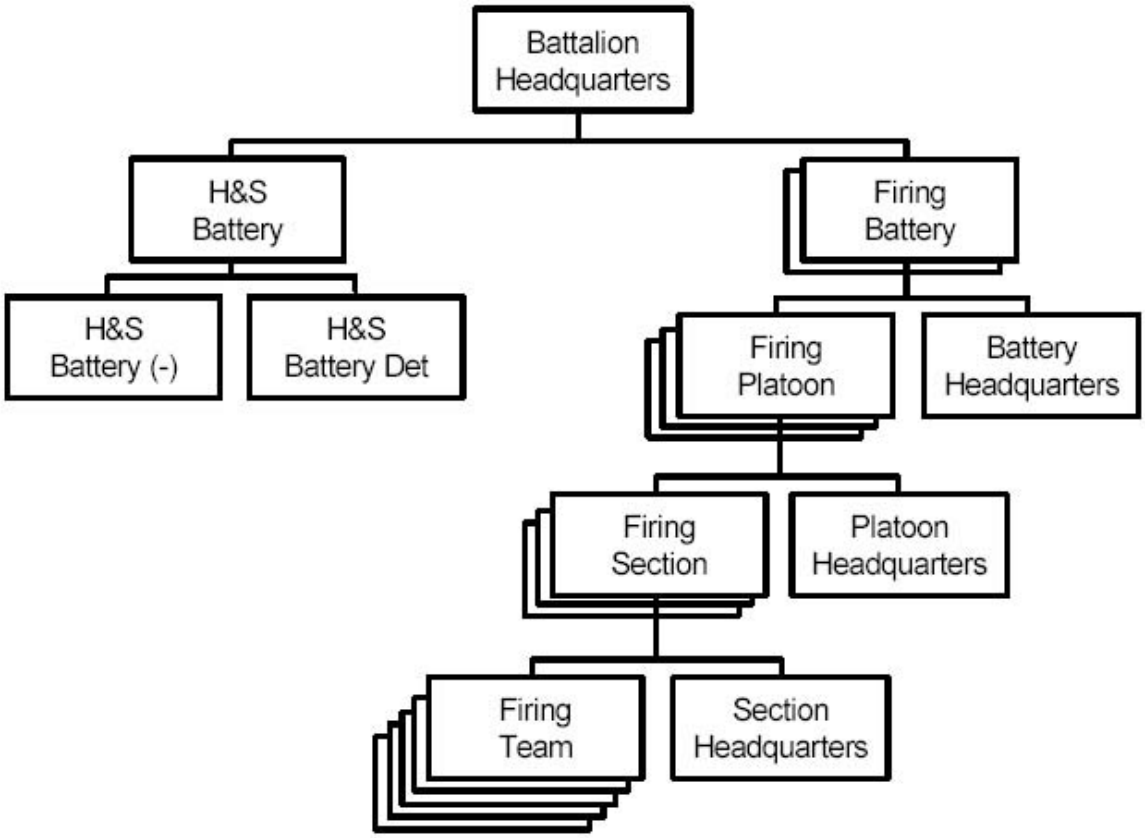

Figure 1-1. Battalion Organization

Battalion Headquarters

The battalion headquarters is organized to provide command of subordinate batteries and to accomplish command and staff functions necessary to fulfill the battalion's mission.

Headquarters and Service Battery

The H&S battery is organized and equipped to provide the battalion with supply, logistics, communications, motor transportation, computer or information systems, and administrative support. It can be divided into a H&S battery minus (-) and a H&S battery detachment. Division allows the H&S battery to deploy separately to support two geographically separated firing batteries. Depending on the size and scope of the operation, the H&S battery may be augmented with personnel from the battalion headquarters for additional administrative, intelligence, operational, or logistical support.

Firing Battery

The firing battery provides the personnel and Stinger weapon systems. Each firing battery is composed of 30 Avenger and 15 man portable Stinger teams. Distribution of the Avenger and man portable firing teams is determined by the commander's task organization. Each firing battery has a battery headquarters and three firing platoons. Platoons are composed of a platoon headquarters and three firing sections. The platoon headquarters consists of the platoon commander, the platoon sergeant, and two radio operators or drivers.

The firing section is the smallest tactical unit of the LAAD battalion. Each firing section consists of a section headquarters and five firing teams. The section headquarters are composed of a section leader and two radio operators or drivers.

The firing team consists of a team leader and a gunner/driver. Both team members require knowledge of basic field radio communications, target detection, and aircraft recognition. Normally, the gunner/driver fires the Stinger missile, allowing the team leader to evaluate targets and make engagement decisions. During periods of intense enemy air activity, both team members may act as gunners to increase the team's rate of fire.

COMMAND RELATIONSHIPS

An understanding of command relationships is vital to all operations. The LAAD commander's conduct of operations can vary greatly depending on who:

- Assigns the LAAD unit its mission.
- Approves the Defended Asset List (DAL) and the Airspace Control Measures (ACMs).
- Establishes engagement criteria.
- Provides administrative and logistical support
- Plans for their employment.
- These aspects are normally addressed by the existing or established command relationship.

The authority vested in a commander must be commensurate with the responsibility assigned (Joint Pub 0-2, Unified Action Armed Forces [UNAAF]). Inherent in command is the authority that a military commander lawfully exercises over subordinates and confers authority to assign missions and to demand accountability for their attainment. A commander can gain additional authority from his superior in the form of command relationships that place other commanders and their assets under his authority.

Command relationships strongly influence a commander's ability to carry out the mission. In fact, the command relationships established between LAAD unit commanders and other commanders provide the basic criteria that define the commander's conduct of LAAD operations.

Command relationships specify the degree of authority one commander has over another commander and are used to allocate assets (units) to a commander. Several commanders may exercise some degree of authority over a particular LAAD unit commander. Although each level of authority is important, Operational Control (OPCON), Tactical Control (TACON), and support are the command relationships most applicable to LAAD units. Although not command relationships, other levels of authority such as Administrative Control (ADCON) and Direct Liaison Authority (DIRLAUTH) are also critical to the LAAD unit in determining essential coordination relationships.

OPCON

When a commander exercises operational control over a low altitude air defense unit commander, the commander has the authority to direct the LAAD unit commander to accomplish specific missions, usually limited by function, time, or location. Inherent with operational control is the authority to exercise or delegate operational or tactical control of, establish support relationships for, and designate coordinating authorities to the attached or assigned low altitude air defense unit.

Operational control does not include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. It may include such authority when specified in the assignment or attachment order.

The commander exercising operational control has the authority to—

- Give direction, as necessary, to carry out the assigned mission.
- Prescribe the chain of command.
- Task-organize, as necessary, to carry out the assigned mission.
- Employ tactically.
- Assign command functions.
- Plan for and coordinate the unit's actions.
- Suspend from duty and recommend reassignment of any officer.
- Establish an adequate system of control for local air defense or ground defense, and delineate such areas of operation.
- Delineate a functional responsibility.

TACON

Tactical control is the command authority over assigned or attached forces, commands, or military capabilities or forces made available for tasking. Tactical control is limited to the detailed and usually local direction and control of movements or maneuvers necessary to accomplish assigned missions or tasks.

Tactical control is inherent in operational control. The commander exercising tactical control of a unit has the authority to control and direct the tactical movement of the unit and the application of the unit's organic weapons fires.

Tactical control does not provide organizational authority or authoritative direction for administrative and logistic support. The commander of the LAAD unit or the commander delegated administrative control continues to exercise command authorities unless otherwise specified in the attachment or assignment order.

Assignment or Attachment

An assignment or an attachment is simply a transfer of forces. A LAAD unit can be assigned or attached to another unit under a General Support (GS) or Direct Support (DS) status.

An assignment is the placement of a unit or personnel into an organization outside the normal chain of command, where such placement is relatively permanent. For example, a LAAD section deploying with a Marine Expeditionary Unit (MEU) is normally assigned DS to the MEU because the relationship is relatively permanent.

An attachment is the temporary placement of units or personnel in an organization outside the normal chain of command. LAAD units would be used as an attachment in independent operations such as Noncombatant Evacuation Operation (NEO), helicopter borne assault, or raid.

The difference between assignment and attachment is the period of time the relationship exists. An attachment is relatively temporary, while an assignment is more permanent.

Support

Support is a command authority. A support relationship is established by a superior commander between subordinate commanders when one organization should aid, protect, complement, or sustain another force while maintaining the normal chain of command. For example, the MAGTF commander may direct a LAAD battery to be in direct support of a Marine regiment. In a support relationship, the battery commander can accomplish the mission and still maintain the normal chain of command within the battalion.

The MAGTF commander approves support relationships between the Ground Combat Element (GCE) and the Aviation Combat Element (ACE). He also establishes MAGTF defended assets before any LAAD assets are given support missions. A support relationship does not necessarily imply logistical or administrative support. This responsibility is retained by the commander exercising ADCON of the unit.

There are four types of support relationships: general, direct, close, and mutual. The two support relationships most commonly used by LAAD units are general support and direct support. Close and mutual support relationships are not usually formally established within the MAGTF context; however, LAAD units may find themselves in such relationships during joint or multinational operations.

GS

General Support is support given to the supported force as a whole, not just to a subdivision. The LAAD unit commander should ensure that—

- Defended assets are established based on the needs of the entire force.
- LAAD units are not associated with the maneuvering of any particular component as this may leave a gap in air defense coverage.
- LAAD units maintain communications with the Marine Air Command and Control System (MACCS) to ensure that critical information is disseminated to all levels within the integrated air defense system (IADS). The coordination for LAAD units in general support should consist of security, coordination with adjacent units, dissemination of early warning information, and advising units on passive defense and small arms defense from air attack.
- Logistical needs, such as the resupply of missiles, food, fuel, and maintenance support, are provided by the LAAD battalion or battery headquarters and services detachment via the chain of command. Timely resupply may be difficult, since LAAD sections are normally dispersed widely throughout the IADS. When possible, receive support from adjacent or supported units to reduce the time it takes for critical resupply to reach the sections.
- Security from ground attack is coordinated with the supported unit. The LAAD commander should conduct liaison with the commander whose Zone Of Action (ZOA) they are operating in to ensure that units are aware that LAAD units are moving through their ZOA.

DS

Direct Support is support given to another force that requires the supporting force to answer to the supported commander's request for assistance. In DS—

- The supporting LAAD unit is immediately responsive to the supported unit's requirements for air defense.
- The supported unit commander establishes local defended assets.
- LAAD units operate within the supported unit's ZOA.
- The supporting LAAD units go where the supported unit goes in order to maintain coverage of the established defended assets.
- LAAD units maintain communications with the supported unit to receive critical information such as modifications to Rules Of Engagement (ROE), early warning, cueing, and any essential intelligence.
- LAAD units coordinate local security requirements. Security is not always provided while in a DS role.
- LAAD units may be directed to augment local security. The senior LAAD representative should brief the supported unit commander on the detrimental effects the lack of crew rest may have on the quality of air defense provided. The supported unit commander should determine the priority for air defense versus perimeter security. This coordination should also provide LAAD units with proper procedures for maneuvering throughout the supported unit's ZOA.
- When LAAD units in DS are dispersed widely, it is difficult for the parent LAAD unit to provide logistical support even it they may retain ADCON. LAAD commanders in direct support should coordinate with supported unit commanders to enhance logistical support.
- LAAD units maintain communications with the MACCS, when feasible. This allows LAAD teams to receive critical early warning and cueing information.

GS vs. DS

Establishment of the DAL. In a GS role, the DAL is established by the MAGTF commander. In Coalition/Joint operations the DAL is established by the CJTF Commander with input from subordinate commanders to include the MAGTF Commander. In DS roles, the supported unit commander establishes local defended assets in concert with the MAGTF commander's guidance.

Planning for the Employment of Air Defense Assets. In general support, the LAAD unit commander plans for the employment of air defense assets in context with the MAGTF/ACE commander's guidance. In DS, the LAAD commander plans for the employment of air defense assets in coordination with the supported unit commander's concept of operations and scheme of maneuver.

Establishment of Liaison and Communications. In GS, LAAD units establish communications with MACCS nodes where available or appropriate. In direct support, LAAD units maintain liaison or communications with the supported unit commander and any MACCS nodes that are available.

Planning for Logistical Support and Physical Security. In general support, the arrangement for logistical support and physical security is established by the operations order. In direct support, coordination for logistical support and physical security is made with the supported unit.

Close Support. Close support is that action of the supporting force against targets or objectives that are sufficiently near the supported force as to require detailed integration or coordination of the supporting action with fire, movement, or other actions of the supported force. For example, a close support relationship could be established between a LAAD battery and an US Army Air Defense Artillery (ADA) battery given the mission of protecting a vital area from air attack. A close support relationship would exist to facilitate integration and coordination of their respective surface-to-air fires and surveillance sectors.

Mutual Support. Mutual support is that support units render each other against an enemy, because of their assigned tasks, their position relative to each other and to the enemy, and their inherent capabilities. Mutual support occurs continuously throughout the battlespace. For example an infantry company provides ground security to a LAAD section that, in turn, provides air defense to the infantry company.

Administrative Control. ADCON includes more than authority over administrative matters and personnel management. It is the direction or exercise of authority over subordinate or other organizations with respect to administration and support.

ADCON includes organization, control of resources and equipment, personnel management, unit logistics, individual and unit training, readiness, mobilization, demobilization, and discipline, and other matters not included in the operational missions of the subordinate or other organizations. The degree of ADCON may be delegated by the MAGTF commander to subordinate commanders and exercised at any echelon at or below the commander's level.

When LAAD teams are dispersed widely over the battlefield, the commander-delegated ADCON has a challenging mission. The commander is not only responsible for getting supplies to LAAD units, but the commander must also determine resupply priorities and, if applicable, determine which units will receive items with limited availability.

Direct Liaison Authorized. DIRLAUTH is the authority granted by a commander (any level) to a subordinate to directly consult or coordinate an action with a command or agency within or outside of the granting command. DIRLAUTH is more applicable to planning than operations and always carries with it the requirement of keeping the commander granting DIRLAUTH informed. For example, a LAAD unit my be granted DIRLAUTH from a commander it is in DS of to coordinate administrative or logistical support from another unit in close proximity. DIRLAUTH is a coordination relationship, not an authority through which command may be exercised.

Operation within a Zone of Action (ZOA). The commander of a sector or ZOA in which LAAD units are operating has some degree of authority over those LAAD units in regard to movement and security

requirements, unless the LAAD unit commander is exempt from such authority. For LAAD elements to negotiate safely through or operate within a specific ZOA, the LAAD commander must first make liaison with that unit and any adjacent unit. This will ensure deconfliction of any of any security procedures that will apply to the movement and placement of LAAD elements or firing of missiles within these ZOAs. In addition, LAAD elements must make liaison in regards to their own personnel security requirements that they may have been tasked to provide for the ZOA.

Figure 1-2 depicts the command relationships as applicable to the LAAD unit.

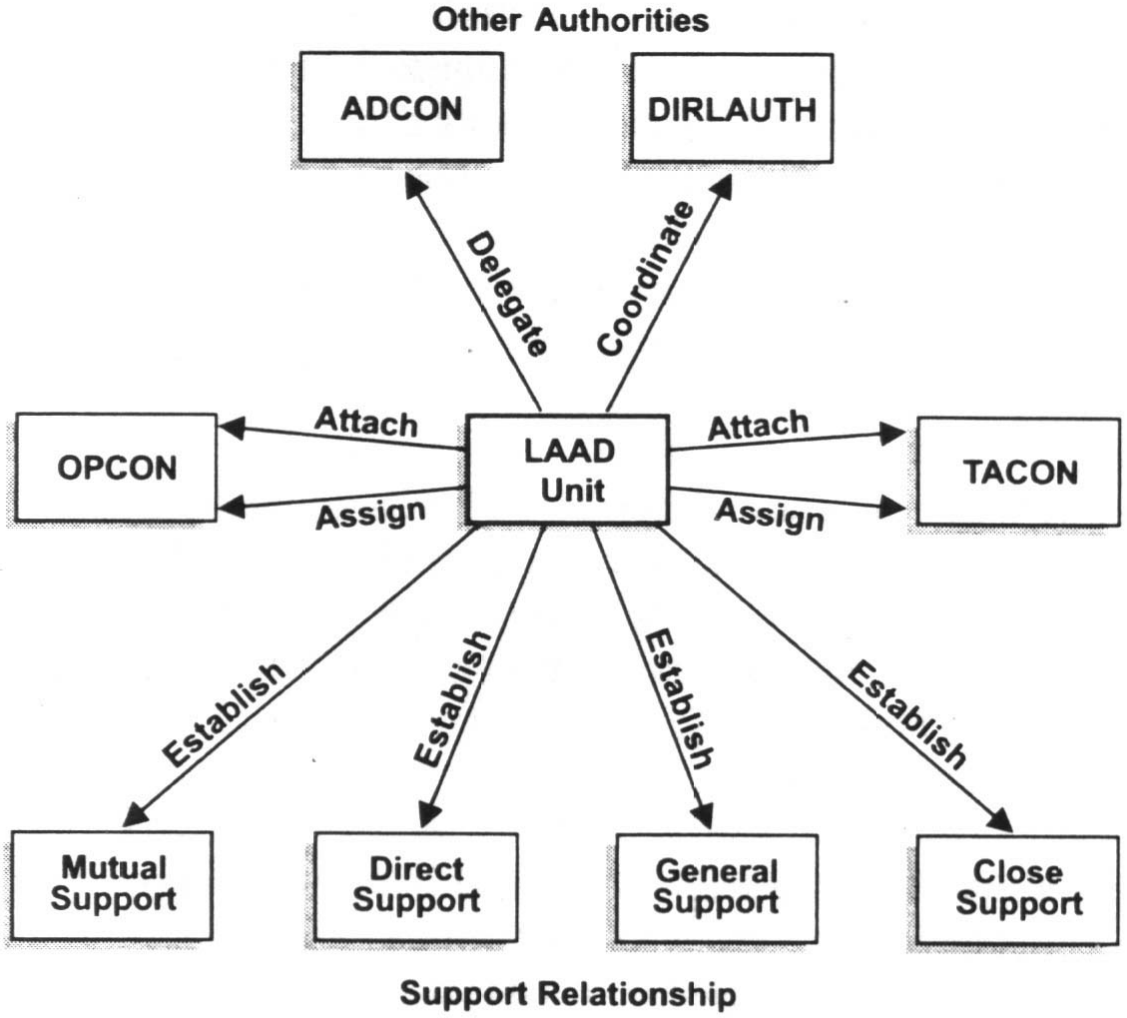

Figure 1-2. Command Relationships

BASIC CRITERIA FOR LAAD UNIT EMPLOYMENT

Four specific questions a unit commander must be able to answer are—

Q. Who do I work for?

A. A LAAD unit commander receives his mission and tasks from the commander who exercises OPCON authority as established by a command relationship.

Q. What is my mission?

A. The LAAD unit commander receives the mission from the commander who exercises OPCON. That commander may be the LAAD unit commander's immediate superior commander. Missions are often assigned in the form of support relationships. When the LAAD commander is assigned a support relationship, the chain of command established by a command relationship does not change. The LAAD unit commander remains under the command of the commander with OPCON regardless of the support relationships established. A support relationship simply indicates which unit gets priority benefit of the LAAD unit's capabilities.

Q. Who establishes the criteria on which my teams base their engagement decisions?

A. LAAD teams can engage aircraft based on the ROE. Air defense control measures assist air defenders in making engagement decisions. Air defense control measures are established by the ACE commander; however, if LAAD units participate in operations that do not allow them to maintain communications with the MACCS, the ACE commander may delegate the authority to establish local air defense control measures to another commander on the scene.

Q. Who is going to provide my unit with administrative and logistics support?

A. The commander delegated ADCON over the LAAD unit is responsible for providing administrative and logistical support. The establishing directive should delineate exactly who is providing logistical and administrative support to whom and how much will be provided. However, since LAAD units are often dispersed widely across the battlefield, the commander with ADCON may make arrangements for LAAD units to be resupplied by the supported unit or through units operating in close proximity.

Detailed relationships and responsibilities will always be mission, enemy, terrain and weather, troops and support available, and time available (METT-T) dependent. For all command relationships, the unit commander delegated ADCON IAW the attachment or assignment order or the establishing directive provides the LAAD unit with logistical and administrative support.

CHAPTER 2
STINGER WEAPON SYSTEM

The LAAD battalion's ability to task-organize its units, coupled with Stinger's inherent mobility and flexibility in employment, give the MAGTF commander a maneuver-oriented LAAD capability that can support all types of tactical operations.

DESCRIPTION

The Stinger weapon system is a man portable (34.5 pounds), shoulder-fired, supersonic missile system designed to counter high-speed, low-level, ground attack aircraft. Stinger is effective against helicopters, Unmanned Aerial Vehicles (UAVs), and observation and transport aircraft. Once fired, Stinger uses proportional navigation algorithms to guide the missile to a predicted intercept point. The Stinger missile can be used as a man portable air defense (MANPAD) system when the weapon is fired from the gunner's shoulder, mounted aboard the Avenger weapons system. Air-To-Air Stinger (ATAS) can be employed from various airborne platforms that range from helicopters and UAVs.

Stinger reprogrammable microprocessor (RMP) has a dual-channel, passive infrared (IR) and ultraviolet (UV) tracking seeker, and a proportional navigational guidance missile system. The spectral discrimination of the seeker detector material, when super cooled by the argon gas in the Battery Coolant Unit, enables Stinger to acquire, track, and engage targets in any aspect (incoming, outgoing, or crossing). Stinger is a true "fire and forget" missile, requiring no inputs from the gunner once the weapon is fired. This allows the gunner to take cover, move to an alternate position, or engage additional targets. Stinger also possesses an integral Identification, Friend or Foe (IFF) subsystem to assist the gunner in identifying friendly aircraft. The Stinger missile has three main sections: guidance, propulsion, and warhead sections. Each section can be broken down into sub-components of the missile. See figure 2-1.

GUIDANCE SECTION

The guidance section consists of a seeker assembly, a guidance assembly, a control assembly, a missile battery, and four control surfaces (or wings) that provide in-flight maneuverability. The tail assembly, which is not located with the guidance section, does provide roll and stability while the missile is in flight using four folding tail fins that are attached at the aft of the missile.

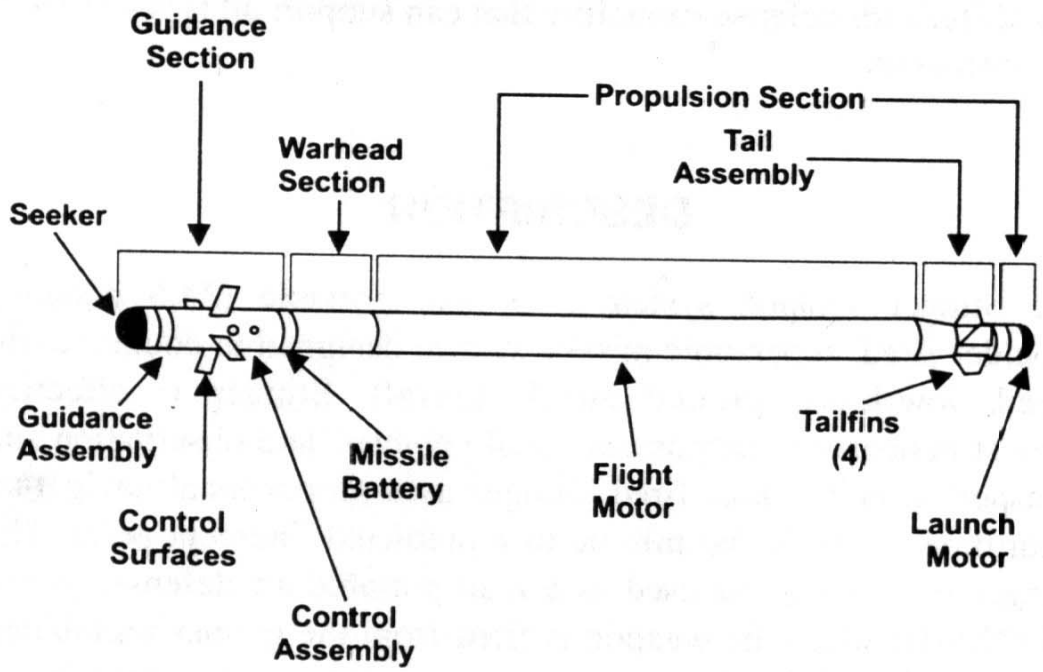

Figure 2-1. Stinger Missile.

Warhead Section

The warhead section consists of a fuse assembly and the equivalent of one pound of high explosives. The fuse is extremely safe and makes the missile exempt from any hazards of electromagnetic radiation to ordnance conditions. The warhead can be detonated by penetrating the target, impacting the target, or self-destruction.

Propulsion Section

The propulsion section consists of a launch motor and a dual-thrust flight motor. When the missile has been fired the launch motor ejects the missile from the launch tube. The missile will then coast a safe distance (about 9 meters) from the gunner before the dual thrust flight motor ignites and provides the sustained acceleration that arms the missile. After the missile is armed, a sustained flight phase maintains missile velocity until the propellant is consumed. Then the missile enters a free flight period or coast phase in which the motor has burned out, but the missile maintains a degree of maneuverability prior to interception or self-destruction.

STINGER WEAPON ROUND

The Stinger weapon round (figure 2-2) is certified for immediate firing when received from the Ammunition Supply Point (ASP). The Stinger is transported in a crush resistant, hardened, reusable aluminum box. called the Weapon Round Container (WRC), but is more commonly referred to as a mono box. Stinger rounds are packaged in a thin, wood-sided box surrounding a foam insert in which the missile is packed. The Stinger

weapon round consists of a missile round, a separable grip stock assembly, and up to three (BCU). The gripstocks are shipped separately from the missile to enhance security during shipping.

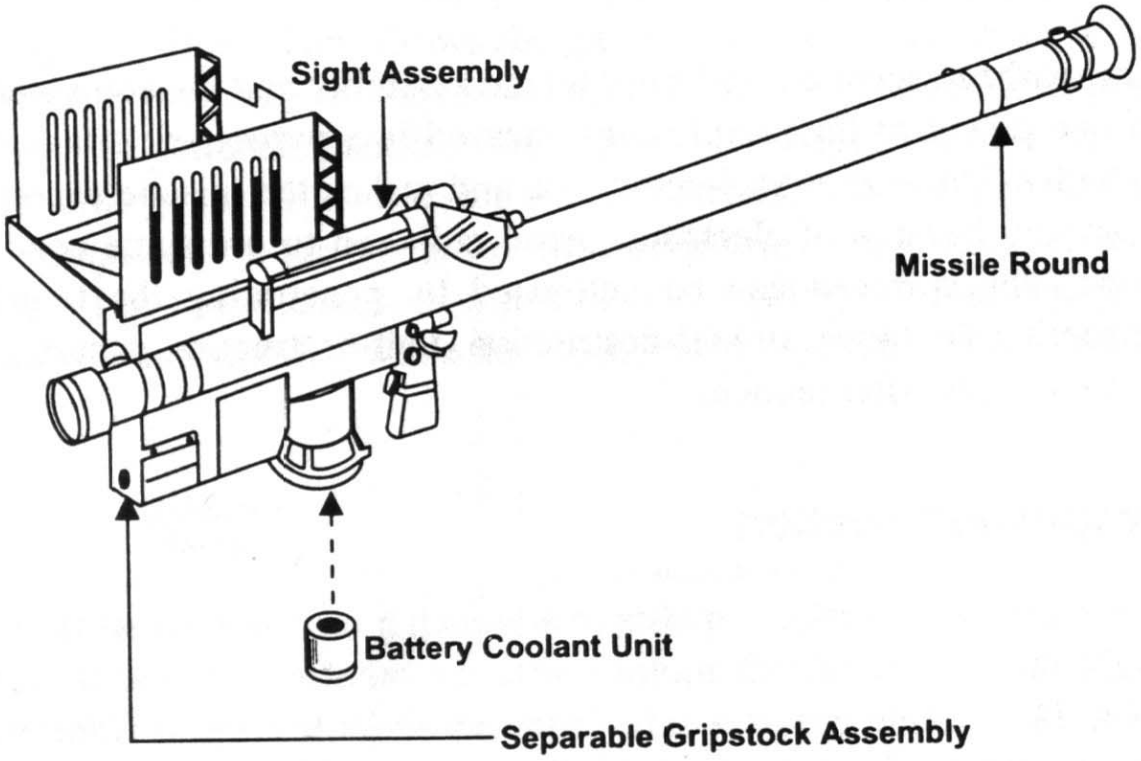

Figure 2-2. Stinger Weapon Round.

Missile Round

The missile round consists of a Stinger missile sealed in a launch tube with an attached sight assembly. The sight assembly allows the gunner to range and track an aircraft. Attached to the sight assembly are two acquisition indicators to aid the gunner in firing of the missile. The first indicator is a speaker that allows the gunner to hear the IR acquisition signal and IFF tones when interrogations are made through the IFF subsystem. The second indicator is a bone transducer that allows the gunner to "feel" the IR acquisition signal on the cheekbone. Also attached to the sight is a clear plastic eye shield that protects the gunner's left eye when the missile is fired.

Separable Gripstock Assembly

The gripstock consists of the gripstock assembly and the IFF antenna assembly. The gripstock assembly contains all of the circuits and components required to prepare and launch the missile as well as the interface for the IFF subsystem. The gripstock is of a clamshell design so that internal components and circuitry

within the gripstock can be serviced by qualified technicians at depot-level maintenance. After the missile is launched, the gripstock is removed from the launch tube for attachment to a missile round.

When the IFF antenna assembly is unfolded and the IFF interrogator is connected to the weapon, the gunner can interrogate aircraft and receive coded replies. The gripstock also houses the auxiliary unit interface, where the reprogrammable microprocessor Read-Only Memory (ROM) module is located. It is accessed through an interface connector cover on the left side of the gripstock. The read-only memory module provides not only additional capability, but built-in economy into the Stinger missile program as a whole. Since the missile is fully digital, the ROM module allows for advanced guidance and tracking technology to be added to the missile without purchasing new missiles. Advanced counter-countermeasure technology can update current missiles in the same manner. The ROM interface allows technicians to access the electronics section and install the updated modules into the missiles. This is not an operator-level function and requires support from the Naval Warfare Systems Center.

Battery Coolant Unit

The BCU contains a thermal battery that provides power for pre-flight system operations and a supply of argon gas to cool the IR detector in the missile seeker. Once activated, the BCU supplies electrical power and seeker coolant until the missile is launched or for a maximum of 45 seconds. The BCU is removed from the gripstock BCU well and discarded immediately after use.

IFF SUBSYSTEM

The IFF subsystem allows the gunner to electronically interrogate an aircraft to determine if the aircraft is a friend, possible friend, or unknown. See figure 2-3. The IFF subsystem notifies the gunner of the results of an interrogation using a sequence of audible tones. Once the gunner issues an IFF challenge, the remainder of the sequence is automatic. The IFF subsystem does not identify hostile aircraft or prevent Stinger from firing at friendly aircraft.

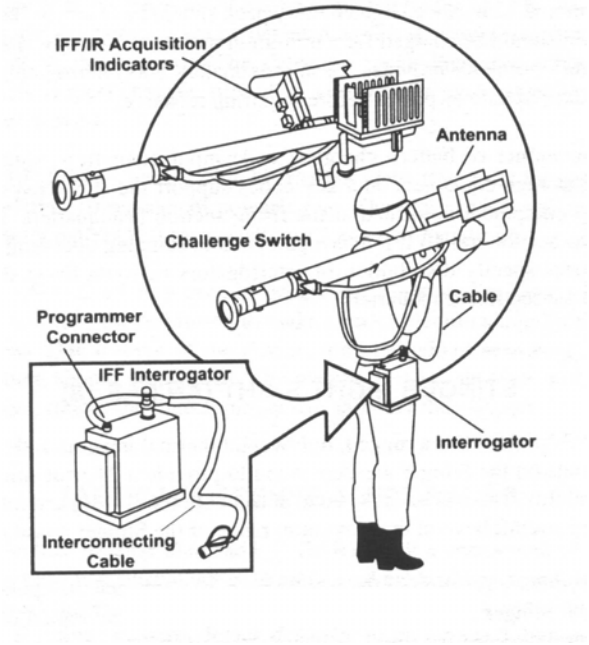

Figure 2-3. IFF Subsystem.

The IFF subsystem is coded in either a complex, cryptographic secure form (Mode IV) or a simpler form (Mode III). All United States combat aircraft are equipped with transponders to provide Mode III and Mode IV replies; however, some aircraft, including commercial and allied nation aircraft, can only provide Mode III replies. Since Mode IV is secure, a friendly Mode IV reply is considered a "true friend" reply. A Mode III reply is considered a "possible friend" reply.

A Stinger's IFF response or lack of response does not constitute authority to fire on a target. IFF responses merely assist gunners in determining the true nature of a target. Weapons Control Statuses, identification criteria, and ROE for the operation provide the guidelines for identification and engagement of targets.

STINGER NIGHT SIGHT (AN/PAS 18)

The AN/PAS-18 is a rugged, lightweight thermal imaging sight that mounts on the Stinger weapon round to provide a 24-hour mission capability. The unit is designed to detect both fixed-wing and rotary-wing aircraft beyond the maximum range of the Stinger missile.

The primary function of the AN/PAS-18 is to enhance the operation of the Stinger missile system. It operates in the same region of the electromagnetic spectrum as the Stinger missile and detects any infrared source the missile can detect. This capability also allows a secondary function of night area surveillance.

Operating passively in the infrared spectrum, the AN/PAS-18 allows the gunner to perform target acquisition and weapon firing during total darkness and under reduced visibility conditions (e.g., fog, dust, and smoke). In a clear sky environment, day or night, the AN/PAS-18 can detect fixed-wing aircraft at high altitude in a tail aspect to the horizon. In optimal conditions, detection can be in excess of 20 to 30 kilometers. The AN/PAS-18 is least effective in detecting fixed-wing aircraft at low altitude coming directly toward the operator. As the exhaust plume is hidden by the body of the aircraft, the aircraft may not be detected until it is within 8 to 10 kilometers of the operator. The detection range increases when an aircraft's aspect changes, providing a view of the plume (side aspect to rear aspect).

The AN/PAS 18 is ready for operation within 10 seconds of powering up. The receiver can be powered by a lithium battery that provides 6 to 12 hours of battery life, or plugged directly into the HMMWV Slave receptacle.

The AN/PAS-18 is a second-generation night vision device and does not have the resolution to make aircraft identification determinations. Due to bulk of the device, long periods of searching and scanning should be avoided. The weight of the night sight and the missile reduces the time a gunner can shoulder the weapon.

TACTICAL DEFENSE ALERT RADAR

The Tactical Defense Alert Radar (TDAR) is not a component of the Stinger weapon system but is an associated piece of equipment used to detect targets. The TDAR is a lightweight, early warning detection device designed to be a rugged, transportable radar system that provides LAAD units with an organic cueing, alerting, and early warning capability. The TDAR is designed to provide a surveillance capability to the unit when early warning and cueing is not available from more capable sensors such as the long- range air surveillance radars of the Tactical Air Operations Center (TAOC).

The tactical defense alert radar consists of an antenna array, rotating pedestal, quadripod, transceiver unit, and display terminal. See figure 2-4 on page 2-8. The display terminal can be remoted over 100 meters from the radar transceiver. While the TDAR is transportable in the HMMWV, it cannot be operated from the back of a moving HMMWV. The TDAR can be powered by the HMMWV portable generator, commercial power, or 24-volt, direct current power supply.

The TDAR provides LAAD units with a 20-kilometer detection capability against fixed-wing aircraft and an 8 to 10 kilometer detection capability against rotary- wing aircraft and unmanned aerial vehicles. The

TDAR's maximum detection altitude is 10,000 feet. Although the TDAR may be employed from the firing battery to the firing section level, it is ideal for use at the section level due to its relatively short range.

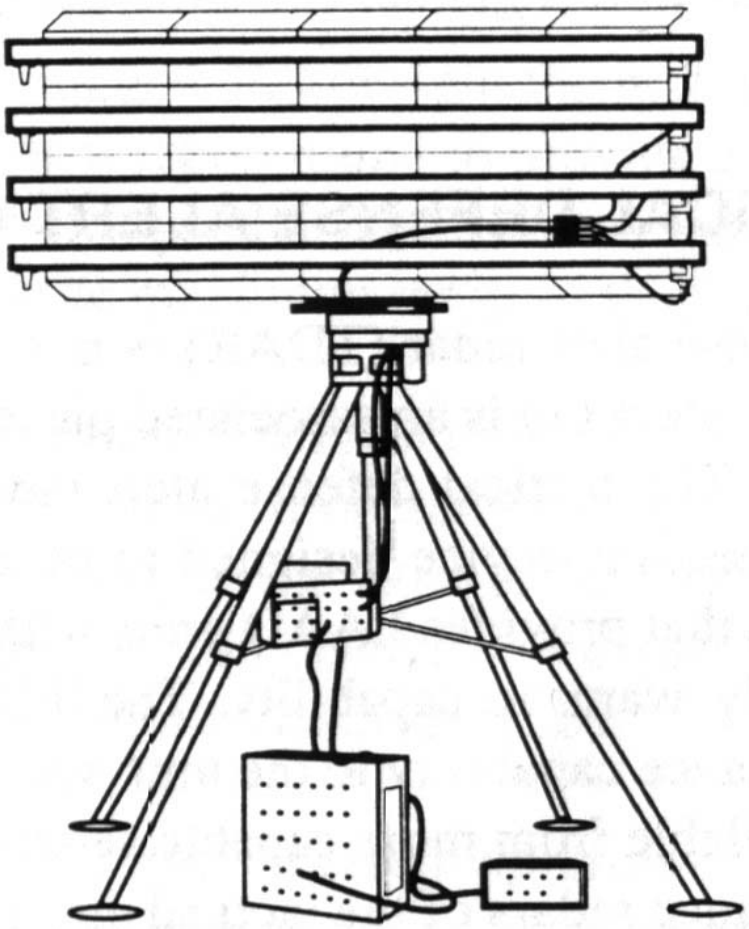

Figure 2-4. Tactical Defense Alert Radar.

REMOTE TERMINAL UNIT

A common tactical air picture is developed from sensor systems within the joint air defense network. Radar-equipped units of the MACCS, Air Force command and reporting centers (CRCs) and elements, the airborne warning and control system (AWACS), and Navy Aegis ships are among the agencies and systems that contribute to this picture. The air picture developed by the radars is shared among air defense units through a network of data links such as tactical digital information link (TADL) A, B, and J. For example, an E-3 AWACS aircraft may send air tracks to other air defense units via TADL A, where the picture is combined with the presentation from each units' own radar picture. At the TAOC, air surveillance information generated from its organic sensors and from other data link participants is forwarded to a Ground-Based Air Defense (GBAD) unit via Army tactical data link 1 (ATDL-1), or TADIL B. This information can be combined with the GBAD unit's organic radar picture and sent to LAAD units via Ground-Based Data Link

(GBDL). Transferring the air track data to the Stinger units provides Stinger sections with a recognized air picture that provides early warning and cueing to assist in the engagement process.

GBDL is passed to LAAD units through the Remote Terminal Unit (RTU). The RTU is a ruggedized, microcomputer or radio combination integrated system. It has the capability to retransmit a GBDL signal. This enables a section to "daisy chain" GBDL to distant elements and to send local air defense radar pictures back through the GBDL network and into the common tactical air picture.

GBAD units can provide a GBDL capability that enhances the situational awareness of remotely positioned gunners by providing them with a low- to medium-altitude air picture and weapons cueing.

The short-range air defense RTU configuration consists of a VHF radio system and the RTU computer that receives the air picture, converts it to a local geographic position, and displays the air picture in near-real-time using common symbology on the RTU display. The near real time display on the RTU is capable by connecting the RTU to a VHF-FM frequency-hopping radio (i.e., SINCGARS [single-channel ground and airborne radio system]), which through a digital data buffer processes the information received over GBDL for display on the terminal.

LAAD TEAM ORGANIC VEHICLE (MANPAD)

In addition to being able to shoot and communicate, LAAD units must also be able to move to accomplish their mission. LAAD teams should deploy with their organic HMMWVs whenever possible.

Although not a component of the Stinger missile system, the HMMWV should be considered part of the weapon system. The HMMWV allows the LAAD team to—

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- Move rapidly to alternate positions.
- Carry its full, basic load of 6 missiles.
- Reach missile resupply points.
- Carry the ancillary equipment and supplies necessary to accomplish the team mission (e.g., batteries, ammunition, cryptographic equipment, radios, IFF equipment).

Situations which force the team to deploy without the HMMWV should be minimized. Without its vehicle, the LAAD team can fulfill only a portion of the mission for which it was designed and equipped. If the team is to be employed without the vehicle, extensive coordination and planning should be conducted to provide the logistical support necessary to continue the mission.

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The Avenger weapon system includes a 360°, rotating turret mounted on a heavy HMMWV chassis with an upgraded suspension and 200 amp alternator. The baseline configuration consists of a gunner's turret with missile pods mounted on each side. Each missile pod, called the Standard Vehicle-Mounted Launcher (SVML), can hold four missiles that can be removed and fired in the MANPAD employment configuration. The rotation of the turret and the elevation of the SVML is accomplished by the Environmental Control Unit Power Producing Unit (ECU/PPU). A .50 caliber machine gun is also part of the system armament. It affords a measure of self-protection by providing coverage within the Stinger missile's inner launch boundary. See figure 2-5.

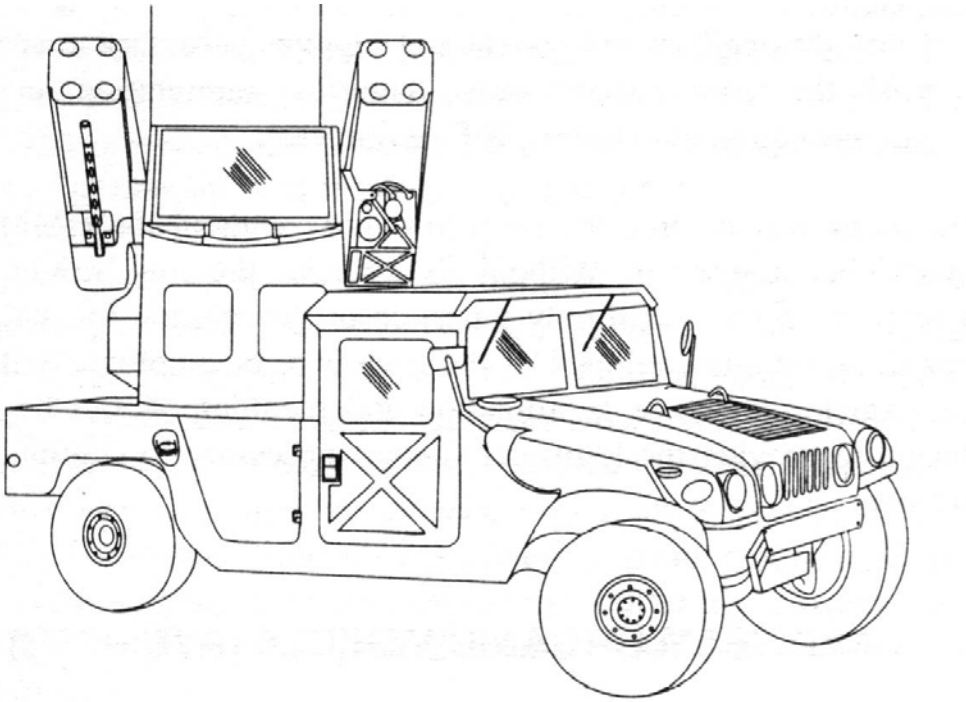

Figure 2-5. The Avenger Weapon System.

The Avenger weapons system has an unobstructed, 360° field of fire and can engage at elevations between -10 and +70°. The modular design of Avenger allows complementary missiles and/or rockets to be installed on the launch arms in addition to (or in place of) Stinger missiles. The gunner has sufficient visibility out of the turret for visual target acquisition, tracking, and engagement. A combination glass sight is used through which the gunner looks to aim the missiles and on which a driven reticle display is projected. The driven reticle indicates the aiming point of the missile seeker to confirm to the gunner that the missile seeker is locked onto the desired target.

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The turret drive is gyro-stabilized to automatically maintain the missile pod aiming direction regardless of the vehicle motion. The turret drive control is operated by the gunner with a hand controller on which the missile and gun controls are placed. The gunner can transfer tracking control to an automatic turret drive control system that uses signals for the uncaged missile seeker of the FLIR video auto tracker to track the target until the gunner is ready to fire. The firing sequence is entirely automated, including super elevation and lead, so that the gunner need merely push the fire button to initiate the fire sequence and immediately select and prepare the next missile for firing. These systems enable Avenger to accurately and rapidly launch missiles.

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GBAD units, TAOC operators, or the LAAD section leader can be accepted or rejected by the gunner. Until the gunner responds to the cue, the gunner maintains complete control of the Avenger turret. If the gunner accepts a pointer, the turret automatically slews to the azimuth of the target. The gunner then resumes control of the turret and completes the engagement process by acquiring, tracking, and engaging the target. "Slew to cue" is a capability inherent to any radar picture.

EQUIPMENT INITIATIVES

Among the planned improvements to LAAD equipment is the Common Aviation Command and Control System (CAC2S) and the Complementary Low Altitude Weapon System (CLAWS).

Common Aviation Command and Control System

The CAC2S will be fielded to all major MACCS and activities to replace their current command and control suites. CAC2S is envisioned to be a multi-role air command, control, and communications (C3) suite that will support the necessary software and external interfaces to conduct all facets of Marine air command and control from a single, modular system. When equipped with a common aviation command and control system node, a LAAD unit's situational awareness will increase dramatically. The unit will be able to view and contribute to the common tactical air picture; pass and receive data link commands via TADL A, B, or J; receive the Air Tasking Order (ATO); and review subsequent Airspace Control Orders (ACOs) and special instructions.

Complementary Low Altitude Weapons System

CLAWS may be fielded to all the LAAD Bn's in order to complement not only the Stinger missile's effectiveness but, that of other SAM systems such as Patriot. The final CLAWS configuration is yet to be determined. The system will however consist of 4-6 AIM-120 Advanced Medium Range Air-to-Air Missiles (AMRAAM) mounted on a HMMWV. In it's initial configuration cueing will be provided by the AN/MPQ-64 Sentinel Radar.

CHAPTER 2
STINGER WEAPON SYSTEM

The LAAD battalion's ability to task-organize its units, coupled with Stinger's inherent mobility and flexibility in employment, give the MAGTF commander a maneuver-oriented LAAD capability that can support all types of tactical operations.

DESCRIPTION

The Stinger weapon system is a man portable (34.5 pounds), shoulder-fired, supersonic missile system designed to counter high-speed, low-level, ground attack aircraft. Stinger is effective against helicopters, Unmanned Aerial Vehicles (UAVs), and observation and transport aircraft. Once fired, Stinger uses proportional navigation algorithms to guide the missile to a predicted intercept point. The Stinger missile can be used as a man portable air defense (MANPAD) system when the weapon is fired from the gunner's shoulder, mounted aboard the Avenger weapons system. Air-To-Air Stinger (ATAS) can be employed from various airborne platforms that range from helicopters and UAVs.

Stinger reprogrammable microprocessor (RMP) has a dual-channel, passive infrared (IR) and ultraviolet (UV) tracking seeker, and a proportional navigational guidance missile system. The spectral discrimination of the seeker detector material, when super cooled by the argon gas in the Battery Coolant Unit, enables Stinger to acquire, track, and engage targets in any aspect (incoming, outgoing, or crossing). Stinger is a true "fire and forget" missile, requiring no inputs from the gunner once the weapon is fired. This allows the gunner to take cover, move to an alternate position, or engage additional targets. Stinger also possesses an integral Identification, Friend or Foe (IFF) subsystem to assist the gunner in identifying friendly aircraft. The Stinger missile has three main sections: guidance, propulsion, and warhead sections. Each section can be broken down into sub-components of the missile. See figure 2-1.

GUIDANCE SECTION

The guidance section consists of a seeker assembly, a guidance assembly, a control assembly, a missile battery, and four control surfaces (or wings) that provide in-flight maneuverability. The tail assembly, which is not located with the guidance section, does provide roll and stability while the missile is in flight using four folding tail fins that are attached at the aft of the missile.

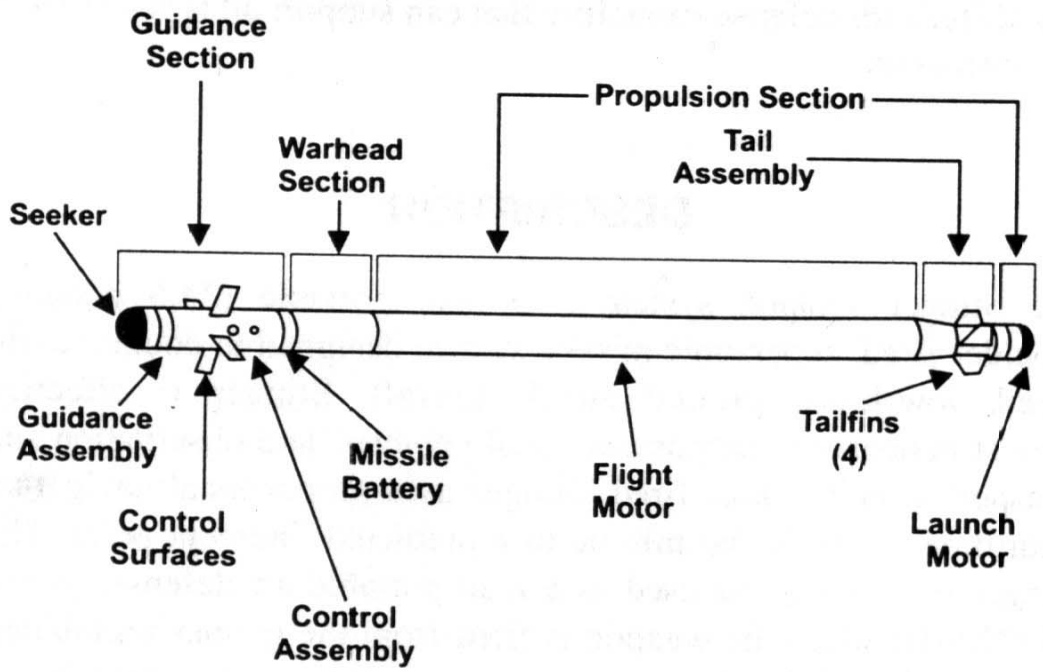

Figure 2-1. Stinger Missile.

Warhead Section

The warhead section consists of a fuze assembly and the equivalent of one pound of high explosives. The fuze is extremely safe and makes the missile exempt from any hazards of electromagnetic radiation to ordnance conditions. The warhead can be detonated by penetrating the target, impacting the target, or self-destruction.

Propulsion Section

The propulsion section consists of a launch motor and a dual-thrust flight motor. When the missile has been fired the launch motor ejects the missile from the launch tube. The missile will then coast a safe distance (about 9 meters) from the gunner before the dual thrust flight motor ignites and provides the sustained acceleration that arms the missile. After the missile is armed, a sustained flight phase maintains missile velocity until the propellant is consumed. Then the missile enters a free flight period or coast phase in which the motor has burned out, but the missile maintains a degree of maneuverability prior to interception or self-destruction.

STINGER WEAPON ROUND

The Stinger weapon round (figure 2-2) is certified for immediate firing when received from the Ammunition Supply Point (ASP). The Stinger is transported in a crush resistant, hardened, reusable aluminum box. called the Weapon Round Container (WRC), but is more commonly referred to as a mono box. Stinger rounds are packaged in a thin, wood-sided box surrounding a foam insert in which the missile is packed. The Stinger

weapon round consists of a missile round, a separable gripstock assembly, and up to three (BCU). The gripstocks are shipped separately from the missile to enhance security during shipping.

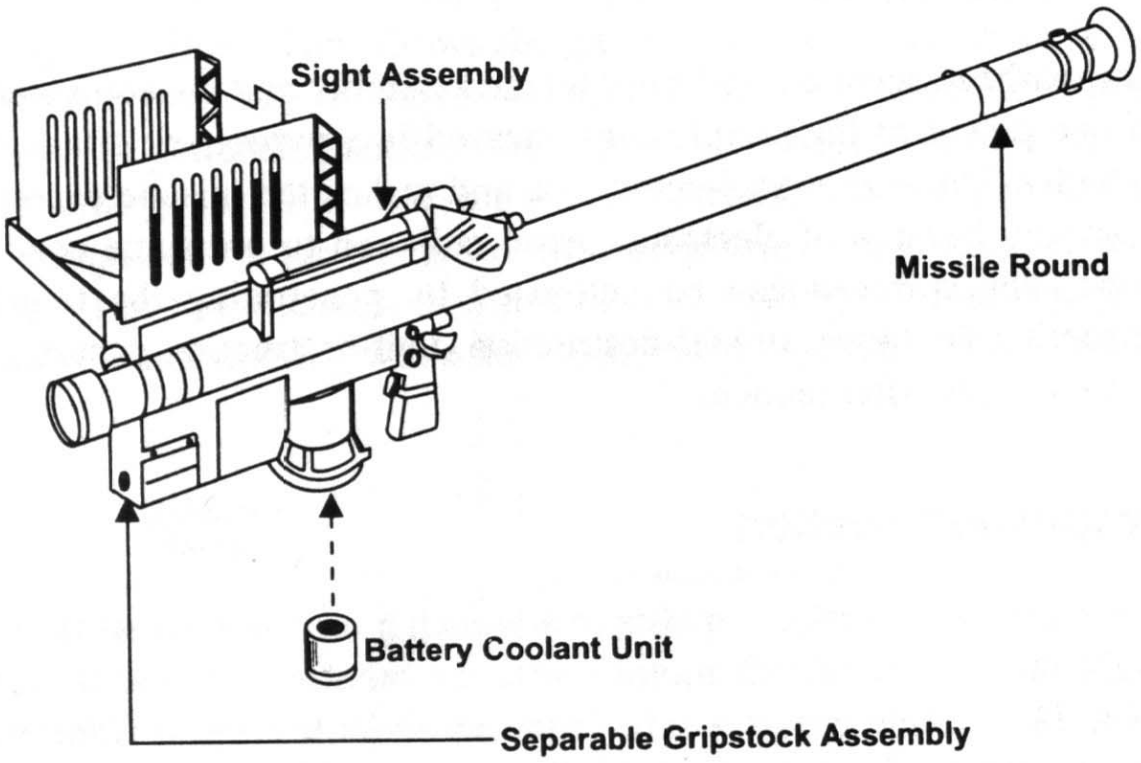

Figure 2-2. Stinger Weapon Round.

Missile Round

The missile round consists of a Stinger missile sealed in a launch tube with an attached sight assembly. The sight assembly allows the gunner to range and track an aircraft. Attached to the sight assembly are two acquisition indicators to aid the gunner in firing of the missile. The first indicator is a speaker that allows the gunner to hear the IR acquisition signal and IFF tones when interrogations are made through the IFF subsystem. The second indicator is a bone transducer that allows the gunner to "feel" the IR acquisition signal on the cheekbone. Also attached to the sight is a clear plastic eye shield that protects the gunner's left eye when the missile is fired.

Separable Gripstock Assembly

The gripstock consists of the gripstock assembly and the IFF antenna assembly. The gripstock assembly contains all of the circuits and components required to prepare and launch the missile as well as the interface for the IFF subsystem. The gripstock is of a clamshell design so that internal components and circuitry

within the gripstock can be serviced by qualified technicians at depot-level maintenance. After the missile is launched, the gripstock is removed from the launch tube for attachment to a missile round.

When the IFF antenna assembly is unfolded and the IFF interrogator is connected to the weapon, the gunner can interrogate aircraft and receive coded replies. The gripstock also houses the auxiliary unit interface, where the reprogrammable microprocessor Read-Only Memory (ROM) module is located. It is accessed through an interface connector cover on the left side of the gripstock. The read-only memory module provides not only additional capability, but built-in economy into the Stinger missile program as a whole. Since the missile is fully digital, the ROM module allows for advanced guidance and tracking technology to be added to the missile without purchasing new missiles. Advanced counter-countermeasure technology can update current missiles in the same manner. The ROM interface allows technicians to access the electronics section and install the updated modules into the missiles. This is not an operator-level function and requires support from the Naval Warfare Systems Center.

Battery Coolant Unit

The BCU contains a thermal battery that provides power for pre-flight system operations and a supply of argon gas to cool the IR detector in the missile seeker. Once activated, the BCU supplies electrical power and seeker coolant until the missile is launched or for a maximum of 45 seconds. The BCU is removed from the gripstock BCU well and discarded immediately after use.

IFF SUBSYSTEM

The IFF subsystem allows the gunner to electronically interrogate an aircraft to determine if the aircraft is a friend, possible friend, or unknown. See figure 2-3. The IFF subsystem notifies the gunner of the results of an interrogation using a sequence of audible tones. Once the gunner issues an IFF challenge, the remainder of the sequence is automatic. The IFF subsystem does not identify hostile aircraft or prevent Stinger from firing at friendly aircraft.

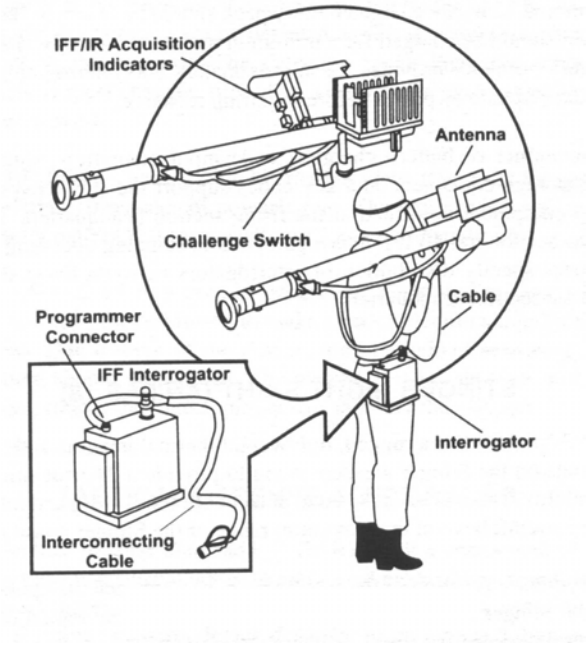

Figure 2-3. IFF Subsystem.

The IFF subsystem is coded in either a complex, cryptographic secure form (Mode IV) or a simpler form (Mode III). All United States combat aircraft are equipped with transponders to provide Mode III and Mode IV replies; however, some aircraft, including commercial and allied nation aircraft, can only provide Mode III replies. Since Mode IV is secure, a friendly Mode IV reply is considered a "true friend" reply. A Mode III reply is considered a "possible friend" reply.

A Stinger's IFF response or lack of response does not constitute authority to fire on a target. IFF responses merely assist gunners in determining the true nature of a target. Weapons Control Statuses, identification criteria, and ROE for the operation provide the guidelines for identification and engagement of targets.

STINGER NIGHT SIGHT (AN/PAS 18)

The AN/PAS-18 is a rugged, lightweight thermal imaging sight that mounts on the Stinger weapon round to provide a 24-hour mission capability. The unit is designed to detect both fixed-wing and rotary-wing aircraft beyond the maximum range of the Stinger missile.

The primary function of the AN/PAS-18 is to enhance the operation of the Stinger missile system. It operates in the same region of the electromagnetic spectrum as the Stinger missile and detects any infrared source the missile can detect. This capability also allows a secondary function of night area surveillance.

Operating passively in the infrared spectrum, the AN/PAS-18 allows the gunner to perform target acquisition and weapon firing during total darkness and under reduced visibility conditions (e.g., fog, dust, and smoke). In a clear sky environment, day or night, the AN/PAS-18 can detect fixed-wing aircraft at high altitude in a tail aspect to the horizon. In optimal conditions, detection can be in excess of 20 to 30 kilometers. The AN/PAS-18 is least effective in detecting fixed-wing aircraft at low altitude coming directly toward the operator. As the exhaust plume is hidden by the body of the aircraft, the aircraft may not be detected until it is within 8 to 10 kilometers of the operator. The detection range increases when an aircraft's aspect changes, providing a view of the plume (side aspect to rear aspect).

The AN/PAS 18 is ready for operation within 10 seconds of powering up. The receiver can be powered by a lithium battery that provides 6 to 12 hours of battery life, or plugged directly into the HMMWV Slave receptacle.

The AN/PAS-18 is a second generation night vision device and does not have the resolution to make aircraft identification determinations. Due to bulk of the device, long periods of searching and scanning should be avoided. The weight of the night sight and the missile reduces the time a gunner can shoulder the weapon.

TACTICAL DEFENSE ALERT RADAR

The Tactical Defense Alert Radar (TDAR) is not a component of the Stinger weapon system but is an associated piece of equipment used to detect targets. The TDAR is a lightweight, early warning detection device designed to be a rugged, transportable radar system that provides LAAD units with an organic cueing, alerting, and early warning capability. The TDAR is designed to provide a surveillance capability to the unit when early warning and cueing is not available from more capable sensors such as the long- range air surveillance radars of the Tactical Air Operations Center (TAOC).

The tactical defense alert radar consists of an antenna array, rotating pedestal, quadripod, transceiver unit, and display terminal. See figure 2-4 on page 2-8. The display terminal can be remoted over 100 meters from the radar transceiver. While the TDAR is transportable in the HMMWV, it cannot be operated from the back of a moving HMMWV. The TDAR can be powered by the HMMWV portable generator, commercial power, or 24-volt, direct current power supply.

The TDAR provides LAAD units with a 20 kilometer detection capability against fixed-wing aircraft and an 8 to 10 kilometer detection capability against rotary- wing aircraft and unmanned aerial vehicles. The

TDAR's maximum detection altitude is 10,000 feet. Although the TDAR may be employed from the firing battery to the firing section level, it is ideal for use at the section level due to its relatively short range.

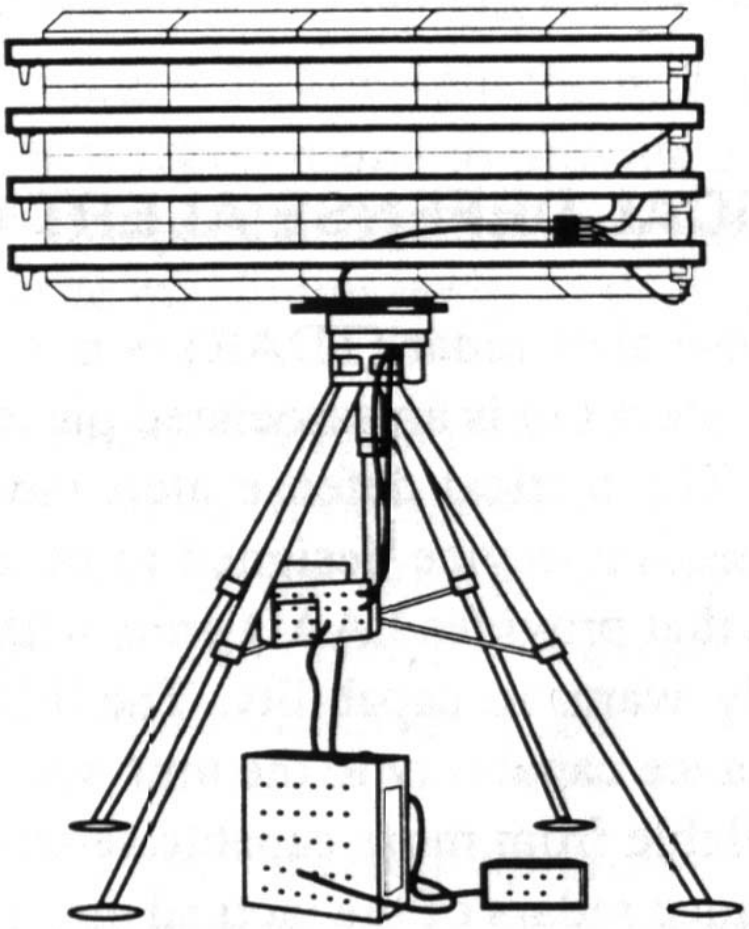

Figure 2-4. Tactical Defense Alert Radar.

REMOTE TERMINAL UNIT

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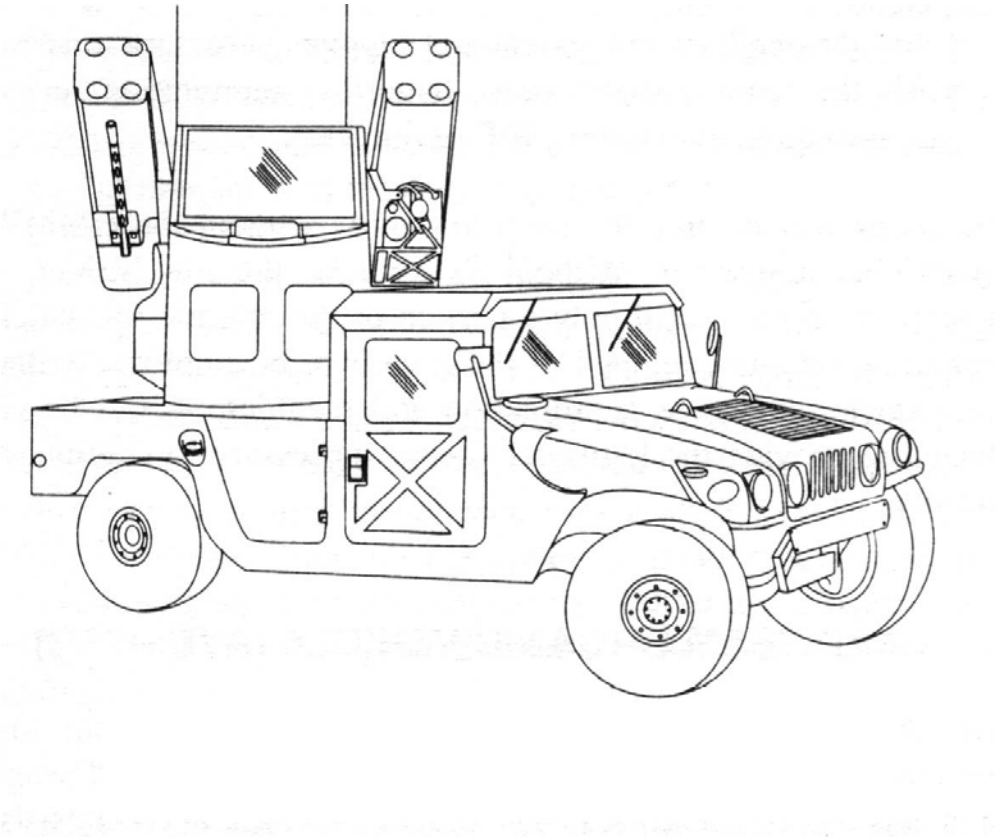

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CHAPTER 3
PLANNING

The MAGTF provides protection against aircraft and missile attack through the development of an Integrated Air Defense System (IADS). Key to this tenet is the detailed yet flexible planning necessary to ensure the IADS provide defense in depth. Weapons are employed to be mutually supporting. Command functions are centralized, while control of assets is decentralized to the lowest practical level. LAAD units significantly contribute to the planning and execution of IAD operations. FMFM 5-70, MAGTF Aviation Planning, discusses planning requirements for the ACE. Marine Corps Order (MCO) 3501.9B, Marine Corps Combat Readiness Evaluation System (MCCRES), Volume VIII, outlines specific planning requirements for the LAAD battalion. Although the planning activities for LAAD, as outlined below, are sequential, many are conducted simultaneously.

INITIAL PLANNING

After receiving an initiating directive from the MAGTF commander (in situations involving amphibious operations) or after receiving an operation plan's initiating order, LAAD planners begin the initial planning phase. Considerations for this phase include-

- Analyzing the assigned mission, to include the ACE and MAGTF missions, commanders' intent, and concept of operations to derive specified and implied tasks.
- Requesting the MAGTF or supported unit commander's guidance concerning vital areas to be defended and assisting in the identification of defended assets.
- Determining the mission, concept of operations, scheme of maneuver, and disposition of defended assets or supported units.
- Conducting liaison and initiating coordination efforts with the amphibious task force to determine LAAD requirements for Emergency Air Defense of the Amphibious Task Force (EDATF).
- Developing the aviation estimates of supportability. LAAD unit input should summarize significant aspects of the situation as they might influence any course of action proposals and should evaluate how LAAD units can best be employed to support the contemplated courses of action. Prepared for the ACE commander by the TACC future plans section, the aviation estimates of supportability provide an end product that includes a recommended course of action for the MAGTF commander. At a minimum, the aviation estimates of supportability will include—
  - The contemplated course(s) of action that can best be supported by the ACE.
  - Salient disadvantages of less desirable courses of action.
  - Significant aviation (to include command and control) limitations and problems of an operational or logistic nature.

INTELLIGENCE PLANNING

LAAD intelligence planning focuses on the enemy's air order of battle and capabilities. Intelligence planning considerations will include—

- Examining the enemy's capabilities with respect to MAGTF capabilities, limitations, and intentions. Efforts should address air, ground, and electronic orders of battle; reconnaissance capabilities; and terrorist or unconventional warfare capabilities.
- Developing information requirements in the form of simple, concise requests.

- Examining threat capabilities, limitations, weapons, tactics, and doctrine and accounting for these factors when developing the battalion's concept of operations.
- Conducting a well-planned intelligence preparation of the battlespace.

COMMUNICATIONS PLANNING

LAAD units require extensive communications for air defense coordination within the MACCS. Information on LAAD voice communications is presented in appendix A. Planning considerations for communications connectivity include—

- Developing necessary communications connectivity for deployed LAAD units. This includes single-channel radio and GBDL connectivity with supported units and adjacent MACCS agencies.
- Identifying cryptographic hardware and software necessary for secure communications.
- Identifying alternative paths of communication available for use should the primary means be unavailable or unusable.

AIR DEFENSE SPECIFIC PLANNING

Surveillance capabilities of radar-equipped agencies within the MAGTF, amphibious task force, and joint force that can provide early warning and cueing to LAAD units must be considered.

Positions must be determined for LAAD battery commanders, platoon commanders, and section leaders. These positions should enhance control of subordinate units; allow for coordination with adjacent MACCS agencies and supported units; and facilitate critical information flow within the IADS.

Lame duck procedures must be established for friendly aircraft when their communications, navigation, and IFF capabilities are degraded or inoperable because of battle damage or equipment malfunction. These procedures allow friendly aircraft to safely ingress through a MAGTF-controlled airspace.

Lame duck procedures must be well-planned (detailed but simple), well-briefed, and disseminated to all friendly aircrews and operators within the IADS and the MACCS. Procedures must allow for different situations as an aircraft with considerable battle damage may be unable to reach numerous control points at specific altitudes and air speeds. Aircrews must understand that failure to adhere to lame duck procedures may result in engagement by friendly air defense systems.

The impact of airspace control measures, air defense measures, and air defense procedures on LAAD operations must be evaluated.

The most effective grid reference system and reporting procedures for manual cross tell must be determined. Manual cross tell procedures are outlined in appendix B.

Combat service support procedures that support the LAAD units' concepts of employment and operations to include missile resupply, maintenance, and replacement of combat essential supply items must be developed.

The air defense appendix to the operations order (based on an analysis of the enemy air order of battle and own systems' capabilities and limitations) must be developed. Emphasis should be placed on—

- Centralized or decentralized operations procedures.
- Autonomous operations procedures.
- ROE.
- Air Defense Warning conditions (ADWC).
- Air defense states of alert.
- Air defense weapons control statuses.

- Air defense identification procedures.
- Lame duck procedures.
- Air command and control casualty plans or procedures.
- Weapons engagement zone configuration.
- Methods of coordination or deconfliction.
- Return to force procedures.
- Emissions control measures.
- Track telling or cross tell procedures.
- Data link configuration, connectivity, and priority.
- Communications prioritization.
- Control procedures.
- Agency casualty plans.
- Engagement authority.
- Identification authority.

WEAPONS EMPLOYMENT PLANNING

Commanders determine the best use for the MAGTF's limited organic air defense resources. Air defense of the MAGTF should achieve a balance between defensive effectiveness and economy of force. LAAD weapon employment planning is a command responsibility.

Developing the Defended Asset List

A MAGTF commander facing an air threat must plan for the employment of the air defense assets. The MAGTF commander evaluates the mission, the unit's assets, and the available air defense assets when establishing the MAGTF DAL. When employed in a Coalition/Joint environment the MAGTF DAL is submitted to the CJFC. This determination is based on criticality, vulnerability, recuperability, and the threat.

Criticality is the degree to which the asset is essential to mission accomplishment. To determine criticality, the commander prioritizes unit assets by considering which of them, if damaged or destroyed—

- Are capable of preventing the execution of the unit's mission.
- Will cause immediate and serious interference with execution of the unit's mission.
- Can ultimately cause serious interference with the execution of the unit's mission.
- Could cause limited interference with the execution of the unit's mission.

Vulnerability is the characteristics of a system that cause it to suffer a definite degradation (incapability to perform the designated mission) as a result of having been subjected to a certain level of effects in an unnatural (manmade) hostile environment. It is the degree to which an asset can survive on the battlefield. Consideration should be given to the asset's survivability after attack, its specific role in the overall operation, the degree to which the asset can disperse or displace to another position, the degree to which it can provide its own air defense, and the amount of protection afforded by passive air defense measures (cover, camouflage, concealment, dispersion, deception, and protective construction).

Recuperability is the degree to which the asset can be recovered from inflicted damage. Recuperability is measured in terms of time, equipment, and available manpower.

Threat characteristics are used to determine which weapon(s) provide the most economical air defense of the asset. Targeting information provided by intelligence estimates, historical enemy attack methods, enemy location and strength, type of enemy aircraft and ordnance, and enemy doctrine are all useful in determining which assets require active air defense protection.

Developing the Air Defense Plan

Once the supported commander prioritizes assets from an air defense standpoint, the supported commander and the supporting LAAD unit commander begin developing the air defense plan. It should address command and control warfare strategies, detailed weapons control and engagement procedures, guidance for employment of weapon systems, delineation of responsibilities, and interface relationships for exchanging air defense information.

The employment principles of weapons mass, weapons mix, mobility, and integration provide the basis for air defense planning and for the employment of air defense weapons. The MAGTF's success in attaining and maintaining air superiority is determined by how these principles are applied.

Weapons Mass

Weapons mass is the concentration of air defense combat power. The purpose of mass is to establish a favorable ratio of air defense units against threat attack aircraft. GBAD units employed in mass can place an effective, all direction volume of fire on attacking aircraft. If GBAD units are not employed in mass, threat aircraft can destroy no only the defended asset but also the defending GBAD units.

Weapons Mix

Weapons mix is the balance between different GBAD units and/or GBAD units and air defense aircraft. Establishing a mix of air defense assets will offset the limitations of one system with the capabilities of another. Employing the mix principle forces the enemy to use tactics against an array of systems rather than just against a single system. With the divestiture of HAWK, it is increasingly important for LAAD units to mix with Joint and/or Coalition GBAD units within the area of operation. This will provide the maximum desired effect of available air defense assets. Mixing air defense weapon systems goes in hand with massing. If threat planners fail to plan tactics and force structure against a massed and mixed defense, the price of entry into the battle area will be high. Defending an defended asset with the proper mix if GBAD assets complicates the enemy’s strategy. An effective mix of GBAD units and/or GBAD units and air defense aircraft forces enemy planners and pilots to defend themselves against several types of air defense weapons to accomplish their mission. .

Mobility

GBAD units are required to be highly mobile. Principle of mass and mix can only be maximized through the effective use of mobility. Properly controlled movement ensures continuous coverage of the defended assets and reduces the enemy’s capability to gain precise targeting information on defending GBAD unit locations, thereby improving unit effectiveness and survivability.

Integration

Is vital to all operations in the air-land-battle. It occurs between air defense units as well as with the supported unit’s ground scheme of maneuver. Integration requires effective C2 links capable of sustained operations in high-intensity NBC and EW environments. An air defense system that is not effectively integrating and maximizing each component’s capabilities will be subject to destruction.

Developing the LAAD Employment Plan

When positioning individual fire units to defend a specific asset or area, the LAAD unit commander considers six air defense employment guidelines in conjunction with the air defense employment principles. These guidelines assist the LAAD planner to maximize the effectiveness of the missile, to maximize the use of terrain, to ensure responsiveness to the MAGTF commander's defended assets , and to increase the survivability of the firing teams. The guidelines are balanced fires, weighted coverage, overlapping fires, mutual support, early engagement, and defense in depth.

Balanced Fires

Balanced fires are achieved by positioning air defense units to permit approximately equal defensive fires in all directions. Balanced fires take on added importance when facing a 360o threat (figure 3-1).

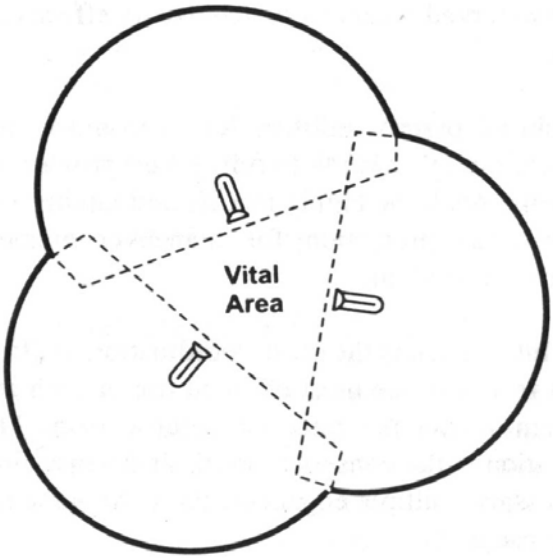


Figure 3-1. LAAD Balanced Fires.

Weighted Coverage

Weighted coverage is achieved by concentrating air defense weapons toward known enemy locations, unprotected unit boundaries, or likely enemy attack corridors (figure 3-2).

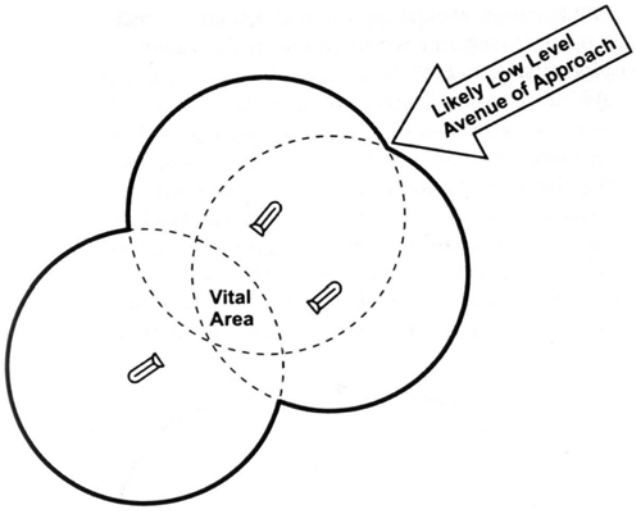


Figure 3-2. LAAD Weighted Coverage.

Overlapping Fires

Air Defense units are normally positioned so that the engagement zone of one unit overlaps the engagement zones of adjacent unit. This positioning reduces the likelihood that an aircraft can slip through the defense without being engaged by at least one air defense unit. (fig. 3-3).

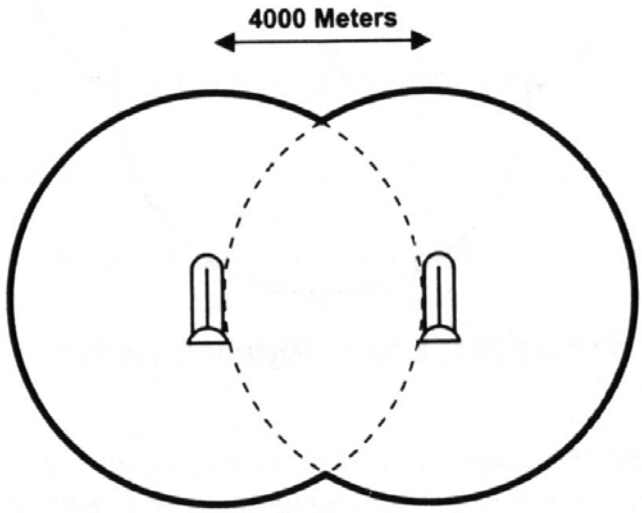


Figure 3-3. LAAD Overlapping Fires.

Mutual Support

Results from positioning individual assets so they deliver fires into dead zones that surround adjacent assets. The required distance between air defense units and assets to achieve mutual support varies depending on the type of air defense weapon as well as the speed and altitude of the threat (fig. 3-4).

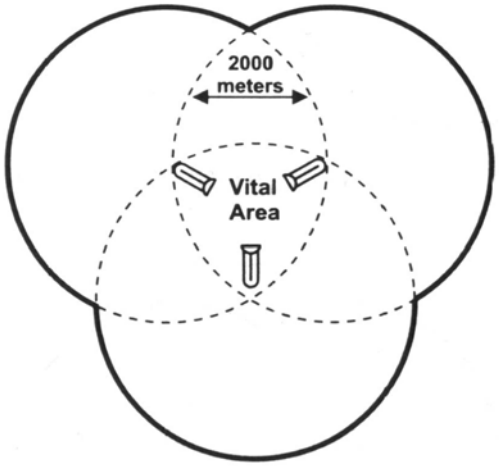


Figure 3-4. LAAD Mutual Support.

Early Engagement

Air defense units should be positioned far enough out from the asset or unit being defended to permit the engagement of enemy aircraft before ordnance release. The enemy's ordnance release line (ORL) will vary with the type of aircraft and ordnance employed. For planning purposes, 1,500 meters is the minimum ORL figure to use for low altitude pop-up attacks. In some cases, ordnance may be released in excess of 20,000 meters from the target. When developing air defense plans, actual threat tactics, flight profiles, and ordnance capabilities should be considered (fig. 3-5).

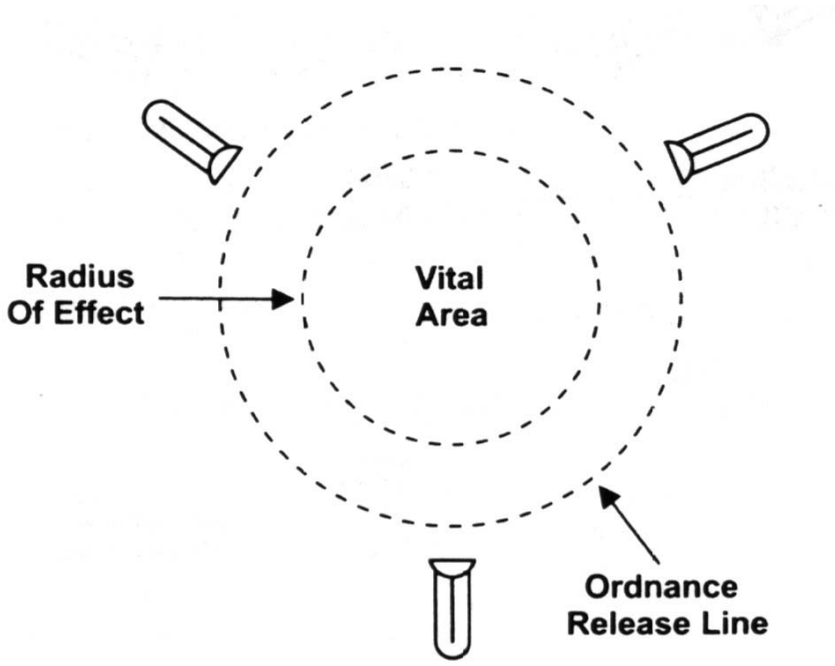


Figure 3-5. LAAD Early Engagement.

Defense in Depth

Defense in depth is achieved by positioning air defense assets so that enemy aircraft encounter an ever-increasing volume of fire as they approach a specific defended asset or area. Integrating all air defense weapons used in the defense maximizes defense in depth (figure 3-6).

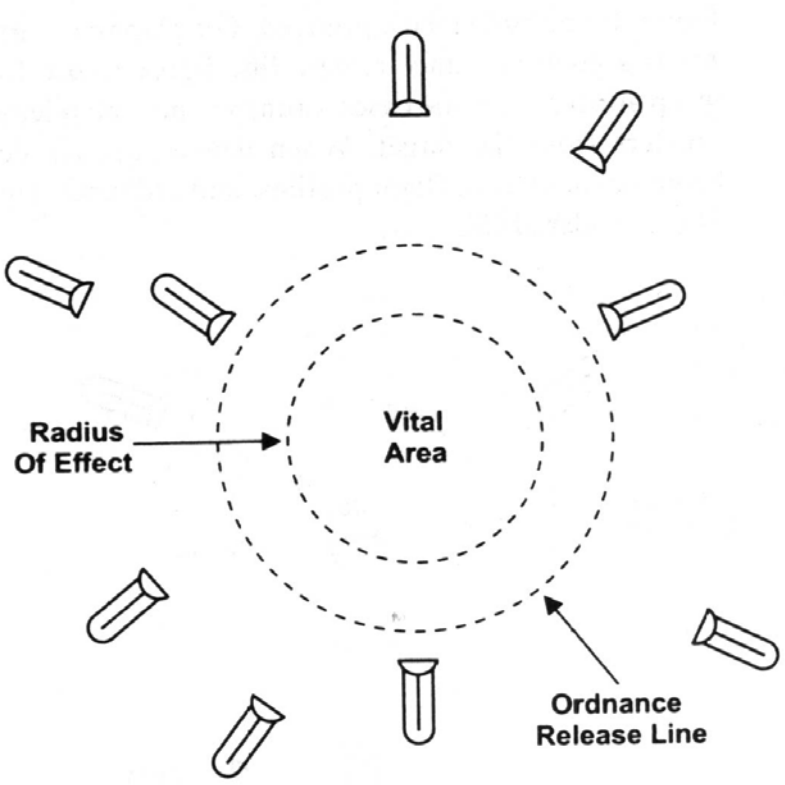


Figure 3-6. LAAD Defense in Depth.

LAAD teams may not be available in sufficient numbers to defend all the supported unit commander's assets. The LAAD unit commander should advise the supported unit commander of any deficiency and make recommendations on how best to employ the available teams. Balancing the desires of the supported unit against the air defense assets available is a challenge faced by LAAD commanders at all levels. As such, following all of the air defense employment guidelines is seldom possible.

To determine the proper mix of these guidelines for any tactical situation, the LAAD commander should consider the—

- Supported unit's mission and scheme of maneuver or defense plan.
- Supported unit commander's defended assets.
- Number of LAAD teams available.
- Terrain (topography and availability).
- Nature of the threat, to include air delivery methods and tactics.
- Priority of targets by aircraft type.
- Capabilities of other ACE or MACCS agencies to support the MAGTF's air defense requirements.
- Command and control criteria.
- Location and coverage of other (including adjacent) air defense units or assets.
- Logistical support requirements.

Selecting LAAD Team Firing Positions

Mission accomplishment is the prime consideration in site selection. Cover, concealment, and camouflage should also be considered when a choice of sites is available. Particular attention should be given to unobstructed fields of fire, masking clearance, and back blast area. Terrain features that present a masking

problem for employment of Stinger or line of sight communications should be avoided. Primary and alternate firing positions should be selected.

The team leader selects the best firing position within the area selected by the section leader or platoon commander. This site becomes the team's primary position. Although terrain evaluation and orientation precedes the selection of a position, it is a continuous process.

After an engagement in a forward area, the team may have to move quickly to an alternate position. Alternate positions should not be located far from the primary position. Alternate positions should cover the same sector of fire as the primary position.

If time permits, routes into and out of primary and alternate positions should be reconnoitered and selected. Routes should afford cover between positions. When choosing available positions, the advantages and disadvantages of each must be weighed. When compromises are necessary, mission performance at the position is the determining factor.

Observation and Fields of Fire

LAAD teams depend primarily on visual means for detection and recognition of their targets. Optimally, a team's firing position should be selected to provide members with all-around visibility and allow them to fire the Stinger in any direction. The firing position must allow them to fire the Stinger in any direction. The firing position must also allow coverage of the team’s assigned sector to allow earliest detection of low-flying aircraft, permitting engagement at the Stinger’s maximum range. Firing positions should minimize masking effects of vegetation and terrain and maximize cover and concealment for team members and their equipment. The team may have to use separate, but closely linked, positions for observation and firing.

Cover and Concealment

Team positions should also afford LAAD gunners some element of cover from the effects of the enemy's direct and indirect fires, as well as concealment from ground and air observation. These factors should not outweigh the position's primary requirement for having unobstructed observation and fields of fire over the assigned sector of fire.

Accessibility

If time permits, routes into and out of these positions must be reconnoitered and selected. The routes should afford cover between positions. The advantages and disadvantages of each available position must be weighed. The firing position (both primary and alternate) should provide ready access to the vehicle (normally a HMMWV) to allow mobility, survivability, and rapid displacement. The ultimate determining factor is how well the team can perform its mission.

Security from Ground Attack

LAAD teams depend upon the supported unit for defense against ground attack. This generally requires that LAAD teams be positioned within, or very near, the supported unit’s perimeter. Positioning LAAD teams too close to the supported unit can degrade their effectiveness. Stinger's launch signature can compromise the supported unit's location if LAAD teams are positioned to closely. A balance must be made between local security and mission capability.

Communications

Firing positions should offer good line-of-sight communications with the section leader.

Safety Requirements

The LAAD gunner must stand in the open to fire the missile. The selected firing position should be clear of dry brush and other materials that may ignite when the weapon is fired. Back blast and hearing hazards to personnel exist whenever a Stinger is fired.

CHAPTER 4
OPERATIONS

The MAGTF commander uses LAAD assets to provide close-in, short-range air defense to the ground maneuver elements and vital areas. These assets add depth to the MAGTF's IADS through integration with air defense agencies of the MACCS and the amphibious or joint task force.

—Section I—

GENERAL

LAAD Command and Control

Command and control is the exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission (Joint Pub 1-02).

The full potential of any military force cannot be realized without effective command and control. The MAGTF's air defense command and control should provide for the prompt engagement of hostile aircraft and missiles while ensuring the safety of friendly aircraft and unite all of the MAGTF's air defense weapons into a cohesive IADS.

Command and control of LAAD units is especially challenging because units are dispersed throughout the battlespace, rely upon secure voice communications, and need to maintain high mobility to enhance mission effectiveness and unit survivability.

Key requirements for the command and control of widely-dispersed, highly-mobile LAAD units are centralized command (by the ACE commander through the MACCS), decentralized control (down to the firing team leader level), and reliable and effective communications.

Centralized Command

The MAGTF should have a command and control system that allows the ACE commander to direct individual air defense units. This system provides for the economical use of the MAGTF's limited air defense assets.

The MAGTF commander normally establishes the air defense engagement policies, unless already dictated by higher authority. Based on these policies, the ACE commander develops and issues air defense control measures. These measures give the MAGTF's air defense units the criteria to determine whether an aircraft is hostile and establish the degree of control placed on air defense weapons. Air defense control measures are normally the only higher-level control exercised over the firing of LAAD weapons.

Centralized command does not imply that all of the MAGTF's air defense units are actually controlled from a single location. The IADS requires the capability to function under decentralized control to capitalize on the maximum range capabilities of its air defense weapons and to react quickly to a dynamic battlespace.

Decentralized Control

The elapsed time for LAAD engagements from target detection to target flyover is measured in seconds. Enemy pilots often employ high-speed, low-level tactics to penetrate our air defense coverage. When the enemy uses these types of air attack maneuvers, team leaders do not have enough time to request permission to engage from a higher authority. Additionally, because of the possibility for imprecise track correlation, LAAD teams cannot engage specific tracks based solely on radar data. The team must visually identify the aircraft and engage based upon the ROE and identification criteria.

The authority for mission execution should be delegated to the lowest possible level to allow LAAD weapons to engage enemy aircraft before the enemy can inflict damage on friendly forces. For maximum responsiveness, firing control of teams should be decentralized to the firing platoon commander or to the firing teams.

COMMAND POSTS OR COMBAT OPERATIONS CENTER

LAAD commanders direct and control the operations of their units from their command posts. A command post is a unit or subunit's headquarters where the commander and the staff perform their activities. In combat, a unit or subunit's headquarters is often divided into echelons: tactical, main, and rear. The echelon in which the unit or subunit commander is located is called the command post (Joint Pub 1-02). Command posts are established by LAAD commanders from the section through the battalion level.

A combat operations center (COC) is the primary operational agency required to control the tactical operations of a command that employs ground and aviation combat, combat support, and combat service support elements or portions thereof. The COC continually monitors, records, and supervises operations in the name of the commander and includes the necessary personnel and communications to do the same (Fleet Marine Force Reference Publication [FMFRP] 0-14, Marine Corps Supplement to the DOD Dictionary of Military and Associated Terms).

The COC is normally located at the main echelon. When the commander is physically located at the main echelon, it is called the command post. Necessary staff personnel (normally the S-2 and S-3 officers in the case of a battalion COC) supervise battalion operations, obtain and relay intelligence and combat information, and make recommendations to the commander from the COC. The internal arrangement, operation, and displacement of the COC should be prescribed in the unit's standing operating procedures. For the staff to function properly, communications from the COC to subordinate units, adjacent MACCS agencies, and higher headquarters should be established and maintained.

LAAD units often choose to collocate their COC with other agencies of the MACCS to enhance weapons cueing and situational awareness. Regardless of the location, LAAD unit COCs must have the connectivity required to command and control subordinate units.

The LAAD battalion may also operate a battalion rear echelon. When the commander is physically located at the rear echelon, it becomes the command post. A battalion rear echelon is established to coordinate administrative and logistical matters. The S-1 and S-4 officers usually coordinate the establishment, operations, and movement of the battalion rear echelon.

The battalion commander may form a command group to operate away (normally forward at the tactical echelon) from the main echelon or COC. A command group is a small party that accompanies the commander when he departs the command post (main echelon) to be present at a critical action. The party is organized and equipped to suit the commander and normally provides local security and other personal assistance for the commander as he requires. (FM 101-5-1/MCRP 5-2A, Operational Terms and Graphics).

The command group has no fixed organization. Personnel and equipment comprising it are selected by the commander for a particular situation. In addition to the commander, the command group may consist of the

S-2 officer, S-3 officer (for a battalion command group), and communications personnel. Regardless of its composition and location, the command group must have the communications means to control operations, maintain communications with the COC, and communicate with higher headquarters.

For a battalion, the S-1 officer, in conjunction with the communications officer and headquarters commandant (who is normally the commanding officer of headquarters and service battery), selects the exact site for the command post or combat operations center and prescribes the general interior arrangement. The headquarters commandant provides the working parties to erect the command post or combat operations center and is responsible for local security of the facility.

A unit's main echelon should be organized for sustained 24-hour operations. The best way to prepare for continuous operations is to train that way. Commanders and primary staff officers must integrate their assistants into command post operations during high tempo training exercises and not only during periods of relatively low activity.

When establishing command posts or COCs, the commander must consider the following:

- The message center, if established, should be located in a secure location near an accessible entrance to the COC to ensure the physical security of sensitive material and to expedite the arrival and departure of messengers.
- Vehicles located near the command post or COC should be kept to a minimum. Dispersion, concealment, and camouflage measures must be taken to prevent their detection. Consider establishing a dismount point outside of the command post or COC compound to reduce the number of vehicles within the compound.
- Siting of radio sets may influence the location and internal arrangement of the command post or COC. Using radio remote control equipment decreases the risk of detection by the enemy.
- The switchboard is located where it is free from noise and interference.
- The area selected for command post or COC status boards should be fairly level and open so that the status boards can be easily seen and are readily accessible.

CONCEPT OF EMPLOYMENT

Marine Expeditionary Force

One or more LAAD battalions are typically employed to support Marine expeditionary force (MEF) operations. The lead echelon of a MEF normally deploys with one LAAD battery in support. The senior LAAD element normally establishes its COC at or near the Sector Air Defense Facility (SADF), the Sector Air Defense Commander's (SADC) operational facility.

Marine Expeditionary Unit

Other than small arms and machine guns, the (MEU) normally does not have an organic air defense capability except for its LAAD assets. A LAAD platoon (three sections) normally supports a MEU; however, due to high operational tempo, limited Stinger gunners, and limited amphibious shipping, one section (five teams) often deploys with the MEU. If a MACG detachment is not employed with the MEU, the ACE commander may give the senior LAAD representative the authority to coordinate air defense operations directly with the commander amphibious task force's (CATF's) air warfare commander.

Since control of aviation assets is not normally phased ashore during MEU operations, the CATF's air warfare commander establishes air defense control measures for the MEU. A LAAD representative may be located within the amphibious task force's supporting arms coordination center or combat information center to receive this information and pass it to LAAD personnel ashore.

When the MEU is sent ashore, it is supported from the Expeditionary Strike Group ships. The MEU depends greatly on shipboard facilities for communications and maintenance. Only those elements, supplies, and equipment needed for the operation are deployed ashore. The early establishment of forward operating bases ashore for helicopters and short takeoff and vertical landing aircraft is often critical to the rapid execution of MEU operations. If forward operating bases are planned, their air defense requirements should be included in the MEU' LAAD allocation planning.

Special Purpose MAGTF

A special purpose MAGTF is a nonstanding MAGTF temporarily formed to conduct a specific mission for which a standing MAGTF is either inappropriate or unavailable. Special purpose MAGTFs are organized, trained, and equipped to conduct a wide variety of missions. LAAD unit participation is situationally dependent.

INTERAGENCY RELATIONSHIPS

LAAD units must be able to effectively interact with other agencies of the MACCS in order to contribute to the IADS. Specifically, interagency relationships are normally formed with the SADC, TAOC, direct air support center (DASC), Marine air traffic control (MATC) detachment, and the Tactical Air Command Center (TACC).

LAAD AND SADC OR TAOC

The LAAD battalion's COC is normally collocated with the SADF typically located with the TAOC. LAAD assets provide the TAOC with low altitude air surveillance information, through visual sightings, TDAR detected targets, and engagement reports. The SADC coordinates with the LAAD battalion for air defense planning within the SADC sector. The SADC also provides the LAAD battalion's COC with direction regarding air defense warning conditions and weapons release conditions. The TAOC provides LAAD units with early warning and cueing for engagement of air tracks.

The GBAD Representative (also know as the Surface-to-Air Weapons (SAW) Representative) in the SADF normally serves as the primary conduit for information exchange between the SADC and the LAAD battalion's COC. When U.S. Army Patriot units are supporting MAGTF operations the Air Defense Artillery Firing Control Officer (ADAFCO) will serve as the conduit between the SADC and the Patriot unit. A LAAD representative may also be included as part of the TAOC crew to facilitate information exchange between LAAD units and the TAOC.

LAAD and DASC

LAAD units provide the DASC with information on aircraft sightings and engagements that may affect air support operations. In turn, the DASC keeps LAAD units informed of friendly aircraft that are operating in the vicinity.

During amphibious operations, the LAAD combat operations center may initially be established at the DASC site. Following establishment of TAOC, the LAAD COC normally collocates with the SADF. However, a LAAD representative may remain at the DASC to assist in information exchange between the two entities.

LAAD and MATCD

LAAD units may operate in support of a Base Defense Zone (BDZ) established around a Forward Operating Base (FOB). The LAAD unit commander coordinates fires within the BDZ with MATCD personnel. MATC

personnel provide early warning information and friendly aircraft location information to LAAD units operating in the BDZ. See appendix C for more information on BDZ operations.

LAAD and TACC

The TACC is the agency ultimately responsible for air defense of the MAGTF's area of operations. It also serves as the ACE commander's command post. LAAD units provide the TACC with engagement information forwarded through the air defense chain of command, and provide subject matter experts to assist in developing of air defense courses of action for future operations. The TACC is the approval authority for changes to air defense alert conditions and weapons release conditions within the MAGTF's area of operations, and provides guidance on current ROE that cannot be clarified at lower levels.

AIR DEFENSE CONTROL MEASURES

Air defense control measures aid the ACE commander in designing an air defense system that protects the friendly force and its aircraft while enabling air defense units to identify and engage hostile aircraft at the maximum ranges of their weapons envelopes. These measures are established by the MAGTF commander based on recommendations from the ACE commander.

Air defense control measures include ROE, identification criteria, air defense warning conditions, weapons control statuses, airspace control measures, and states of alert. A description of LAAD states of alert is presented in appendix D.

METHODS OF TARGET ENGAGEMENT

The method of target engagement a LAAD team uses is determined by the number of enemy aircraft in a particular air attack. A multiple target air attack is an attack by two or more aircraft flying the same course, at the same speed, less than 1,000 meters apart. All other attacks are single target air attacks.

Single Target Air Attack

All single target air attacks are engaged using a SHOOT- LOOK- SHOOT method. The first missile is fired (SHOOT) as soon as the requirements for an engagement are met. Next, the missile's success is evaluated (LOOK). If the first missile does not hit the target or does not achieve guided flight, a second missile is fired (SHOOT). After firing the first missile, the gunner immediately readies another weapon, regains visual track, and acquires the IR tone of the target. The gunner does not watch the missile's flight . The team leader observes the flight of the missile's flight, makes the kill evaluation, and if time permits, directs the gunner to launch another missile. Under certain circumstances, the team leader may launch a missile himself.

Multiple Target Air Attacks

Multiple target air attacks are engaged using the SHOOT-NEW TARGET-SHOOT method. As many missiles as possible are launched at successive aircraft in the raid. When practical, fire coordination within a team will be on voice command of the team leader. When faced with multiple targets of equal threat, both team members will engage targets. The team leader should direct the gunner to fire at the lead (or right) hostile target in the sector of fire. The team leader engages the trailing (or left) hostile target. When deployed in an Avenger, the team leader will direct the gunner to engage subsequent targets.

LAAD UNIT AIR SURVEILLANCE CAPABILITIES

LAAD units can be deployed in support of every MAGTF element from the forward maneuver elements to the vital support bases in the rear. Trained in aircraft recognition and airspace surveillance techniques, LAAD units can provide the MAGTF with aircraft detection and identification information. LAAD units can supplement other air defense agencies, particularly those with ground-based radar systems, with low altitude visual and electronic surveillance capabilities. LAAD unit surveillance information can be quickly disseminated to MAGTF units through the MACCS. A risk assessment must be done when operating in a high threat environment to determine individual team surveillance sectors. Teams can be given a 360^0 sector, but commanders should realize that the larger the sector, the more likely the LAAD team will fail to see a target. A common threat sector in a high threat environment is no more than 45^0 to either side of the team's primary threat axis. Supported units can contribute additional personnel for air watches to enhance air surveillance.

LAAD unit visual surveillance and tactical defense alert radar information, coupled with radar information available from non-organic radar, contribute to the air picture formation. LAAD units in direct support of forward maneuver units may provide the earliest visual detection of approaching aircraft; however, as they are moving with the supported units, they are not able to provide continuous air surveillance. Conversely, LAAD units in general support of the MAGTF can be positioned in radar blind spots to provide a detection and identification capability. Used effectively, LAAD units can provide a formidable low altitude surveillance network for the MAGTF.

Employment of the TDAR requires additional operational and logistical considerations that must be weighed against the specific requirements of each mission. The advantage that early warning from a TDAR provides (in the absence of any other cueing) can increase operational effectiveness of the LAAD unit. On the other hand, TDAR employment carries additional power, fuel, personnel, and transportation requirements.

The ACE commander must weigh the benefits of surveillance by these units to the firepower tradeoffs that may occur. If the air threat is significant enough, the cost of increased surveillance may be prohibitive, and the commander may opt to mass LAAD assets along likely avenues of approach near the defended assets at the expense of overall situational awareness.

LAAD UNIT ALERTING AND CUEING

Due to the Stinger system's reaction time and its limited weapon firing envelope, LAAD units need the earliest possible notice (alerting) of air threats in their area. Providing LAAD units with specific threat location information (cueing) allows them to engage enemy aircraft as soon as the aircraft become visible in the LAAD units' areas. LAAD unit leaders extract threat information from all available sources as rapidly as possible and disseminate the information over all available nets to optimize weapons employment. Proper employment of the TDAR can significantly enhance the ability of section leaders to provide their teams with organic alerting and cueing information. This relieves the teams from total dependence on other MACCS agencies and visual air search. The TDAR is especially useful during independent operations when no other MACCS radars are available. The supported unit commander and the LAAD commander should weigh the practicality of TDAR employment and the potential for compromise of the radiation footprint against the benefits of alerting and cueing.

MANUAL CROSS TELL

Manual cross tell allows cueing information to be passed as non-real-time tracks among agencies that may or may not have the capability to participate in an active digital information link system. For agencies such as the TACC, TAOC, MATC, and GBAD units who are data link participants, manual cross tell offers a backup track sharing method when the data link is degraded or inactive. Manual cross tell procedures are not

solely designed as backup to data links. They are designed to maximize the sharing of time-critical information within the IADS.

Cueing information is crucial for LAAD unit engagements. Manual cross tell provides the primary method by which cueing information is disseminated to dispersed LAAD units. Because information is passed manually, often over multiple communications nets or through a number of stations, there is a great opportunity for information to be misunderstood or inaccurately transmitted. Increasing the number of stations required to relay information increases the likelihood of error and the time required to pass information. To effect manual cross tell, LAAD units should determine the method and reference system for use and thoroughly brief subordinate units. Commanders should ensure that their subordinates train with these methods on a regular basis to maintain proficiency and accuracy.

The four primary means of passing manual cross tell include: the Cartesian Coordinate Grid System, the Polar Grid System, Polar Coordinate System and the Common Grid Reference System (CGRS).

LAAD FIRING TEAM INTEGRITY

A LAAD team is best employed as a two-man partnership. The team concept is built around specific responsibilities within the team structure. As such, team integrity should not be compromised. Logistical requirements are doubled in the support of two individuals vice one team. Individual gunners cannot maintain the high level of awareness over the extended time periods required for air defense operations. Two-man teams afford individuals moments of mental relaxation between periods of focused concentration.

SPECIFIC LAAD WEAPON APPLICATIONS

LAAD units can be employed in a variety of roles. The most common applications are point defense, surveillance or weapon gap filler, convoy defense, and in defense of a maneuver unit.

Point Defense

Within the area to be defended, certain assets are prioritized for defense against air attack. Commanders may be able to accept limited amounts of damage in some areas and unable to accept any damage in others. In these cases, LAAD units can be assigned to defend a specific vital installation, agency, MAGTF component, or geographical location. This mission is the most common assigned to LAAD units.

Conversely, certain types of air threats may have priority for engagement over others. This is especially true when the MAGTF has limited air defense assets. As an example, the MAGTF commander may choose to allow enemy helicopters and/or UAVs that do not pose a significant threat to go unchallenged for a period of time and save limited air defense resources for higher priority fixed-wing targets that represent a greater threat to MAGTF operations.

Surveillance or Weapon Gap Filler

The surveillance or weapon gap filler mission is similar to point defense but emphasizes coverage within a network of coverage. Key avenues of approach, terrain masking effects, and expected threat density dictate LAAD employment to supplement or reinforce other air defense sensors or weapons. The mission is calculated as part of a MAGTF defense in depth. The limited number of air defense assets available to defend multiple vital areas usually preclude the use of LAAD assets as gap fillers for other weapons systems or as surveillance gap fillers.

Defense of Convoys

Units traveling in convoy are typically exposed and therefore vulnerable to air attack. Combining organic small arms and machine guns with supporting LAAD teams can provide a convoying unit with close-in air defense. Stinger can be employed to defend a convoy by pre-positioning teams along the convoy's route, integrating teams into the convoy column, and using a combination of these methods if enough assets are available.

The method employed is contingent upon the available air defense resources, the anticipated number of enemy aircraft, the location of critical points along the route, and the length of the convoy route.

LAAD teams may be pre-positioned at critical points along the convoy's route if the route is relatively secure from ground attack and time permits the teams to occupy firing positions ahead of the convoy. Critical points are those locations that force the convoy to slow or halt, making the convoy especially vulnerable to enemy air attack. Examples of critical points are bridges, road junctions, and refueling points. Should the TACON commander decide to preposition LAAD assets at critical points, careful planning is needed to ensure that the convoy has adequate air defense protection in the areas between the critical points.

When LAAD teams are integrated into the convoy to provide air defense, their specific positioning depends on the length of the convoy and the number of available teams. It is important to position teams near the front and rear of the convoy and to distribute additional teams an equal distance throughout the rest of the column. Enemy aircraft normally attack convoy columns linearly, either directly from the front or rear of the column. With teams integrated into the convoy this provides overlapping fires, forcing the attacking aircraft to enter the engagement envelope of at least one LAAD team.

When air attack is imminent or in progress, LAAD teams move their vehicles off the road and quickly dismount. Teams assume a firing position from which the aircraft can be seen and the Stinger missile can be safely fired. When possible, teams engage the aircraft on its first pass before it can make an attack run on the convoy. When the column is attacked, the massed fires of all available small arms, machine guns, and Stinger are placed on the attacking aircraft to destroy it, drive it away, or cause its ordnance delivery to be ineffective. After the immediate threat of air attack has subsided, teams remount and pass other vehicles as necessary to resume its assigned position within the convoy.

With Avenger, convoy defense can be conducted on the move or from a static location . With adequate warning, Avenger should be employed from a static position to increase kill probability. The Avenger's slew-to-cue feature enhances the team's ability to rapidly engage targets while providing convoy protection either in the static mode or on the move. These capabilities make Avenger optimally suited for convoy defense operations.

Defense of a Maneuver Unit

LAAD units providing air defense for maneuvering units are generally closer to the forward edge of the battle area (FEBA) than those defending static assets. When LAAD teams are supporting a maneuver unit, there are two methods to use.

Deploy Teams Behind the Maneuver Unit

When teams deploy behind a maneuver unit, they follow the unit by successive bound. Teams should remain approximately 500 meters behind the maneuver unit. Section leaders should maintain close coordination with supported units to avoid having the maneuver unit out run its supporting LAAD protection.

Deploy Teams With the Formation

LAAD teams may be deployed within the maneuver unit's formation. Teams can have their own transportation or be mounted on vehicles organic to the supported unit on a share-a-ride basis. If teams are

mounted and traveling when warning of air attack is received, they should dismount from their vehicle as quickly as possible and immediately occupy the best firing positions available.

SUPPLY AND MAINTENANCE

Standard ammunition resupply procedures are used by LAAD units for both small arms ammunition and Stinger missiles. The LAAD unit requisitions and assumes custody of the missiles designated as its prescribed load at the beginning of the operation. The combat load for each team is situationally dependent. Missile load-out is determined by the LAAD commander after considering the expected threat and planned resupply procedures. Foot mobile team members can be expected to carry no more than one missile. Teams in HMMWVs equipped with a missile ready rack can deploy with up to six missiles.

As missiles are expended, requests for resupply originate from the LAAD teams and are forwarded to the section leaders. Section resupply requests are consolidated at the platoon, battery, or battalion level before being submitted to the combat service support element. The LAAD commander may assign a representative or support element to work with the combat service support element to coordinate resupply efforts.

Several methods can be used to perform missile resupply. The combat service support element can deliver missiles to designated ammunition transfer points that are manned by personnel from the LAAD battalion's headquarters and service battery. H&S battery personnel can deliver missiles to the firing section leaders. Firing teams then pick up their missiles from their section leaders at a mutually acceptable time and location. H&S battery personnel and platoon sergeants may use ground or combat service support assets (such as logistics trains) and/or LAAD battalion assets to resupply missiles to section leaders. Section leaders arrange delivery of missiles to the teams.

The combat service support element, in an emergency, may deliver missiles directly to teams by air or surface means. All LAAD personnel should be aware of the procedures to coordinate emergency resupply. Coordination is made through the DASC for air assets to deliver missiles. The fire support coordination center (FSCC) effects the necessary coordination and communication procedures for emergency resupply.

FIVE-PARAGRAPH ORDER

LAAD unit employment requires detailed coordination and planning. Operation orders, applicable standing operating procedures, and doctrinal publications provide much of the basis for conducting LAAD planning. Appendix E contains a sample five-paragraph order format that can be used by GBAD commanders.

—Section II—

ENVIRONMENTS

AMPHIBIOUS OPERATIONS

The LAAD battalion and its representatives participate in planning for and execution of all phases of an amphibious operation.

Embarkation of LAAD Units

For embarkation planning purposes, a LAAD team consists of a team leader, a gunner/driver, and a HMMWV. Commander must consider implications if he should choose to employ a team without its HMMWV. The team vehicle is an employment option, not a deployment option.

Movement to the Amphibious Objective Area

During the movement of the amphibious task force to the amphibious objective area, the responsibility for antiair warfare rests with the commander, amphibious task force. The CATF controls antiair operations and exercises airspace control through the air warfare commander. Carrier-based Navy and Marine Corps fighter aircraft and air defense-capable ships normally provide air defense for the amphibious task force.

If the amphibious task force is attacked, or intelligence indicates that an air attack is imminent, the CATF and the commander, landing force may agree to employ embarked landing force air defense assets to provide DATF (e.g., air-to-air capable helicopters, AV-8B Harriers, and LAAD units). The commitment of air defense units for DATF operations may result in the potential loss or expenditure of landing force air defense resources before the assault. Whenever feasible, shipboard employment of embarked LAAD units should be planned before embarkation. Preplanning helps to ensure that the commander, amphibious task force, has an adequate number of Stinger systems available for DATF. A LAAD representative should participate in the amphibious assault planning process.

Preassault

After the amphibious task force arrives in the amphibious objective area, the CATF remains responsible for air defense. As the landing force prepares for the assault, any landing force air defense assets supporting the amphibious task force should be replaced by either Navy or joint task force assets to allow landing force air defense assets to be dedicated to the assault.

Depending on the size of the amphibious objective area and the anticipated air threat, the CATF may choose to establish multiple antiair warfare sectors. Each sector will be controlled by a DADC subordinate to the force air warfare commander.

During the Assault

LAAD units usually land in the first waves and early follow-on waves to support the GCE as it pushes ashore. LAAD units will be extremely limited in their ability to provide low altitude air defense for the assault waves because of limited cueing and limited or difficult communications with higher agencies. During this stage, LAAD units will most likely provide a limited point defense capability in direct support of the assault elements. They may also be used to establish point defense of the beachhead until further LAAD and GBAD assets can be brought ashore to establish an IADS.

Passage of Control and Post-Assault Operations

Once the MAGTF's TACC becomes fully operational and all required communications are established with senior and subordinate agencies, the Commander, Landing Force (CLF), will request that control of the amphibious objective area's airspace and aviation assets be passed ashore.

Once control is passed ashore, command of all landing force aviation and air defense assets is exercised by the ACE commander, who is responsible to coordinate the employment of antiair warfare weapons as the situation dictates. Air defense warning conditions and weapons control statuses are normally established by the TACC and are disseminated through the MACCS.

MOUNTAIN OPERATIONS

Mountain operations favor the use of small, lightly equipped maneuver units. The nature of mountainous terrain normally affords these units with good cover and concealment. Other than small arms and machine guns, Stinger may be the only air defense weapon system that can accompany and provide close-in air defense protection for these units. Dismounted LAAD operations are common in mountainous

environments. Helicopters can be used to preposition teams on key terrain features or near likely avenues of approach.

Terrain masking of MACCS radars and the difficulty in establishing line of sight communications may limit early warning and cueing for LAAD teams. To counter this effect, continuous visual observation should be maintained, particularly along likely low-level air attack routes. Remote observation posts within radio range of the LAAD team firing positions may improve the chances for early detection of approaching aircraft.

LAAD units rely on radios for communications. Hills and trees degrade distance and quality of frequency modulated radio transmissions. The use of long wire antennas and relays can ease these problems.

JUNGLE OPERATIONS

Jungle operations present unique challenges to LAAD operations. Movement by vehicle or by foot can be very difficult for small maneuver units within a jungle environment.. When combined with dense vegetation, relatively minor terrain features can become major obstacles for movement within a Jungle. As such, defensive action is considerably aided by natural features.

Dense vegetation offers good concealment for maneuver units. Enemy air attacks will probably be directed against combat service support units, supply lines, and exposed field artillery units; however, maneuver units are vulnerable when they cross open areas such as rice paddies or rivers.

LAAD teams defending convoys are normally positioned within the convoys. Stinger firing positions that offer 360o observation and fields of fire are difficult, if not impossible, to find. Teams defending static assets located in jungle areas may have to clear trees and underbrush to make firing positions. These positions should only be occupied while engaging aircraft and then vacated rapidly. Cleared areas are easily detected and attacked from the air.

Jungle conditions generally reduce detection and identification ranges. This may require teams to be positioned closer together or more teams than usual be assigned to defend a particular asset.

Thick vegetation, high humidity, and rugged, hilly terrain reduce the range of FM radios. Special purpose one-fourth wavelength antennas are optimal for use in the jungle environment. Extensive use of wire communications may also be necessary.

Rust, corrosion, and fungus increase the maintenance effort. Repair parts, ammunition, and other items should be kept in sealed containers until needed. Electronic equipment should be left on, if possible. Heat from equipment helps eliminate the moisture that causes corrosion. Personnel must be well-trained and acclimated to the jungle.

DESERT OPERATIONS

The Stinger missile system is well-suited for desert operations. It can be stored in temperatures up to 160oF and operated in temperatures up to 140oF.

The low, flat terrain found in most desert areas offers advantages to both LAAD gunners and the attacking enemy aircraft. In the absence of masking terrain and obstacles, LAAD gunners are usually able to detect and engage enemy aircraft at greater ranges. Conversely, attacking enemy aircraft can more easily locate and attack their targets in a desert environment, as there are fewer terrain features and less vegetation to mask visual and infrared detection. LAAD gunners should also be aware of weather conditions, as blowing sand can make it almost impossible to visually detect and identify aircraft. In areas where blowing sand is common, airspace control measures and the ROE may have to be modified to enhance aircraft identification and allow LAAD engagements.

Low, flat desert terrain mandates friendly force dispersion to prevent detection and engagement at long ranges. Dispersion aids passive air defense. Careful planning should be conducted to ensure that the dispersion of forces does not create gaps in the air defense coverage.

Locations offering good cover and concealment are difficult to find in the desert. Vehicle tracks leading into firing positions must be erased or covered since they are easily spotted from the air. If the terrain makes adequate concealment difficult, teams should resist unnecessary movement while in position. If the teams are engaging aircraft, they should move between alternate firing positions every 1 or 2 hours if the state of alert allows.

LAAD teams must move rapidly to survive and to keep up with the high-speed tactics of mechanized maneuver units. In some desert areas, the team's HMMWV may not be able to keep up with the supported unit's tracked or wheeled vehicles. Similar vehicles should be provided to carry the LAAD unit's personnel and equipment. Teams require mobility equal to or greater than that of the supported force.

Fast-moving operations and great distances between units are characteristics of desert operations. They require reliance on radio, vice wire, for communications as most units are within radio line-of-sight of each other. Of concern, however, is that lack of moisture and the extreme heat may cause frequency modulation radio ranges to be reduced by as much as 30 percent. Dipole or other directional antennas should be used where possible to increase the range of frequency modulation radios.

Dust and sand can be deadly to equipment. Vehicle cooling and electrical systems are vulnerable to extreme heat. All vehicles should carry extra water for personnel as well as the engine cooling system. Cooling systems should be checked several times a day. The eroding effect of sand on moving metal parts requires more frequent cleaning of individual weapons and equipment air filters. Preventive maintenance on all equipment should be increased in the desert.

COLD WEATHER OPERATIONS

The Stinger weapons system is also well-suited for cold weather operations. It can be stored at temperatures as low as -50oF and operated at temperatures above -40oF.

Operations in cold weather pose significant leadership, operational, and logistical challenges for LAAD units. While LAAD operational necessities remain relatively unchanged, safety and health hazards presented by cold weather operations may necessitate the formation of four-man teams to ensure that sufficient personnel and equipment are on-hand to function effectively. For safety, as well as logistical considerations, two vehicles should be used. Two vehicles provide additional space to carry the larger amounts of personal equipment required to survive in an arctic environment. With four Marines, a LAAD team can establish a personnel rotation that allows two Marines to maintain normal team operations, while the other two Marines rest, warm themselves, and prepare hot fluids and food for the team on watch.

LAAD teams and other personnel in close vicinity to Stinger positions operating in extreme cold (-25oF or below) should hold their breath for about 20 seconds during and after firing the Stinger. At these temperatures, the exhaust from the missile may crystallize into a form of ice fog. If inhaled, toxic fumes may thaw inside the lungs, causing injury or death. Ice fog also obstructs the gunner's vision and compromises team location. This effect makes planning for alternate supplementary firing positions particularly important; additionally, in extreme cold weather, the backblast hazard area for a Stinger missile is approximately three times larger than normal.

Heavy snow and ice causing poor driving conditions may require units to move on foot. Foot mobile LAAD teams are limited to carrying one missile per team member. Other members of the supported unit may be designated to carry additional missiles. Resupply may have to be made by air and/or over snow vehicles.

Missile warm up time is increased in extreme cold weather. Bulky, heavy clothing and gloves also increase the time required to perform the engagement sequence. Extreme and prolonged cold has an adverse effect on

all weapons and equipment; sluggish operations, malfunctions, and broken parts are common. More time should be allowed for preventive maintenance. Extreme cold more than doubles the time it takes to perform simple maintenance tasks. Special attention should be given to batteries. In extreme cold, batteries have decreased power levels and drain more quickly.

URBANIZED TERRAIN OPERATIONS

Ideally, urbanized areas are bypassed and isolated by attacking forces; however, the massive growth of urban centers has made their avoidance in tactical operations difficult. Basic air defense doctrine does not change when units operate on urbanized terrain. The air defense employment principles of weapons mix, weapons mass, mobility, and integration still apply on urbanized terrain.

The defender has distinct advantages in urbanized areas. Superior protection, cover, and concealment are abundant. Attacking and defending enemy forces will likely capitalize on these advantages by locating command posts, supplies, and combat service support units within urbanized areas. The inherent cover and concealment provided to these critical assets enhance the degree of passive air defense protection against air attack and minimize the need for inordinate amounts of active air defenses.

Stinger is the most viable active air defense system for deployment within urbanized areas. It is highly mobile, very effective, and minimally hampered by operations in urbanized terrain. LAAD teams on rooftops and parking garages generally have good line-of-sight observation and fields of fire. Surrounding hillsides may also provide good firing positions.

As supported units move through urbanized areas, some LAAD teams should remain in over watch positions while others move to take up new firing positions on other rooftops. This tactic allows teams to keep up with the supported unit and ensures a continuous watch against enemy aircraft. Small arms and machine guns may also be used to supplement Stinger.

When developing an air defense plan for combat in an urbanized area, commanders should consider that—

- Enemy air targets such as principal lines of communications (e.g., roads, rail networks, and bridges) are often found in and around built-up areas.
- Good firing positions may be difficult to find and occupy for long-range air defense missile systems in the built-up areas.
- Movement between positions is normally restricted in built-up areas.
- Long-range systems can provide air defense cover from positions on or outside of the edge of the city.
- Radar masking and degraded communications reduce air defense warning time for all units. Air defense control measures should be adjusted to permit responsive air defense within this reduced warning environment.
- The positioning of air defense weapons in built-up areas is often limited to more open areas without masking, such as parks, fields, and rail yards.
- LAAD teams provide protection for infantry battalions the same as in any operation. When employed within the built-up area, rooftops normally offer the best firing positions.
- MANPAD assets will likely be employed by the enemy from rooftops. It is important to maintain the security of the rooftops to reduce the enemy MANPAD threat and assist in the maintenance of local air superiority.
- Heavy machine guns emplaced on rooftops can augment the air defense effort.

NIGHT OPERATIONS

While the Stinger system can be employed at night without night vision devices, its effectiveness depends on the gunner's ability to identify, acquire, and range the target. Thermal imaging sights organic to LAAD

units improve the gunner's ability to detect targets at night. However, thermal imaging sights are not always conducive to effect positive identification of targets or, because of a narrow field of view, to conduct adequate surveillance of an assigned sector. Avenger, with its associated FLIR sight, enhances the gunner's ability to detect and acquire targets at night and in adverse weather; however, nighttime employment of the Avenger is still limited by the operator's inability to visually identify targets.

Visual identification is usually required by the ROE prior to firing. Typically, LAAD units are placed in a weapons hold status during the hours of darkness, as there is no means available to the gunner to make a positive identification at night. When air defense is paramount, the ACE commander may perform the risk assessment and decide to alter the weapons release condition (to weapons free) and air defense control measures to allow LAAD teams to engage targets at night, which will also increase the risk of fratricide.

LAAD units operating at night also have to contend with the impact on personnel readiness and combat capability that results from sustained 24-hour operations. Commanders have to manage states of alert and rotate LAAD teams and Avenger crews to maintain the capability to defend the defended assets day and night.

LAAD units normally use the hours of darkness to move, rest, resupply, and perform maintenance on their equipment. They may be supporting a unit in a static position or a stationary asset. At nightfall, they may move from their firing positions to positions affording better security against ground attack (e.g., listening posts, observation posts, or within the perimeters of friendly units). When supporting a unit that is moving at night, LAAD units normally move with the unit. Remaining within the unit's formation provides the best security from ground attack. Before first light, the teams deploy to their firing positions so they are ready to engage aircraft as soon as visibility permits.

If the MAGTF commander authorizes LAAD night engagements, the ROE should be very specific on visual identification criteria. Nighttime ROE should be carefully thought out, widely published, and strictly followed to maximize LAAD weapon capabilities and to provide acceptable safety for friendly aircraft. A weapons free Stinger missile engagement zone or restricted operating zone (ROZ) is sometimes used around high value assets such as a headquarters. This air control measure allows LAAD units to engage hostile targets with minimal restrictions, thereby increasing their effectiveness. Friendly aircraft should remain outside the restricted operating zone until notified that all LAAD units have been placed in a weapons hold status.

NUCLEAR, BIOLOGICAL, AND CHEMICAL OPERATIONS

LAAD units must be able to function effectively in a nuclear, biological, and chemical (NBC) environment. To do so, LAAD units must be able to disperse rapidly; operate with degraded or lost command, control, communications, or combat service support; function on or near contaminated areas; function effectively in all levels of mission oriented protective posture (MOPP) equipment; and function effectively without detailed guidance.

As with any other MAGTF unit, LAAD unit performance will be degraded when forced to operate in MOPP gear. While wearing mission oriented protective posture equipment, it is more difficult to visually acquire and identify targets. It is also more difficult to perform the Stinger engagement sequence. Communications are usually adversely affected as well, making it more difficult to receive target cueing and coordinate team employment at all echelons. To be effective while wearing MOPP equipment, units must often practice all aspects of LAAD operations in a simulated NBC contaminated environment. Adherence to the concept of centralized command and decentralized control is also important when working through NBC conditions. A thorough understanding of the commander's intent, flexibility in the air defense plan, aggressiveness in execution, and the judicious use of initiative and common sense in operations will enhance the effectiveness of LAAD units when operating in a NBC contaminated environment.

—Section III—

OTHER OPERATIONS

COMBAT SERVICE SUPPORT OPERATIONS

LAAD commanders determine combat service support requirements, priorities, and allocations for effective employment and sustainment of their units after establishment of mission assignment and support relationships. Commanders consider their requirements for supply, maintenance, transportation, deliberate engineering, and health services during the planning phase. Combat service support for LAAD units is identical to that of any other MAGTF unit; however, the widely dispersed nature of LAAD operations makes careful and detailed combat service support planning more difficult.

The commander with administrative authority over a LAAD unit is responsible for providing that unit with combat service support. Often, it is difficult for the commander exercising administrative control to provide widely dispersed LAAD units with timely resupply. Logistical support may be provided by a supported or adjacent unit, dependent upon the tactical situation and the resupply capability of the supported or adjacent unit. Logistics support of this type should be prearranged between the staffs of the involved units. The operation order should clearly state how LAAD units will be sustained.

The LAAD battalion has organic combat service support capabilities in supply, maintenance, transportation, and health services. Of these capabilities, transportation is normally the major limiting factor in organic support of LAAD units. LAAD operations are inherently mobile operations and are transportation intensive. The LAAD battalion has enough organic transportation to move its teams; however, it cannot support extended day-to-day operations without dedicated external support such as 5-ton trucks, water trailers, and diesel refuelers.

When operating as part of a Marine Expeditionary Force, the LAAD battalion relies primarily on the Marine aircraft wing for external combat service support. When subordinate LAAD units operate as part of a MAGTF smaller than a Marine Expeditionary Force, they obtain combat service support from a variety of sources. Logistical support of LAAD units operating with a Marine Expeditionary Unit is normally accomplished through the MEU's tactical-logistics group. The senior LAAD representative should coordinate the unit's logistical requirements with the MEU's logistics officer (S-4).

HELICOPTERBORNE OPERATIONS

The concept of rapid tactical mobility through the extensive use of helicopters is an integral part of Marine Corps doctrine. Helicopters enable LAAD units to occupy firing positions that would normally not be accessible by wheeled or tracked vehicles. In addition to the standard methods of employing helicopters, rappelling, fastrope, and special patrol insertion and extraction techniques greatly enhance the LAAD unit's ability to provide effective air defense for supported units. Using these techniques, LAAD teams can quickly deploy to sites on hilltops and other terrain features that lack adequate areas for helicopter landing zones. These sites can give teams increased surveillance and overwatch capabilities, allowing them to detect and engage hostile aircraft at the maximum range of the Stinger system.

Consideration must be given to mobility restrictions placed on LAAD units when they are positioned by helicopter. Because the Stinger's launch signature is highly visible, the enemy can quickly locate the team's firing position. To enhance team preservation, detailed redeployment planning for LAAD units should be done before they are placed in remote sites.

AVENGER OPERATIONS

Avenger was developed to offset limitations in firepower, to enhance the detection of targets at night and in adverse weather, and to provide a shoot on the move capability. . While the Avenger does have the capability to shoot on the move, it is limited to hard ball and improved surfaces. Avenger also has no armor to protect the crew from direct or indirect fire, and it has a fairly large and distinct visual signature that cannot be adequately camouflaged. The Avenger system is limited in its ability to ford water obstacles. Depths of water greater than 30 inches can damage the slip ring of the turret in the bed of the HMMWV. Avenger employment may therefore be similar to the employment of man portable air defense HMMWV-equipped teams except in a surveillance role. The sensor suite that is contained within Avenger is unparalleled by any other system directly available to most supported commanders, and may dictate the surveillance task.

Avenger Employment

The addition of Avenger into the arsenal of LAAD unit equipment provides increased flexibility and firepower to the Stinger section. Although Avenger is usually considered a general support weapon system, the added versatility and technology incorporated into Avenger allows the Stinger section to increase employment options. Stinger employment planners should take into consideration the composition of sections while planning so that Avenger and man portable air defense teams are assigned appropriate missions.

Avenger Employment at Night

Avenger possesses an enhanced ability to acquire targets at night due to the incorporation of the FLIR device mounted to the side of the Avenger turret. This capability reduces the need for heavy and bulky MANPAD Stinger night sights. Turret slew time and the gunner's ability to scan the sky at night limit the size of the search sector that can be supported. Planners should consider reducing the nighttime sectors assigned to Stinger platoons based on the focal view of the FLIR, wide angle or narrow view. The section leader then can determine the field of view setting for the FLIR sight and position individual Avenger teams so that their FLIR coverage overlaps. This allows teams to search and scan the assigned sector vertically, eliminating the delay of turret slew time and decreasing target acquisition time.

CHAPTER 5
TRAINING

Marine leaders have the responsibility to establish and conduct technical and tactical training to enable their Marines to successfully accomplish the unit's mission. The complexities of amphibious, joint, and multinational operations highlight the importance of individual and unit level training for low altitude air defense Marines.

INDIVIDUAL TRAINING

Training requirements for employment of the Stinger weapon system are standardized by MCO P3500.19, Aviation Training and Readiness (T&R) Manual, Volume V, Marine Air Command and Control System (MACCS). The T&R Manual specifies training events and position requirements necessary for these personnel to attain position designations. Follow-on formal training is available to those Marines who demonstrate military occupational specialty proficiency.

Formal Schools

Entry Level Training

Entry level training for anti-air warfare officers and Stinger gunners is conducted at the U.S. Army Air Defense School, Fort Bliss, Texas.

Stinger Officers Course

This 6-week course focuses on training in aircraft identification, Stinger missile operating characteristics, Stinger employment, and the application of air defense principles. Opportunities are provided to track simulated targets in the moving target simulator, conduct terrain analysis, and observe live tracking and live-missile firing.

Stinger Gunners Course

This 12-week course focuses on enlisted gunners' initial training in Stinger operation and maintenance. The course emphasizes the engagement process, aircraft identification, and employment of the Stinger missile through lectures and tracking exercises in the moving target simulator. The course culminates with a live missile fire exercise. Gunners receive training on missile operating characteristics and the Avenger weapon system.

Graduate-Level Training

Weapons and Tactics Instructor Course

LAAD Marine Officers and SNCOs exhibiting requisite technical and tactical proficiency may be selected by their commands to attend the Weapons and Tactics Instructor (WTI) course. The WTI course is a 6-week graduate-level school, held at Marine Corps Air Station, Yuma, Arizona, designed to provide advanced training and practical application regarding the planning and execution of the six functions of Marine aviation. Students receive specific instruction in the areas of MACCS and air defense planning considerations. The WTI course is geared toward the mid-level Captain and senior SNCO who would return to the LAAD battalion and assist in the training of personnel. Prerequisites for WTI attendance include experience in MEF exercises and specific T&R syllabus events up to the battery level. Upon completion of

the weapons and tactics instructor course, officers are eligible for the military occupational specialty 7277 designation, weapons and tactics instructor.

LAAD Enhanced Training (LET) Course

The LET course is conducted simultaneously with the WTI course. During the course the students receive many classes regarding the employment of a LAAD Section and Platoon, to include an overview of all LAAD related equipment. The course also includes many of the same classes the WTI students receive, providing an overview of the MACCS. Students will conduct detail planning and then execute approximately six separate evolutions under the supervision of the 2 WTI enlisted LAAD instructors and the GBAD division head. Enlisted personnel from the DASC, TAOC, and MATC detachment participate in many of the classes and in the flight phase of this course to help with student interaction. The course provides a deeper understanding and appreciation for the complexities associated with employment of LAAD and the MACCS.

WTI Commanders Course

Held at Marine Corps Air Station, Yuma, Arizona, the 3-day WTI commanders' course provides field grade officers an opportunity to examine and discuss issues affecting the Marine Air Command and Control System and considerations for its employment.

On-the-Job Training

The *Training & Readiness Manual*, Volumes I and V, provide information on individual training and qualification criteria for Marine air command and control system personnel. Specific academic and practical application training standards for low altitude air defense anti-air warfare officers and gunners are outlined in Volume V (chapter 5). Officers and enlisted personnel complete separate training syllabi. A different syllabus is established for enlisted personnel functioning at the platoon sergeant or section leader position. Tracking of individual readiness is computed by the aviation training and readiness information management system. Refer to MCWP 3-25.3, *Marine Air Command and Control System Handbook*, for detailed discussion on levels of training.

Stinger Gunner Training Devices

Field Handling Trainer

The field handling trainer (FHT) has the same size, weight, and external appearance as the Stinger weapon round but is totally inert. Its controls and mechanical operation are also the same. Stinger gunners use the FHT to practice the basic manual skills of weapon handling, operation, sighting, and ranging. Gunners can practice mating or removing the gripstock and inserting or removing the battery coolant unit. Unlike the Stinger weapons system, the FHT does not provide gunners with indications of target acquisition and has no IFF capability.

Guided Missile Training Set

The guided missile training set consists of a tracking head trainer (THT), five rechargeable nickel-cadmium batteries, an IFF simulator with cable, and a shipping and storage container. It is used to develop and maintain proficiency in tracking aircraft and firing the Stinger weapon. The THT has the same appearance as the weapon round except for a performance indicator assembly strapped near the aft end of the launch tube. Weighing about 38 pounds, its rechargeable battery looks like the BCU except that it is approximately 3 inches longer and twice as heavy. A fully charged battery produces a minimum of 15 training missions of 47 seconds each. The IFF simulator provides the operator with random, simulated IFF interrogation responses. The performance indicator displays the gunner's progress during a simulated engagement. It provides indications that the gunner has—

- Correctly performed the engagement sequence.

- Committed a correctable error (e.g., a procedural error that can be corrected before squeezing the firing trigger).
- Committed an uncorrectable error (e.g., squeezing the firing trigger out of sequence).
- Allowed the 47-second timer to run down, which shuts down the trainer.

Moving Target Simulator II

The moving target simulator II (MTS II) provides representative sights and sounds of aircraft expected to be encountered by Stinger gunners. One to three gunners can be trained simultaneously in the MTS II. Environmental realism is achieved by using a large 40-foot diameter, 360o display area that displays authentic aircraft presentation (with up to three active targets), selectable background scenery and weather conditions, and stereophonic sound. Accurate infrared signatures are computer controlled to indicate target range, type, and attitude. Infrared countermeasures (in the form of flare drops) are also available. When a gunner scores a target kill, the target explodes. The missile's flight path is also shown. Each of the U.S. based active duty LAAD battalions have an MTS II.

Stinger Launch Simulator

The Stinger launch simulator (STLS) is a low-cost, gunner proficiency training device. It is composed of a standard Stinger launcher with an externally mounted captive seeker. All indications received by the gunner during training are identical to those for the tactical weapon round up to and including launch. The Stinger launch simulator uses an eject motor to launch an inert missile to a range of approximately 170 meters (557 feet) with a maximum altitude of 43 meters (141 feet). Normal range safety requirements and operating procedures for the Stinger launch simulator are detailed in Technical Manual (TM) 08319A-12, Technical Manual Operators and Organizational Maintenance Instructions STLS (Stinger Launch Simulator).

Captive Flight Trainer

The captive flight trainer (CFT) is a training tracking device much the same as the THT discussed above. It is modified for the SVML. It allows vehicle-mounted systems to track aircraft and conduct engagements in a training environment. Each CFT has an on-board storage capability for argon gas to cool the seeker head. These training devices are recharged by Stinger personnel who are specially trained in the operation of the single-chamber unit that pressurizes the argon gas from a supply bottle into the CFT or the THT.

Institutional Conduct of Fire Trainer

Institutional conduct of fire trainer (ICOFT) is a self-contained training set that allows simulated Avenger engagements from a computer-based simulation program. Similar to the moving target simulator, the institutional conduct of fire trainer displays preprogrammed flight profiles on a monitor in front of the gunner. The gunner sits in the ICOFT, which is configured identical to an Avenger turret, and performs all actions required in an engagement. The gunner's actions are re-corded by a computer that provides immediate feedback to the operator. The institutional conduct of fire trainer simulates the sounds of a battlefield and displays ground and air activity within the specific profile that is flown.

PLATOON, SECTION, AND TEAM TRAINING

Platoon, section, and team training provide the means by which future LAAD battalion leaders are developed, and it should be incorporated into the daily routine and training plan. Small-unit training is designed to take a basically trained Marine, fine tune those skills, and develop an ability to handle increased responsibilities. Moreover, small unit leadership training develops and reinforces procedures used by the battalion to accomplish its mission.

Platoon Training

Platoon training should include field and garrison training for individual sections that are working together to become a synergistic force to fulfill platoon responsibilities. Platoon headquarters exercises, communication exercises, and deployment/redeployment drills should be conducted on a regular basis in accordance with battalion standard operating procedures and military occupational specialty specific handbooks. Areas of focus in platoon training should include—

Five-paragraph orders (issuing and receiving).

- Preventative and field maintenance of equipment.
- Convoy operations.
- Platoon-level tactical movement.
- Reporting procedures.
- Communications procedures.
- Integration training with other elements of the Marine air command and control system.

Section Training

Sections are the smallest tactical element of Stinger assets and may be expected to perform their mission away from normal platoon-level employment. Standard operating procedures should be consistent, yet provide the ability for the section to operate away from the platoon headquarters. Section-level training should include developing or conducting the following:

- Five-paragraph order.
- Convoy procedures.
- Tactical movement.
- Global positioning system navigation.
- Reporting procedures.
- Lost communication procedures.
- Integration training.
- Preventative and field maintenance training.
- Communications procedures.

Team Training

Team training cannot be overemphasized. The team level is where LAAD Marines spend the majority of their time. A carefully cultivated relationship between the team leader and assistant gunner should exist. Each team member should know the strengths and weaknesses of the other and should strive to offset those weaknesses. Teams are dependent upon each other for survival on the battlefield and should possess a strong sense of loyalty.

Each team should have a routine that is followed every time they deploy. Though it is not necessary to develop a standard operating procedure for each team, team members should have a clear understanding of the process to be followed each time they arrive at a position. Team members should attend tracking training in the moving target simulator II individually and as a team. The team leader should be a mentor to the assistant gunner, developing skills and teaching sound practices for tactical employment. Elements of team training should include—

- Setting up the team.
- Selecting the team position.
- Tracking live and simulated aircraft.
- Reporting procedures.

- Navigating (global positioning system [GPS]).
- Engaging aircraft.
- Identifying aircraft.
- Developing the five-paragraph order.

Training Devices

The training devices used for individual training are also used to augment team, section, and platoon-level training. Some devices are employed to support aircrew training. One such device is the Smokey surface-to-air missile (SAM).

The Smokey SAM is a training device that helps aircrews visualize the backblast and smoke signature created when a short-range surface-to-air missile is fired at their aircraft. They are for non-tactical visual training and are employed solely for aircrews. Personnel who handle and launch Smokey SAMs may have any military occupational specialty; however, because the Smokey SAM igniter and rocket motor contain explosive material, personnel who operate them must have adequate operating, safety, and handling training. Marines who operate these training devices are normally part of the battlefield realism section of the MAW headquarters' G-3.

UNIT TRAINING

Unit training is required to prepare the LAAD battalion to perform its wartime mission. Unit training can take many forms, including command post exercises, simulated exercises, and field training exercises. During unit training, LAAD battalion personnel are intimately involved in preparing training plans and coordinating with higher, adjacent, and subordinate command and control and support units. Command post exercise and field training exercise evolutions are generally conducted at the MAW or higher level. Unit participation in Marine air command and control level training can be accomplished at low-dollar costs while maintaining an effective, stimulating forum geared toward MACCS integration training. Examples of this type of training include the Marine aviation planning problem (MAPP), MACCS integrated simulated training exercise (MISTEX), and joint service training exercises. Refer to MCWP 3-25.3 for a more detailed discussion of MACCS level training opportunities.

EVALUATING TRAINING

The success of individual, crew, and unit training must be qualitatively measured to identify training deficiencies and create a baseline for designing future training. For unit training, identified needs should be stated as training objectives for upcoming exercises. The T&R manual and ATRIMS is the key evaluation tool used to identify unit training needs.

APPENDIX A
LAAD COMMUNICATIONS NETS

Due to the wide dispersion and mobility of LAAD units, radio is the primary means of communications. Wire should be used in any static situation where practical. The LAAD battalion uses internal and external communications nets.

INTERNAL NETS

The LAAD battalion command net (HF) is established between the battalion headquarters (net control) and subordinate batteries to provide administrative and logistics support.

The LAAD command net (HF) is established between the battery (net control) and subordinate platoons. It provides administrative and logistics support and coordinates the tactical employment of LAAD platoons.

LAAD weapon control nets (HF) are established between a platoon commander (net control) and section leaders. This net provides subordinate or senior elements with current air defense warning conditions, weapon control statuses, and pertinent information on hostile, unknown, and friendly aircraft. Several nets may be required.

Each LAAD section leader (net control) uses the LAAD team control net (VHF) to control teams and to relay air defense warning conditions, weapons control statuses, and pertinent information on friendly, enemy, and unknown aircraft. Multiple LAAD team control nets, usually one per section, are normally required. The LAAD team control net may also be used by teams to pass aircraft sighting reports, engagement reports, position reports, status reports, and resupply requests to section leaders.

EXTERNAL NETS

In addition to communications between echelons of the LAAD battalion, communications must be established between a LAAD unit and the unit it is working for or supporting (as established by command and support relationships) or the unit providing it with local security.

The LAAD commander and the commanders of these units will determine the best means for establishing communications (e.g., radio, wire, or messenger). To communicate with MACCS agencies and ACE organizations, LAAD units may employ the nets listed below. Depending on the size of the MAGTF and the scope of the enemy air threat, some or all of these nets may be activated. Example nets follow.

The tactical air command TAC net (HF/VHF) provides the primary means by which the ACE commander provides operational tasking to subordinate units or agencies. Multiple nets may be required.

The anti-aircraft intelligence net (HF) provides a means to report targets by various GBAD units. It may also be used by the TAOC to pass selected early warning contacts to GBAD units.

The anti-aircraft control net (HF) provides a means to control GBAD units. The types of information passed on this net include target assignments, fire direction orders, weapons status commands, battery status reports, and progress of engagement reports.

The combat information detection (CID) net (HF) provides a means for reporting unidentified or hostile aircraft, including initial contact reports, tracking, amplifying, and final dispositions reports.

The command action net (HF) provides a means for command-level coordination of anti-air warfare actions by exchanging information on GBAD unit employment, assignment of air targets, and interceptor or missile coordination.

The Marine air control group MACG command net (HF) provides a means for the MACG commander to exercise command, administrative, and logistics functions with subordinate units.

The ACE command net (HF/VHF) provides a means for the ACE commander to exercise command, administrative, and logistics functions with subordinate units. Multiple nets may be employed.

ALTERNATE COMMUNICATIONS PATHS

All LAAD battalion personnel should be aware of alternate communications nets. If they cannot communicate over the standard nets, LAAD battalion personnel should use any available nets to maintain continuous communications between echelons. Possible alternate nets include the—

- Infantry Battalion/Regimental Tactical Net (HF/VHF).
- Fire Support Coordination Net (HF/VHF).
- Tactical Air Request/Helicopter Request Net (HF/VHF).
- Air Operations Control Net (HF).
- Command Action Net (HF/VHF).
- Direct Air Support Net (HF).
- FMFM 3-30, Communications, provides a detailed description of MAGTF radio nets.

If a total loss of communications occurs, immediate action to reestablish communications must be taken by all affected units. Until communications are restored, engagements may be conducted, based on the established rules of engagement. Unless otherwise directed by the applicable operations order or local combat standing operating procedures, LAAD units will remain in the last directed weapons control status and state of alert.

APPENDIX B
MANUAL CROSS TELL

Although diversified methods are used to pass aircraft location information, one of the most expeditious and effective methods for low altitude air defense units is manual cross tell. Air defense units and agencies use several types of manual cross tell. Regardless of the type of cross tell procedure used, information included in a manual cross tell report should include—

- Track number.
- Track location.
- Identification.
- Number and type (if known).
- Heading.
- Altitude.
- Amplifying information.
- Time of report.

The format for manually reporting tracks is specified in the air defense annex to operations orders and local standing operating procedures.

The principal types of manual cross tell used by low altitude air defense units are the Cartesian Coordinate Grid System, the Polar Grid System, the Polar Coordinate System and the Common Grid Reference System (CGRS).

THE CARTESIAN COORDINATE GRID SYSTEM

The Cartesian coordinate grid system is a manual cross tell system that uses four quadrants delineated by an X and a Y axis (fig. B-1).

The X-Y axes can either be oriented to true north, grid north, or magnetic north. (If oriented to true north or grid north, operators must account for magnetic declination.) The center of the grid, known as the Cartesian coordinate reference point, is normally a geographic point that is compatible to all participating agencies. Each rectangular quadrant of the grid system is given a name designation (Example: NE quadrant is Maine, SE quadrant is Florida, NW quadrant is Washington and the SW quadrant is California). The Cartesian coordinate reference point and the colors assigned to each quadrant are explained in the air operations annex to the MAGTF operations order.

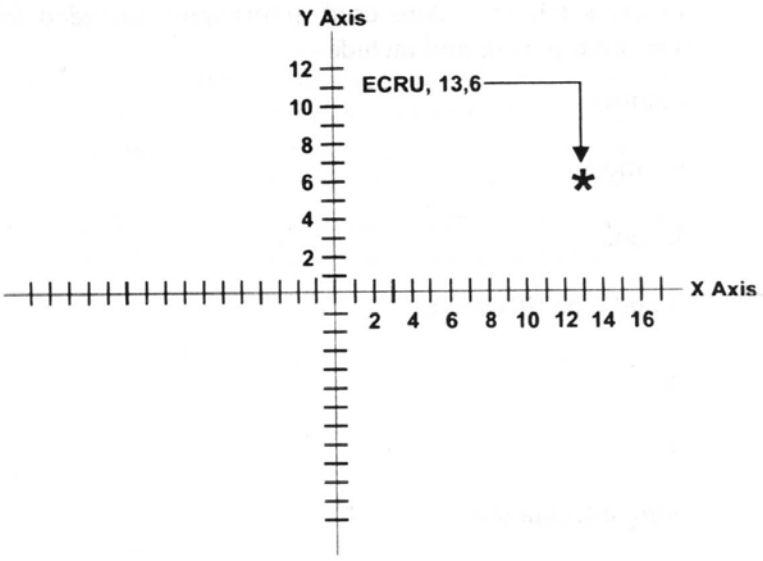


Figure B-1. Cartesian Coordinate Grid System.

For ease of depiction, the X-Y axes lines are normally marked at 5- nautical mile increments, but any common system of measurement could be used (i.e., statute miles or kilometers). Although the grid is commonly marked in increments of 5, it is the responsibility of the individual reporting the track to extrapolate the target's location to the nearest single nautical mile (or whatever unit of measurement is being used). The information is prepared for transmission by reading—

- Northwest quadrant—left and up. NOTE TO PUBLISHER: Figure B-1 "ECRU" needs to be replaced by "Maine"
- Northeast quadrant—right and up.
- Southeast quadrant—right and down.
- Southwest quadrant—left and down.

The track information is passed with the name designation first, followed by the X coordinate location, then the Y coordinate information. For example, if the northeast quadrant's designator was Maine, the target located at the * in figure B-1 would be reported as "Maine (quadrant's designator), 13 (the X axis location), 6 (the Y axis location)."

More information on the track, including its heading, altitude, etc., would be passed as amplifying information.

POLAR GRID SYSTEM

The polar grid system is a circular coordinate system that uses magnetic bearing (in degrees) and distances (in nautical miles or kilometers) from a specified reference point. The polar grid system (see fig. B-2) uses an easily recognizable feature (a tactical air navigation marker or other location specified in the air tasking order's special instructions) as its center and is aligned to magnetic north. The polar grid system is composed of 10° radials, which originate from the grid's center and are further divided into 10-nautical mile range bands. Each 10-nautical mile range band is given an alphabetic designator, beginning with "A" from the origin. Broad brush references can be made using only the radial (to the nearest 10°) and the range band (to the nearest 10 nautical mile). More precise cross tell can be accomplished using the exact radial (to the nearest degree), the range band alphabetic, and the exact number of nautical miles within that range band.

An unknown aircraft detected in the vicinity of the * in figure B-2 could be reported as "one bogey, 080D, heading west." As a precise reference example, two hostile aircraft detected at the + would be reported as "two bandits, 104C6, heading west." This report is derived from the exact magnetic radial (104°) and the range (26 nautical miles) from the grid's origin, that places it 6 nautical miles into the C band of the grid.

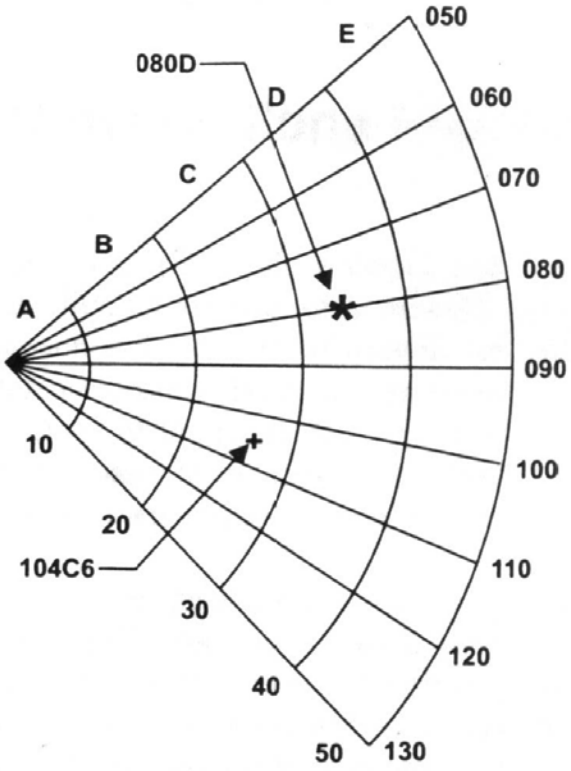


Figure B-2. Polar Grid System.

Polar Coordinate System

Similar to the polar grid system, the polar coordinate system uses a known location as its center point and reports tracks using only radials (magnetic degrees) and miles from its center point. The + in figure B-2 would be reported as "two bandits, 140°/26 miles, heading west" under the polar coordinate system.

COMMON GRID REFERENCE SYSTEM

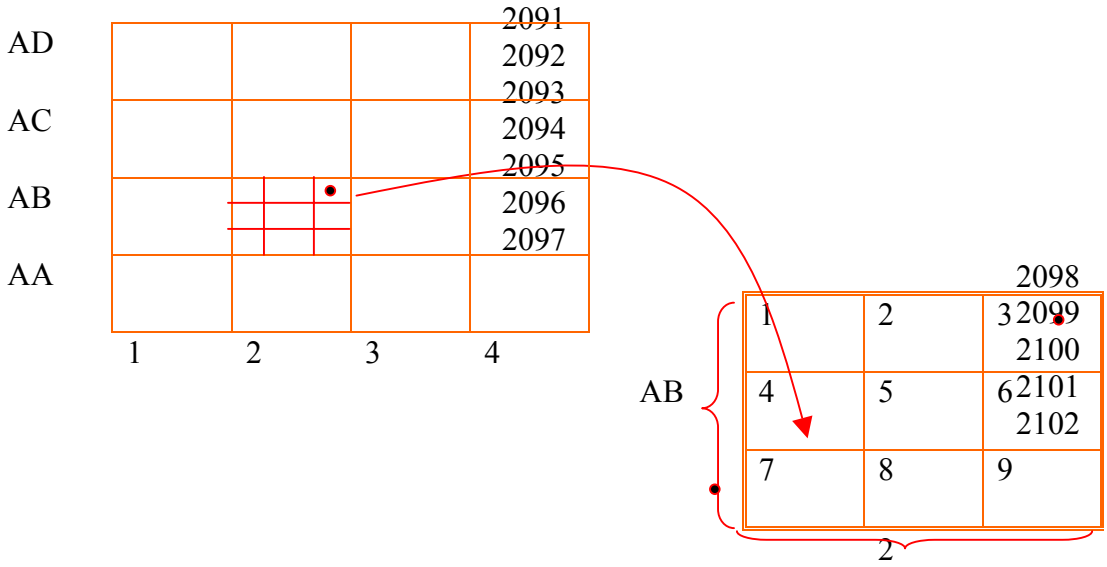
The Common Grid Reference System (CGRS), commonly know as the Kill Box System, is a reference system that can be used as a guide to define certain geographic areas for targeting, BDA, aircraft routing, threat reference, etc. (figure B4 on page B-5).

The CGRS originates at an initial Latitude / Longitude, and is superimposed on Lat / Long boundaries in 30 minute increments. The increments will be marked at every 30 minute increment from East to West and South to North from the initial Lat / Long resulting in a 30 x 30 minute box. The starting coordinate will be assigned a number and a letter. The CGRS is labeled from East to West with either a number or a letter and

from North to South with either a number or letter. The CGRS letters and numbers that are assigned to each quadrant are explained in the air operations annex to the MAGTF operations order.

The 30 X 30 min blocks are further divided into 10 X 10 min by using a keypad numbering system. The keypad numbering system is broken down the same way a touch-tone phone keypad is oriented.

Example of a Common Grid Reference System:



Example of target call with the ( ) representing a hostile aircraft:

Hostile Aircraft at 2 – AB – 3 / heading South East

Figure B-4. Common Grid Reference System

APPENDIX C
BASE DEFENSE ZONE PROCEDURES

The base defense zone (BDZ) is a destruction area established around an air facility, an air site, or a forward operating base (FOB) to allow for the launch and recovery of friendly aircraft while maintaining an air defense posture. BDZs are limited to the engagement envelope of the short-range air defense (SHORAD) weapons systems defending that base. In the case of the MAGTF, LAAD battalion assets employ at BDZs.

BDZs have specific entry and exit, as well as IFF procedures associated with their use. LAAD assets will integrate with the MATCD operating at the airfield around which the BDZ has been established. Preplanned BDZs are published in the airspace control plan, while requests for activation of BDZs are made to the ACE commander. Three critical elements are required to establish a base defense zone:

- A controlling agency (e.g., MATCD, TAOC, or a joint/multinational air traffic control system).
- A radar.
- A weapon system.

BDZ AREA OF OPERATIONS

The MATCD, in concert with the MACCS and any host nation air traffic control agencies, define the BDZs procedures. BDZ dimensions are predicated on the maximum engagement capability of the SHORAD system and not on the dimensions of the controlled airspace (i.e., Class D airspace).

MATCD AND LAAD INTEGRATION

The Marine air traffic control detachment has the requisite doctrine, forces, equipment, and capabilities to effectively manage and control a BDZ. The success of the BDZ depends on integration of the SHORAD and MATCD personnel.

The LAAD section leader responsible for supervising Stinger fires within the BDZ physically locates in the MATCD control and communications subsystem at a control scope along with the approach controller. The approach controller monitors the assigned airspace and provides cueing to the LAAD section leader. The section leader's control scope should depict the airspace, individual team positions, sectors of responsibility, and the manual cross tell system. The approach controller provides the section leader with cueing on all air tracks within the airspace. The section leader provides cueing and aircraft position updates to teams. The detailed entry, exit, and IFF procedures that are required for the launch and recovery of friendly aircraft within a BDZ are monitored by the MATCD tower, departure, approach, and radar controllers to ensure friendly aircraft are passed safely through established air defenses.

BDZ operations may be conducted 24 hours a day. At least two sections of Stinger assets are required to conduct the sustained mission. Avenger is the weapon of choice because its FLIR, RTU, and slew-to-cue capability make it the optimal asset for use in defense of a BDZ.

PLANNING CONSIDERATIONS

The planning considerations critical to the success of BDZ employment include the threat, terrain, night operations, asset availability, integration with air traffic control, communication architecture, and command and control. To a lesser extent, logistics and missile resupply must be preplanned but are not as critical to success.

A thorough analysis of the threat is important when planning a BDZ. Detailed analysis of threat aircraft (e.g., likely avenues of approach, day or night capabilities, ordnance, delivery techniques, and infrared countermeasure capabilities) help establish a more effective defense. Every threat cannot be countered solely by LAAD assets within the BDZ. A cohesive IADS must be in place to provide destruction in depth against attacking aircraft.

Teams should not be positioned directly on the approach or departure corridors of the BDZ. Friendly aircraft transiting these corridors may present a hostile profile for individual teams and increase the risk of fratricide, particularly if a hostile aircraft is following a friendly aircraft. Search sectors should overlap the corridors to allow surveillance and adequate coverage without unnecessarily placing the teams or friendly aircraft at risk.

Teams should be emplaced into individual positions using the global positioning system to ensure grid location accuracy. Lat/Long locations can be applied to the control scope within the control and communications subsystem for viewing by the section leader. This application facilitates correlation of tracks with respect to the team position and may allow for a more responsive engagement of the threat, particularly at night.

Night positions should be no more than 2 kilometers apart and search sectors should be reduced as much as possible to decrease acquisition time. Search sectors should be consistent with the narrow field of view of the FLIR. This improves night acquisition of targets without the requirement to slew the Avenger turret. By overlapping the fields of view between adjacent positions and scanning vertically (vice horizontally), a seamless coverage can be established during darkness or reduced visibility.

When repositioning, teams should move one team at a time to allow for continuing coverage of the zone during the re-dispersion of assets. (This may become a very time consuming process and will require detailed planning to one team to move, set up, and become operational before moving a second team.) All movement should be completed prior to the end of evening nautical twilight.

The section leader is the cornerstone for LAAD participation in BDZ operations. The section leader is responsible for numerous tasks that ensure the seamless operation of multiple, simultaneous activities. Some of the key actions the section leader must take in conjunction with establishing a BDZ are to—

- Establish liaison with the Marine ATC detachment commander.
- Establish communications with teams and platoon headquarters.
- Plot team positions, search sectors, and the manual cross tell system on the control and communications subsystem's radar scope.
- Cue teams based on ATC identification.
- Report and disseminate critical information.

The integration requirements for the BDZ cannot be overstated. Constant dialog and information sharing must occur among the section leader, the teams, and the approach controller to effectively sort the aircraft as they enter the BDZ.

COMMAND AND CONTROL

The process of command and control within the b BDZ is accomplished through the communications link between the section leader and the Stinger teams. Weapon control statuses may not apply to BDZ operations. Aircraft are engaged based on their classification by ATC assets through electronic means (e.g., IFF), determination of noncompliance with pre-briefed approach procedures, lack of voice communications, or visual identification by LAAD teams. The constant dialogue between the section leader and the approach controller provides the teams with a steady flow of friendly and threat air activity within the BDZ.

Teams that lose communications with the section leader immediately revert to a weapons tight control status during daylight hours, weapons hold at night, and assume a point defense role until restoration of

communications with the section leader. Likewise, if ATC radars and data links to the MACCS are inoperable or not providing a recognized air picture, all LAAD assets within the BDZ revert to a point defense role. Point defense allows gunners to prosecute engagements of hostile aircraft in accordance with the established rules of engagement and weapons control status.

COMMUNICATIONS

Communications are critical to the success of the BDZ. The section leader maintains a direct link to the teams via the LAAD team control net while the communicator maintains HF communications with the platoon commander. The section leader may also choose to monitor the ATC detachment doctrinal nets that link the MATCD to the MACCS. These links provide redundant paths for critical information flow regarding friendly or hostile cueing, lame duck calls, updates to air defense warning conditions, states of alert, resupply information, and engagement reports. These paths also provide multiple opportunities to build and maintain situational awareness for the destruction area as a whole.

Implementation of these procedures will depend on the tactical situation and the MAGTF commander's air defense priorities.

APPENDIX D
LAAD STATES OF ALERT

Generally, air defense warnings dictate the alert state for all organizations including those not dedicated to air defense. The most difficult decision for commanders of dedicated air defense units is determining which personnel and weapons are ready immediately to do battle and which can be placed on a lesser alert to perform maintenance and let the crew rest.

A State Of Alert (SOA) establishes the maximum allowable period of time in which the air defense unit must be able to engage a target. The time associated with each state of alert provides a frame of reference for the air defense battle manager to determine the level of readiness of low altitude air defense units within the integrated air defense system. In many cases, LAAD units can engage aircraft from their assigned positions in much less time.

The state of alert for each missile unit can be determined by the Area Air Defense Commander (AADC), Regional Air Defense Commander (RADC) or the SADC. SOA is normally determined by the SADC giving consideration to the Air Defense Warning Condition (ADWC) and alert status imposed by higher headquarters. Subordinate commanders may order their unit to a higher state of alert, but never to a lesser state of alert than imposed by higher headquarters. Normally, the command element of the low altitude air defense unit determines states of alert for their subordinate units in conjunction with the SADC. When a prescribed state of alert cannot be assumed for any reason (e.g., equipment malfunction), higher headquarters must be notified immediately.

Unless otherwise dictated by the applicable operation order or local tactical standing operating procedures, the following states of alert apply to low altitude air defense units (see table D-1):

- **SOA A (Battle Stations).** Marines are in their assigned firing positions. All communications nets are manned. At the team level one member is scanning all visible avenues while the other is searching the threat sector. Missiles are ready to fire immediately. Units assume that an air attack is imminent.
- **SOA B (5 Minutes).** Marines are in the immediate vicinity of their firing positions and can engage a target within 5 minutes. No movement in or out of the team position occurs. All communications nets are monitored. At the team level, both gunners are alert. One team member maintains surveillance over the team's assigned sector of fire at all times. At least two missiles are ready to fire within 10 seconds. Units assume that an air attack is probable.
- **SOA C (1 Hour).** Marines are in the general vicinity of their positions and can engage a target within 1 hour. Only mission essential movement and resupply take place. All communications nets are monitored. One team member maintains surveillance over the team's assigned sector of fire at all times. At least two missiles are readily available. Units assume that an air attack is probable.
- **SOA D (4 Hours).** Marines have 4 hours before they have to be capable of engaging a target. This time is used for movement, resupply, maintenance, improving positions, and rest. Communications nets are monitored as directed. Units assume that an air attack is improbable.

Table D-1. LAAD States of Alert.

	A Battle Stations	B 5-Minute Alert	C 1-Hour Alert	D 4-Hour Alert
Surveillance	Assigned sector and all visible avenues of approach	Assigned sector	Assigned sector	Not required
Communications	All nets	All nets	All nets	As directed
Movement	None	None	Mission essential within immediate vicinity of position	As required
Maintenance	None	None	Preventive	As required
Resupply	Delivered to team level only in critical circumstances	Delivered to team level only in critical circumstances	Mission essential routine distribution IAW section SOPs	Mission essential routine distribution IAW section SOPs
Weapons	2 missiles ready to fire	2 missiles ready to fire within 10 seconds	2 missiles readily available	Basic load on hand
Rest	None	None	1 Marine as required	As required

LAAD WEAPON CONTROL STATUS

Weapon Control Statuses define restrictions on firing Stinger and other air defense weapons for a particular area and time period.

- **Weapons Free.** LAAD teams engage all aircraft not positively identified as friendly.
- **Weapons Tight.** LAAD teams engage any aircraft positively identified as hostile.
- **Weapons Hold.** Do not open fire or cease fire on aircraft currently engaged. Do not fire except in self-defense or in response to a formal fire control order.

LAAD AIR DEFENSE WARNING CONDITIONS

Air defense warning conditions indicate probability of air attack. They are passed by the senior air control agency to all MAGTF elements. Warning conditions may differ from one area of the battlefield to another due to the tactical situation and level of enemy air threat.

- Red. Attack by hostile aircraft and/or missiles is imminent or in progress. This means that hostile aircraft and/or missiles are within an air defense sector or are in the immediate vicinity of an air defense sector. The audio signal for condition red is one long, yelping blast lasting approximately one minute. A code word may be assigned to signify warning condition red as per the unit SOP.
- Yellow. Attack by hostile aircraft and/or missiles is probable. This means that hostile or unknown aircraft and/or missiles are en route or within an air defense sector. The audio signal for warning

condition yellow is three yelping blasts, lasting approximately 2 seconds each. A code word may be assigned to signify warning condition yellow as per the unit SOP.

- **White.** Attack by hostile aircraft and/or missiles is improbable. The audio signal for warning condition white is verbal or data communications passed over established nets. A code word may be assigned to signify warning condition white as per the unit SOP.

APPENDIX E
GROUND-BASED AIR DEFENSE
FIVE-PARAGRAPH ORDER FORMAT

The below template is intended to be used as a guide and a reference for LAAD Marines when preparing and delivering a Ground Based Air Defense (GBAD) Operations Order. This format does not list every subject that could be included in a ground-based air defense order nor do all the subjects have to be included. The drafter must analyze the audience that will receive the order and tailor the format and information. Operations orders, applicable standing operational procedures, and doctrinal publications should be referenced in lieu of standard, well-known information internal to the order. Not all information in the below template may be required when delivering the GBAD Operations Order.

Operation/Exercise Name: _____

References: (List all that were used in preparing the order)

Maps: _____

Enclosures:

TIME ZONE: (List the time zone that will be used during the operation)

TIME HACK:

ORIENTATION: (Will be briefed using the terrain model or 1:250,000 JOGAIR map. Familiarize subordinates with the area they will be operating in. Identify key terrain, expected attack axis, higher and adjacent units)

I. SITUATION:

A. General: (Address the current situation, major force disposition, both friendly and enemy locations, Defended Asset List, current and future weather conditions)

1. Friendly: (National level, theater level, MEF, Wing, Battalion situation)

2. Enemy: (Current location of both air and ground units and their distance from your area of operation, capabilities and limitations of both air and ground threat)

3. Defended Asset List:

1. _____
2. _____
3. _____
4. _____
5. _____

6. _____

4. Weather:

B. Enemy Air Order of Battle:

1. Recent Activity:
2. Sortie Generation:

# AC	Type	Base and Location	Distance from Defended Asset(s)

3. Enemy Ability to Range DAL: (asset you are defending)

A/C Type	Combat Radius	Flight Time	Time on Station	Threat Level

4. Expected threat axis and likely avenues of approach: (To DAL)

A. Attack Axis Air: _____
B. Likely Avenue of Approach Air: _____
C. Attack Axis Ground: _____
D. Likely Avenue of Approach Ground: _____

5. Expected times of attack:

A. Expected time of Attack Air: _____
B. Expected time of Attack Ground: _____

6. Types of enemy ordnance, expected delivery techniques and flight profiles: (Example: Dive Bomb 30 degrees dive angle from 500-18kft. Must hold dive for 30 sec. Nighttime is limited to medium altitude flights.)

A. Air to Surface Missiles:

ASM	Max Effective Range (ORP)	Expected Target	Counter Measure

B. Non-precision guided munitions (NPGMs):

Ordnance Type	Max Effective Range (ORP)	Expected Target	Counter Measure
GP Bombs			
Rockets			
Cannons			
Small Arms			

7. Enemy electronic attack capabilities:

A.
B.

8. Electronic warfare support capabilities:

A.
B.

9. Night, limited visibility, all weather and infrared counter measures capabilities:

A/C Type	Night Capable (Yes/No)	Limited Visibility Capable (Yes/No)	All Weather Capable (Yes/No)	Type(s) Of Visual Aids A/C Equipped w/	Infrared Counter Measure Capability

10. NBC capabilities:

A. Type(s):

1. Nuclear: (Yes / No)
2. Bio: (Yes / No)
3. Chem: (Yes / No)

B. Delivery Platform(s):

11. Surface to Surface threat:

SS Threat	Max Effective Range	Expected Target	Counter Measure

12. Special operations/terrorist threat:

13. Most likely enemy course of action:

A. Enemy Air:
B. Enemy Ground:

C. Friendly forces:

1. Higher:

A.
B.
C.
D.
E.

2. Friendly / Adjacent units: (HN SAMs, etc.)

A.
B.
C.

D.

3. Supporting:

A.
B.
C.
D.
E.

4. Friendly aircraft:

A.
B.
C.
D.
E.

5. UN Aircraft: (if applicable)

A.
B.
C.
D.
E.

D. Attachments and detachments:

E. Assumptions:

II. **MISSION:** (The mission statement is a clear and concise statement of what the unit is to accomplish. Address the units primary TASK and PURPOSE by covering the who, what, where, when and why.)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

III. **EXECUTION:**

_____
_____
_____
_____
_____
_____

A. Commander's intent: (The commander's intent is guidance provided to subordinates that enables them to act in a changing environment in the absence of additional orders. The commander's intent MUST describe the result {desired end state} the commander wants relative to his force, the enemy and the terrain.)

1. (What you intend to have happen to the enemy)

2. (Enemy center of gravity)

3. (How you intend to exploit enemy critical vulnerabilities)

4. (Friendly centers of gravity)

5. (Friendly strengths and how you intend to exploit them)

6. (State focus of main effort)

7. (Critical issues that may impact mission accomplishment)

B. Concept of operations: (Explain how the assigned mission will be accomplished)

C. Tasks: (Should be explicit in addressing each units mission requirements, yet allow room for initiative. Include support relationship, designated sectors of responsibility, primary target lines, and specific integrity requirements. Address each units mission requirement. Special instructions)

Air Defense Warning Condition	Weapons Control Status	States of Alert
Red	Free	Alpha
Yellow	Tight	Bravo
White	Hold	Charlie
		Delta

D. Coordinating instructions:

1. Date & Time of Departure:
2. &Time to be Operational:
3. Initial Air Defense Control Measures:

E. Agency exercising engagement authority:

1. ID Authority:
2. Engagement Authority:

F. Autonomous operations: (How will units function and continue to provide A/D if a loss of C2 occurs)

G. Origin points:

1. Friendly Origin Points:

2. Hostile Origin Points:

H. Location of combat air patrols:

1. Center Point: (LAT/LONG)

I. Destruction Area(s):

1. JEZ:
2. FEZ:
3. MEZ:
4. COZ:
5. BDZ:

J. Detailed Base Defense Zone Procedures: (if applicable)

1. A/C Entry Point:

A. Name:
B. Location:
C. Inbound Heading:
D. Degree offset from entry point:
E. A/C Speed and Altitude:

2. A/C Exit Point:

A. Name:
B. Location:
C. Outbound Heading:
D. Degree offset from entry point:
E. A/C Speed and Altitude:

3. Controlling Agencies Frequencies and Call Signs:

K. Air Defense Asset Location(s): (Controlling agencies require LAT/LONG positional data of all teams.)

Unit/Call Sign	Location MGRS	Location LAT/LONG

L. Surveillance coverage and gaps: (Example: Robust Surveillance plan is already in place with the TPS-59, 73, and Sentinel.)

M. Minimum Risk Route(s): (Ensure subordinates know MRR widths)

MRR Name & Location	A/C Heading	F/W Altitude	R/W Altitude	F/W Speed	R/W Speed

N. Current rules of engagement:

1. Standing ROE: (Can include UN Resolutions, National Policy, Military Policy)
2. Supplemental ROE:

A. New measures authorized:
B. General:
C. Ground:
D. Air:
E. GBAD:

O. Hostile ID Criteria: (What factors will be used to determine if A/C is hostile)

P. Hostile intentions/ acts:

1. Hostile Act:
2. Hostile Intent:

Q. Specific firing doctrine guidance: (If not in accordance with standard operating procedures, specify the exact firing doctrine to be used for each scenario and at each subordinate echelon to your command.)

R. Self defense criteria: (Brief Self Defense criteria VERBATIM out of and in accordance with the Operations Order and current Rules of Engagement. Brief in detail what constitutes a violation of ones self defense for each echelon within your command down to the lowest level)

S. Lame duck procedures/risk assessment: (List all established lame duck procedures.)

1. Risk Assessment in Favor of: (Place an "X" in appropriate collum).

Aircraft	Integrated Air Defense System

T. Liaison requirements: (Who will your subordinates need to get in contact with in order to obtain essential information and supplies)

U. Alternate site locations:

1. Consolidation points:

   A. Rally Point Designator A: _____
   B. Rally Point Designator B: _____
   C. Consolidation Point: (Primary) _____
   D. Consolidation Point: (Alternate) _____
   E. Special Instructions: (As required)

V. Rehearsals and inspections: (As required)

W. Actions to be taken upon enemy contact:

X. Liaison requirements: (Who will your subordinates need to get in contact with in order to obtain essential information and supplies)

Y. Alternate site locations:

1. Consolidation points:

   A. Rally Point Designator A: _____

   B. Rally Point Designator B: _____
   C. Consolidation Point (Primary) _____
   D. Consolidation Point (Alternate) _____
   E. Special Instructions: (As required)

Z. Rehearsals and inspections: (As required)

AA. Actions to be taken upon enemy contact:

BB. Casualty plans:

CC. Current NBC MOPP condition and decontamination plans:

1. MOPP Level:

Level 0	MOPP Gear available but not carried
Level 1	Over garment worn open or closed, Booties, Mask and Gloves carried
Level 2	Over garment worn open or closed, Booties worn, Mask and Gloves carried
Level 3	Over garment worn open or closed, Booties worn, Mask worn with hood open or closed, Gloves carried
Level 4	Over garment, Booties, Mask and Gloves worn

2. NBC Event Reporting Procedure(s): (Time, location, delivery method, platform)

   A. Primary:

B. Alternate:

3. NBC Alert/Warning Procedure(s):

A.
B.

4. Decontamination Site Location(s):

A. Site 1: Grid: _____
B. Site 2: Grid: _____

5. Decontamination Site Detailed Entry Procedure(s):

6. Decontamination Site Detailed Exit Procedure(s):

IV. Administration and logistics:

A. Logistics load out items:

Item	Initial Load Out	Resupply Request at
Rations		
Fuel		
Water		
Small Arms Ammunition		
SA Missiles		
Other		

B. Medical:

1. Facility/BAS located at:

C. Time space logistics analysis: (How long will it take to get the supplies out to your subordinate units.)

1. Missile/ammo resupply:
2. All other requests:

D. Resupply Procedures: (Address in detail, how your subordinate units will receive required resupply.)

1. Further Ammo will be drawn from ASP through:

Item	Location	Grid	P.O.C and Resupply

			Procedures
Ammunition SAM(s)			
Ammunition Small arms			
POL			
Water			
Food			
Contact Team/Logistics Support			
Other _____			

E. Handling enemy prisoners of war:(address how teams/sections will handle POW's while still performing their assigned mission)

V. Command and signal:

A. Command

1. Your Location

A. CP Location: _____ Grid: _____

2. Higher Cmd.: _____ Grid: _____

3. Other Higher: (As appropriate)

A. Higher Cmd: _____ Grid_____

4. Supported Commander

A. Spt Cmdr Location: _____ Grid_____

5. Other (As appropriate)

A. Unit Designator: _____ Grid_____

6. Succession of Command:

A. _____
B. _____
C. _____
D. _____

B. Signal

1. Current period of the ACEOI:
2. Frequencies & Callsigns:
3. KL43, DCT and Other: (List all required information for both KL 43-C/DCT and all other ancillary communications equipment, as required.)

C. Required communications nets to be monitored: (Team control, LAAD Command)

D. Prioritization and restoration of communication nets:

E. Data link configuration and responsibilities:

F. Ground based data link operations:

1. Data Link Reference Point (DLRP): _____
2. Cartesian Coordinate Reference System:

A. CCRP: _____

3. NW quadrant: _____ NE quadrant: _____
4. SW quadrant: _____ SE quadrant: _____

G. Magnetic to True North Declination Conversion:_____(Degrees)

H. GBDL operations sheet: (as an enclosure)

I. Lost and alternate communications procedures: (Identify how subordinates will communicate if primary means are no longer available)

J. Crypto change over times:

Type	Daily	Weekly	Monthly	Time
IFF				
HF				
VHF				
Other_____				
Other_____				
Other_____				

K. Challenge and password:

L. Alternate means of authentication:

M. Brevity code: (As required, or per unit SOP. Note: when communicating with other units, only use ALSA approved multi-service brevity codes)

N. Required reports: (Identify priority and path of transmission)

1. Leaker
2. Engagement
3. SALUTE (Size, Activity Location Unit and type, Time, Equipment)
4. JSIR (Joint Spectrum Interference Report)
5. Logistics/Status Report
6. Other (As required)

O. Required reports: (Identify priority and path of transmission)

1. Leaker
2. Engagement
3. SALUTE (Size, Activity Location Unit and type, Time, Equipment)
4. JSIR (Joint Spectrum Interference Report)
5. Logistics/Status Report
6. Other (As required)

P. EMCON / RADCON / EP / ZIPLIP

1. Emissions Control Procedures:
2. Radiation Control Procedures:
3. Electronic Protection Procedures:
4. ZIPLIP Conditions and Procedures:

Q. ATO DISTRIBUTION: (how will your unit receive the ATO)

R. Special Instructions: (Given to the lowest level as necessary.)

Questions:

APPENDIX F
LAAD REPORT FORMATS

LAAD battalions and units use the following report formats to pass information. The formats are programmed into the remote terminal unit, allowing for ease of submission and transmission.

A. LAAD Early Warning/Leaker Report

Date time group of report

1. Number or type of aircraft
2. Location or heading
3. Time (if not immediate)

Note: (flash report, pass via real voice)

B. Salute Report

Date time group of report

1. Size	(S)quad
	(P)latoon
(C)ompany	
	(B)attalion
	(O)ther
2. Activity	(O)ffensive prep
	(D)efensive prep
	(C)onvoy
	(O)ther
3. Location _____	
4. Unit	(M)ech infantry
	(DI)smounted infantry
Time seen _____	
6. Equipment	(AC)aircraft
	(S)emi-auto mg
	(A)ntitank weapons
	(M)ines
	(T)anks
	(ART)illery
	(TR)ucks

(B)oats

7. Comments _____

C. NBC-1 Report

Date time group of report

1. Type of report (N)uclear
   (B)iological
   (C)hemical
2. Position of observer _____
   Direction of attack _____
   Direction _____ dgs
3. DTG attack began or ended _____/_____
4. Location of attack _____
5. Means of delivery (A)ircraft
   (ART)illery
   (M)issiles
6. Type of burst (A)irburst
   (S)urface
   (SUB)surface
   (SPR)ay
7. Type of agent (N)erve
   (B)lister
   (BL)ood
   (C)hoking
   (I)rritant
   (U)nknown
8. Comments _____

D. CASEVAC Request (Team Leader Level)

Date time group of report

1. Call sign of requesting party _____
2. Number of injured _____
3. Type of injury _____
4. Status of injured _____
5. Location of injured grid _____
6. Amplifying instructions or comments _____

E. Engagement Report

Date time group of report

1. Unit (call sign or tm #)
2. Aircraft number or type
3. Time of engagement
4. Location of engagement
   - Polar _____
   - Cartesian _____
   - Mgrs _____
   - Lat or long _____
5. Number of missiles/rounds fired
6. Results
   - (K)ill
   - (M)iss
   - (D)amage

F. Air Defense Status Message

Date time group of report

1. Air defense warning condition
   - (W)hite
   - (Y)ellow
   - (R)ed
2. Weapons control status
   - (F)ree
   - (T)ight
   - (H)old
3. States of alert
   - (A) Battle stations
   - (B) 5-minute alert
   - (C) 1-hour alert
   - (D) 4-hour alert
4. Effective DTG

G. Frequency Interference Report

Date time group of report

1. Type of report
2. Unit location and time
3. Frequency affected
4. Equipment affected
   - (FM)Radio or VHF
   - (N)AVAID
   - (S)AT comm.

(AM)Radio or HF
(R)adar
(O)ther _____

5. Strength of interference (W)eak
(M)edium
(S)trong
6. Comments or any amplifying instructions

H. Movement Order

Date time group of report
1. Relocation position grid _____
2. Time released from current mission/_____
Mission start time (DTG) _____
3. Time to be operational (DTG)
4. Comments (amplifying instructions

I. LAAD Status or Logistics Report

Date time group of report
1. Personnel OFF/SNCO/ENL ___/___/___
2. Missiles # OP _____
NON-OP _____
needed _____
3. IFF # OP _____
NON-OP _____
4. TDAR # OP _____
NON-OP _____
5. RTU GBDL capable _____up
_____ down
6. Vehicles Type_____ # OP_____
NON-OP_____
Type_____ # OP _____
NON-OP_____
Type_____ # OP _____
NON-OP_____
7. Crypto Type_____ # OP _____
NON-OP_____
8. Pol resupply (in gallons) Diesel _____

Mogas _____
Oil _____
Whitegas _____
Antifreeze _____
Brake fluid _____
CLP _____
Other _____

9. Water resupply _____ gal
10. Battery resupply Type _____ _____ ea
Type _____ _____ ea
Type _____ _____ ea
Type _____ _____ ea
11. Ammo resupply Type _____ _____ ea
Type _____ _____ ea
Type _____ _____ ea
Type _____ _____ ea
12. Chow resupply _____ cases of MREs
13. Location or time for resupply _____
14. Comments _____

J. Tactical Location Report

Location will be sent IAW OPORD (i.e., Grid/Cartesian/Lat/Long)
Date time group of report

1. Bn COC _____
2. Bn (jump CP) _____
3. Alpha btry COC _____
4. Alpha btry (jump CP) _____
5. Bravo btry COC _____
6. Bravo btry (jump CP) _____
7. Alpha btry 1st plt CP _____
8. 1st sec /# of teams _____
9. 2nd sec /# of teams _____
10. 3rd sec /# of teams _____
11. Alpha btry 2nd plt CP _____
12. 1st sec /# of teams _____
13. 2nd sec /# of teams _____

14. 3rd sec /# of teams _____
15. Alpha btry 3rd plt CP _____
16. 1st sec /# of teams _____
17. 2nd sec /# of teams _____
18. 3rd sec /# of teams _____
19. Bravo btry 1st plt CP _____
20. 1st sec /# of teams _____
21. 2nd sec /# of teams _____
22. 3rd sec /# of teams _____
23. Bravo btry 2nd plt CP _____
24. 1st sec /# of teams _____
25. 2nd sec /# of teams _____
26. 3rd sec /# of teams _____
27. Bravo btry 3rd plt CP _____
28. 1st sec /# of teams _____
29. 2nd sec /# of teams _____
30. 3rd sec /# of teams _____

K. Communications Status Report

Date time group of report

1. Reporting unit call sign _____ or unit _____
2. Down radio equipment SINCGARS _____
   AN/PRC-104 _____
   AN/MRC-138 _____
3. Down antennas RC-292_____
   OE-254_____
   AS-2259 _____
   AT-1011 _____
   AS-3900/VRC _____
   AS-3683/PRC _____
   AS-4266/PRC _____
4. Down ky equipment KY-99 _____
   AN/CYZ-10 _____
5. Down misc equipment AN/PSC-2 _____
   KL-43D _____
   AN/UPS-3 _____

AN/GRA-39 _____

PWR SUPP_____

6. Circuit outages Unit/Net/DTG of last contact
7. Comments or requests _____

L. Joint Tactical Air Strike Request

1. Unit called this is _____ Request # _____
2. A Preplanned _____ C Precedence _____
   B Immediate _____ Priority _____
3. Target is or number of
   A Pers in open _____/_____
   B Pers dug in _____/_____
   C WPNS/MG/RR/AT _____/_____
   D MORTARS/ARTY _____/_____
   E AAA, ADA _____/_____
   F RKTS, missile _____/_____
   G Armor _____/_____
   H Vehicles _____/_____
   I Bldgs _____/_____
   J Bridges _____/_____
   K Pillbox bnkrs _____/_____
   L Supplies, equip _____/_____
   M Cntr (CP, COM) _____/_____
   N Area _____/_____
   O Route _____/_____
   P Moving NESW _____/_____
   Q Remarks _____
4. Target location is
   A _____ (Coordinates)
   B _____ (Coordinates)
   C _____ (Coordinates)
   D _____ (Coordinates)
   E Target elevation _____
   F Sheet # _____
   G Series _____
   H Chart # _____

5. Target time or date
   - A ASAP _____
   - B NLT _____
   - C AT _____
   - D TO _____
6. Desired ORD or results
   - A Ordnance _____
   - B Destroy _____
   - C Neutralize _____
   - D Harass or interdict _____
7. Final control
   - A FAC/RASFAC _____
   - B Call sign _____
   - C Freq _____
   - D ASRT _____
   - E Freq (Transmit as appropriate) _____
   - F FIX/CONT PT _____
8. Remarks
   - A IP _____
   - B Hdng _____ MAG Offset L/R
   - C Distance _____
   - D Tgt elevation _____ Feet msl
   - E Tgt description _____
   - F Tgt location _____
   - G Mark type _____ Code _____
   - H Friendlies _____
9. Egress _____
10. BCN-Tgt _____ MAG BCN Grid _____/_____
11. BCN-Tgt _____ Meters Tgt Grid _____/_____
12. BCN elevation _____ Feet msl

M. Assault Support Request

1. Unit called This is _____ Request # _____
2. Request for
   - A Helicopter _____
   - B Fixed-wing _____

3. Mission categories
   - A Preplanned _____ Precedence _____
   - B Priority _____
   - C Immediate _____ Priority _____

4. Type mission
   - A Tactical _____
   - B Administrative _____

5. Mission is
   - A Assault transport _____
   - B Logistical support _____
   - C Air evacuation _____
   - D Medevac _____
   - E Aerial delivery _____
   - F C2 _____
   - G Trap _____
   - H SAR _____
   - I Illumination _____
   - J Special ops _____
   - K Other _____

6. Payload is
   - A Troops _____
   - B External cargo/wt _____/_____
   - C Internal cargo/wt/cu _____/_____/_____
   - Largest item (LXWXH) _____/_____/_____

7. Instructions

	Pickup time	Coordinates	LZ time	Coordinates
A	_____	_____	_____	_____
B	_____	_____	_____	_____
C	_____	_____	_____	_____
D	_____	_____	_____	_____

8. LZ description
   - A Wind direction/velocity _____/_____
   - B Elevation _____ Feet msl
   - C Size _____
   - D Obstacles _____

E Friendly pos _____ dir/dist _____/_____

F Enemy pos _____ dir/dist _____/_____

G Last fire received time/type _____/_____ dir/dist _____/_____

9. Lz will be

A Unmarked _____

B Marked _____ with color _____

10. Remarked with

A Panels _____

B Smoke _____

C Flares _____

D Mirror _____

E Lights _____

F NAVAID _____

G Other _____

11. Lz Description

A Pickup zone call sign _____ /frequency (color code) _____

B Lz call sign _____ /frequency (color code) _____

12. Remarks _____

APPENDIX G
GLOSSARY

SECTION I. ACRONYMS AND ABBREVIATIONS

ACE ..... aviation combat element
ADCON ..... administrative control
at ..... antitank
ASRT ..... air support radar team
AWACS ..... Airborne Warning and Control System
BCN ..... beacon
BCU ..... battery coolant unit
BDZ ..... base defense zone
bldgs ..... buildings
bnkrs ..... bunkers
btry ..... battery
CAC2S ..... common aviation command and control system
CASEVAC ..... casualty evacuation
CATF ..... commander, amphibious task force
CLP ..... cleaning lubricant protectant
cntr ..... centers
cont pt ..... control point
COC ..... combat operations center
comm ..... communications
CP ..... command post
crypto ..... cryptological
cu ..... cubic
DASC ..... direct air support center
dgs ..... degrees
det ..... detachment
DIRLAUTH ..... direct liaison authorized
DOD ..... Department of Defense
DTG ..... dtae-time group
EDATF ..... emergency defense of the amphibious task force
EMCON ..... emission control
enl ..... enlisted
FAC ..... forward air controller
FEZ ..... fighter engagement zone
fix ..... fixed
FLIR ..... forward-looking infrared
FM ..... frequency modulation
FMFM ..... Fleet Marine Force manual
FMFRP ..... Fleet Marine Force reference publication
GBDL ..... ground-based data link
GCE ..... ground combat element
GPS ..... global positioning system

H&S ..... headquarters and service
hdng ..... heading
HF ..... high frequency
HMMWV ..... high mobility, multipurpose wheeled vehicle
IAW ..... in accordance with
ICOFT ..... institutional conduct of fire trainer
IFF ..... identification, friend or foe
IP ..... initial point
IR ..... infrared radiation
LAAD ..... low altitude air defense
lat/long ..... latitude/longitude
LAV-AD ..... light armored vehicle-air defense
LZ ..... anding zone
MACCS ..... Marine air command and control system
MACG ..... Marine air control group
MAG ..... Marine aircraft group
MAGTF ..... Marine air-ground task force
MANPAD ..... man portable air defense
MAPP ..... Marine aviation planning problem
MCCRES ..... Marine Corps Combat Readiness Evaluation System
MCO ..... Marine Corps order
MCRP ..... Marine Corps reference publication
MCWP ..... Marine Corps warfighting publication
MEF ..... Marine expeditionary force
METT-T ..... mission, enemy, terrain and weather, troops and support available, time-available
MEU ..... Marine expeditionary unit
MEZ ..... missile engagement zone
mg ..... machine gun
MGRS ..... Military Grid Reference System
Misc ..... miscellaneous
MOPP ..... mission-oriented protective posture
MRE ..... meal, ready-to-eat
MTS ..... moving target simulator
NBC ..... nuclear, biological, and chemical
off ..... officer
OP ..... observation post
OPCON ..... operational control
ORL ..... ordnance release line
pers ..... personnel
RADCON ..... radiation control
RAS ..... rear area security
rkts ..... rockets
RMP ..... reprogrammable microprocessor
ROM ..... read-only memory
rr ..... railroad
RTU ..... remote terminal unit
SADC ..... sector air defense commander
SAM ..... surface-to-air missile
sec ..... section
SHORAD ..... short-range air defense

SINCGARS.....single-channel and airborne radio system
SNCO..... staff noncommissioned officer
SOA..... state of alert
SOP.....standing operating procedure
T&R ..... training and readiness
TACC.....tactical air command center
TACON..... tactical control
TADIL..... tactical digital information link
TAOC.....tactical air operations center
TDAR..... tactical defense alert radar
tgt .....target
TM.....technical manual
tm ..... team
UHF.....ultra high frequency
UNAAF..... Unified Action Armed Forces
UV.....ultraviolet
VHF..... very high frequency
wps ..... weapons
wt..... weight
WTI.....weapons and tactics instructor

SECTION II. DEFINITIONS

A

active air defense—Direct defensive action taken to nullify or reduce the effectiveness of hostile air action. It includes such measures as the use of aircraft, air defense weapons, weapons not used primarily in an air defense role, and electronic warfare. (Joint Pub 1-02)

administrative control—Direction or exercise of authority over subordinate or other organizations in respect to administration and support, including organization of Service forces, control of resources and equipment, personnel management, unit logistics, individual and unit training, readiness, mobilization, demobilization, discipline, and other matters not included in the operational missions of the subordinate or other organizations. Also called ADCON. (Joint Pub 1-02)

air control—Air control is the authority to direct the physical maneuver of aircraft in flight or to direct an aircraft or SAW unit to engage a specific target. (MCWP 3-25)

air control agency—An organization possessing the capability to exercise air control. (FMFRP 0-14 under "Marine air command and control system")

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

air direction—The guidance and supervision which a commander employs to focus his resources on mission accomplishment. Air direction occurs as a sequence of the following activities: apportionment, allocation, tasking, and fragmentary orders. The authority to regulate the employment of air resources (aircraft and surface-to-air units) to maintain a balance between their availability and the priorities assigned for their usage. (MCWP 3-25)

airspace management—The coordination, integration, and regulation of the use of airspace of defined dimensions. (Joint Pub 1-02)

antiair warfare—A US Navy/US Marine Corps term used to indicate that action required to destroy or reduce to an acceptable level the enemy air and missile threat. It includes such measures as the use of interceptors, bombers, antiaircraft guns, surface-to-air and air-to-air missiles, electronic attack, and destruction of the air or missile threat both before and after it is launched. Other measures which are taken to minimize the effects of hostile air action are cover, concealment, dispersion, deception (including electronic), and mobility. (Joint Pub 1-02)

area of operations—An operational area defined by the joint force commander for land and naval forces. Areas of operation do not typically encompass the entire operational area of the joint force commander, but should be large enough for component commanders to accomplish their missions and protect their forces. Also called AO. (Joint Pub 1-02)

area of responsibility—1. The geographical area associated with a combatant command within which a combatant commander has authority to plan and conduct operations. 2. In naval usage, a predefined area of enemy terrain for which supporting ships are responsible for covering by fire on known targets or targets of opportunity and by observation. Also called AOR. (Joint Pub 1-02)

C

command and control—The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. Also called C2. (Joint Pub 1-02)

D

direct liaison authorized—That authority granted by a commander (any level) to a subordinate to directly consult or coordinate an action with a command or agency within or outside of the granting command. Direct liaison authorized is more applicable to planning than operations and always carries with it the requirement of keeping the commander granting direct liaison authorized informed. Direct liaison authorized is a coordination relationship, not an authority through which command may be exercised. Also called DIRLAUTH. (Joint Pub 1-02)

J

joint operation—An operation carried on by a force which is composed of significant elements of the Army, Navy or the Marine Corps, and the Air Force, or two or more of these Services operating under a single commander authorized to exercise unified command or operational control over joint forces. Note: A Navy/Marine Corps operation is not a joint operation. (FMFRP 0-14)

L

lame duck procedures—Lame duck procedures are established for friendly aircraft when their communications, navigation, and IFF capabilities are degraded or inoperable because of battle damage or equipment malfunction. They allow friendly aircraft to safely ingress through a MAGTF controlled airspace. Lame duck procedures must be well-planned (detailed but simple), well-briefed, and disseminated to all friendly aircrews and operators within the integrated air defense system and Marine air command and control system. They must allow for different situations. For example, an aircraft with considerable battle damage may not be able to go to numerous control points at specific altitudes and air speeds. Aircrews must understand that failure to adhere to lame duck procedures may result in engagement by friendly air defense systems. (FMFM 5-50)

M

Marine air command and control system—A system which provides the aviation combat element commander with the means to command, coordinate, and control all air operations within an assigned sector

and to coordinate air operations with other Services. It is composed of command and control agencies with communications-electronics equipment that incorporates a capability from manual through semiautomatic control. Also called MACCS. (Joint Pub 1-02)

O

operational control—Transferable command authority that may be exercised by commanders at any echelon at or below the level of combatant command. Operational control is inherent in combatant command (command authority). Operational control may be delegated and is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission. Operational control includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions assigned to the command. Operational control should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Operational control normally provides full authority to organize commands and forces and to employ those forces as the commander in operational control considers necessary to accomplish assigned missions. Operational control does not, in and of itself, include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. Also called OPCON. (Joint Pub 1-02)

P

passive air defense—All measures, other than active air defense, taken to minimize the effectiveness of hostile air action. These measures include deception, dispersion, and the use of protective construction. (Joint Pub 1-02)

positive control—A method of airspace control which relies on positive identification, tracking, and direction of aircraft within an airspace, conducted with electronic means by an agency having the authority and responsibility therein. (Joint Pub 1-02) The tactical control of aircraft by a designated control unit, whereby the aircraft receives orders affecting its movements which immediately transfer responsibility for the safe navigation of the aircraft to the unit issuing such orders. (FMFRP 0-14)

procedural control—A method of airspace control which relies on a combination of previously agreed and promulgated orders and procedures. (Joint Pub 1-02)

R

rules of engagement—Directives issued by competent military authority which delineate the circumstances and limitations under which United States forces will initiate and/or continue combat engagement with other forces encountered. Also called ROE. (Joint Pub 1-02)

T

tactical air command center—The principal US Marine Corps air command and control agency from which air operations and air defense warning functions are directed. It is the senior agency of the US Marine air command and control system that serves as the operational command post of the aviation combat element commander. It provides the facility from which the aviation combat element commander and his battle staff plan, supervise, coordinate, and execute all current and future air operations in support of the Marine air-ground task force. The tactical air command center can provide integration, coordination, and direction of joint and combined air operations. Also called Marine TACC. (Joint Pub 1-02)

tactical air control center—The principal air operations installation (land- or ship-based) from which all aircraft and air warning functions of tactical air operations are controlled. Also called Navy TACC. (Joint Pub 1-02)

tactical air direction center—An air operations installation under the overall control of the tactical air control center (afloat)/tactical air command center, from which aircraft and air warning service functions of tactical air operations in an area of responsibility are directed. Also called TADC. (Joint Pub 1-02)

tactical control—Command authority over assigned or attached forces or commands, or military capability or forces made available for tasking, that is limited to the detailed and, usually, local direction and control of movements or maneuvers necessary to accomplish missions or tasks assigned. Tactical control is inherent in operational control. Tactical control may be delegated to, and exercised at any level at or below the level of combatant command. Also called TACON. (Joint Pub 1-02)

APPENDIX H
REFERENCES AND RELATED PUBLICATIONS

Joint Publications

0-2 Unified Action Armed Forces (UNAAF)

1-02 Department of Defense Dictionary of Military and Associated Terms

3-0 Doctrine for Joint Operations

3-01.5 Doctrine for Joint Theater Missile Defense

3-02 Joint Doctrine for Amphibious Operations

3-52 Doctrine for Joint Airspace Control in the Combat Zone

3-54 Joint Doctrine for Operations Security

3-56.1 Command and Control for Joint Air Operations

5-0 Doctrine for Planning Joint Operations

Fleet Marine Force Manuals

3-30 Communications

5-1 Organization and Function of Marine Aviation

5-30 Assault Support

5-50 Antiair Warfare

5-70 MAGTF Aviation Planning

Fleet Marine Force Reference Publications

Marine Corps Supplement to the DOD Dictionary of Military and Associated Terms

ICAC2: Multiservice Procedures for Integral Combat Airspace Command and Control

5-62 TAGS: Multiservice Procedures for the Theatre Air-Ground System

5-71 Aviation Planning Documents

Marine Corps Doctrinal Publications

1 Warfighting

1-3 Tactics

5 Planning

6 Command and Control

Marine Corps Warfighting Publications

3-25 Control of Aircraft and Missiles

3-25.3 Marine Air Command and Control System Handbook

3-25.5 Direct Air Support Center Handbook

3-25.6 Sector Antiair Warfare Coordinator Handbook

3-25.7 Tactical Air Operations Center Handbook

3-25.8 Marine Air Traffic Control Detachment Handbook

Marine Corps Reference Publications

5-2A Operational Terms and Graphics

Naval Warfare Publications

3-01.01 Anti-air Warfare

3-01.10 Anti-air Warfare Commander's Manual

Marine Corps Orders

P3500.19 Aviation Training and Readiness Manual, Vol V, Marine Air Command and Control System (MACCS)

3501.9B Marine Corps Combat Readiness Evaluation System (MCCRES)Vol VIII, Marine Command and Control System (MACCS)

Technical Manuals

08319A-12 Technical Manual Operators and Organizational Maintenance Instructions STLS (Stinger Launch Simulator)

9-1425-429-12 Operator's and Organizational Maintenance Manual: Stinger Guided Missile System