MCRP 3-31.2
(Formerly MCWP 3-22.2)

Suppression of Enemy Air Defenses (SEAD)

US Marine Corps

PCN 144 000245 00

CD&I (C 116)

2 May 2016

ERRATUM

to

MCWP 3-22.2

SUPPRESSION OF ENEMY AIR DEFENSES (SEAD)

1. Change all instances of MCWP 3-22.2, *Suppression of Enemy Air Defenses (SEAD),* to MCRP 3-31.2, *Suppression of Enemy Air Defenses (SEAD).*

2. Change PCN 143 000096 00 to PCN 144 000245 00

3. File this transmittal sheet in the front of this publication.

PCN 144 000245 80

To Our Readers

Changes: Readers of this publication are encouraged to submit suggestions and changes that will improve it. Recommendations may be sent directly to Commanding General, Marine Corps Combat Development Command, Doctrine Division (C 42), 3300 Russell Road, Suite 318A, Quantico, VA 22134-5021 or by fax to 703-784-2917 (DSN 278-2917) or by E-mail to **morgann@mccdc.usmc.mil**. Recommendations should include the following information:

- Location of change
  - Publication number and title
  - Current page number
  - Paragraph number (if applicable)
  - Line number
  - Figure or table number (if applicable)
- Nature of change
  - Add, delete
  - Proposed new text, preferably double-spaced and typewritten
- Justification and/or source of change

Additional copies: A printed copy of this publication may be obtained from Marine Corps Logistics Base, Albany, GA 31704-5001, by following the instructions in MCBul 5600, *Marine Corps Doctrinal Publications Status.* An electronic copy may be obtained from the Doctrine Division, MCCDC, world wide web home page that is found at the following universal reference locator:
http://www.doctrine.usmc.mil.

Unless otherwise stated, whenever the masculine gender is used, both men and women are included.

DEPARTMENT OF THE NAVY
Headquarters United States Marine Corps
Washington, DC 20380-1775

18 May 2001

FOREWORD

Marine Corps Warfighting Publication (MCWP) 3-22.2, *Suppression of Enemy Air Defenses (SEAD)* provides the information needed by Marines to understand, plan, and execute SEAD missions in support of Marine air-ground task force (MAGTF), joint, and combined operations. The focus of MCWP 3-22.2 is for the MAGTF commander, his staff, and other personnel involved in planning and executing operations to understand the requirements to plan successful SEAD missions during an operation. This publication:

- Defines SEAD.
- Assesses the threat.
- Highlights capabilities and limitations of SEAD.
- Discusses SEAD planning.
- Discusses critical aspects of SEAD mission execution.

MCWP 3-22.2 supersedes Fleet Marine Force Manual (FMFM) 5-45, *Suppression of Enemy Air Defenses*, dated 30 September 1994.

Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

B. B. KNUTSON, JR.
Lieutenant General, U.S. Marine Corps
Commanding General
Marine Corps Combat Development Command

DISTRIBUTION: 143 000096 00

Suppression of Enemy Air Defenses

Table of Contents

Chapter 1. Fundamentals

Definitions 1-1
Categories 1-4
  Preplanned SEAD 1-5
  Reactive SEAD 1-5
SEAD Missions 1-7
  Concurrent 1-7
  Sequential 1-8
Courses of Action 1-8
  Destructive 1-8
  Disruptive 1-8
Relationship Between MAGTF and Joint SEAD 1-9
  Joint Operations Area/Area of Responsibility 1-10
  Localized 1-10
  Opportune 1-10
A Tactical Mission 1-11
The Need for SEAD 1-13
The Means of SEAD 1-15

Chapter 2. The Threat

Assessing the Enemy 2-1
Integrated Air Defense System 2-2
  Command Element 2-3
  Sensors 2-3

Weapons Systems 2-3
C2 Network 2-4
Engagement Sequence 2-4
Detect 2-5
Identify 2-5
Correlate/Track 2-5
Target Assignment 2-6
Weapons Control 2-6
Concept of Employment 2-6
Centralized IADS Engagement 2-7
Autonomous Engagement 2-9
Territorial IADS 2-10
Tactical IADS 2-11
Centralized Control 2-13
Decentralized Control 2-14
Autonomous Control 2-14
Capabilities 2-15
Sensors 2-15
Weapons Systems 2-15
C2 Network 2-16
Redundancy 2-16
Surprise, Mobility, and Deception 2-17
Aggressive Action, Initiative, and Originality 2-17
Coordinated Action 2-17
All-Around Security 2-18
Radio Electronic Combat 2-18
Vulnerabilities 2-19
Centralized Control 2-19
Autonomous Control 2-19
Misemployment 2-20
Logistic Support 2-21
Trends 2-21

Chapter 3. Planning

Responsibilities 3-1
Command Element 3-1
Aviation Combat Element. 3-2
Ground Combat Element 3-3
Planning Goals 3-4
Detection. 3-4
Identification. 3-5
Correlation/Tracking. 3-5
Target Assignment 3-6
Weapons Control 3-6
SEAD in Support of a Mission to Destroy an IADS. 3-8
Command Posts 3-8
Sensors 3-9
Weapons Systems 3-9
C2 Network. 3-9
SEAD in Support of a Mission Conducted Within an IADS 3-9
Command Posts 3-10
Sensors 3-10
Weapons Systems 3-10
C2 Network. 3-11
RSEAD Planning 3-11
SEAD Zones 3-11
ACE Commander's Guidance 3-13
Coordinating a Response 3-16
RSEAD Manager 3-16
Adjusting the Plan. 3-20

Chapter 4. Execution

Intelligence Collection and Dissemination 4-1
Collection/Dissemination of Targets 4-2
Target Location Accuracy. 4-3
Damage Assessment 4-4
Requesting SEAD 4-4
Preplanned SEAD 4-4
Reactive SEAD 4-5
Coordination 4-5
Timing and Delivery of Fires 4-5
Coordination with Ground Forces. 4-5
Airspace Coordination 4-6
Separation Techniques 4-6
Lateral Separation 4-7
Altitude Separation 4-7
Altitude and Lateral Separation 4-7
Time Separation 4-8
Combined Arms 4-8

Appendices

A. Glossary A-1
B. References. B-1

Chapter 1
Fundamentals

The Marine air-ground task force (MAGTF) commander uses ground based and airborne fires to suppress enemy air defense systems allowing friendly aircraft to conduct missions within the airspace protected by these defenses. This is known as suppression of enemy air defenses (SEAD). SEAD increases the effectiveness and flexibility of MAGTF operations.

SEAD supports MAGTF, joint, and combined aviation operations across the spectrum of warfare—from peacekeeping to military operations other than war (MOOTW), and low-intensity through high-intensity conflicts. SEAD is a tactical mission. It may support one or more levels of warfare (tactical, operational, and strategic) depending on the mission and the threat systems encountered. See figure 1-1 on page 1-2.

Definitions

Prohibitive interference is that degree of influence introduced by the enemy that prevents the accomplishment of the MAGTF's mission. Prohibitive interference is subjective. Factors influencing prohibitive interference are asset attrition (the inability to achieve the MAGTF mission due to destruction of MAGTF assets) and mission aborts (inability to achieve the MAGTF mission due to enemy forced aborts or likelihood of destruction).

Antiair warfare's (AAW's) primary function is to gain and maintain the degree of air superiority required for the MAGTF to conduct operations. AAW prevents the enemy from restricting MAGTF air, land, and naval operations at a given time and place.

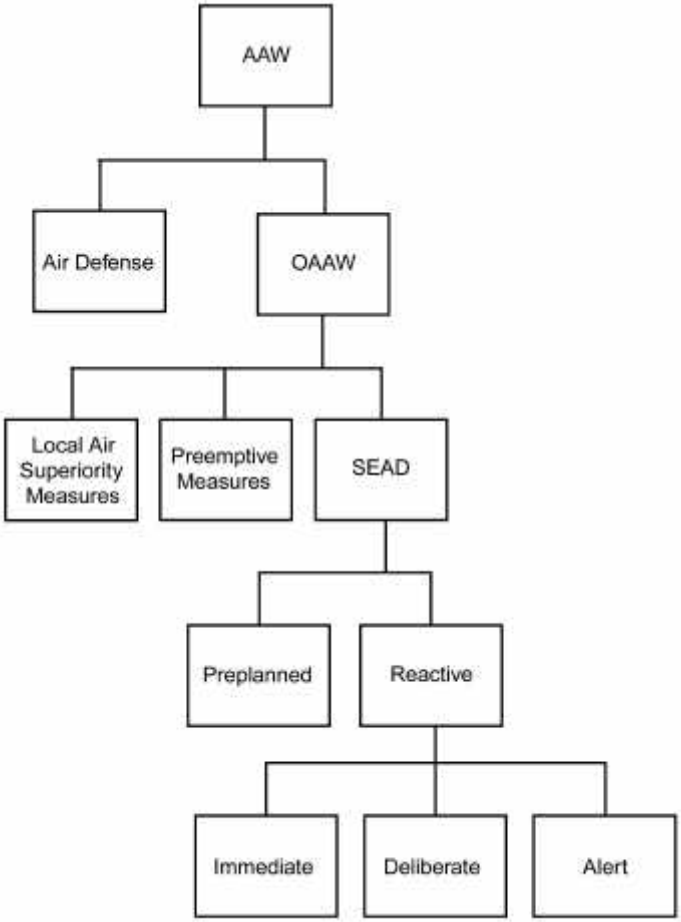

Figure 1-1. Antiair Warfare Diagram.

The enemy's air, surface-to-air, surface-to-surface, and air-to-surface threat to the MAGTF includes aircraft, surface-to-air weapons, tactical missiles (TMs), and unmanned aerial vehicles (UAVs). Tactical missiles include theater and tactical ballistic missiles (TBMs) and cruise missiles. Employing the AAW principles of destruction-in-depth, mutual support, and centralized command and decentralized control, the MAGTF uses air defense and/or offensive antiair warfare (OAAW) to reduce or eliminate this threat.

The objective of OAAW is to destroy or neutralize the enemy's air, surface-to-air, surface-to-surface, and air-to-surface threat before it launches or assumes an attacking role. Preemptive measures, SEAD, and local air superiority measures achieve the objectives of OAAW.

Preemptive measures weaken the enemy's air, surface-to-air, surface-to-surface, and air-to-surface threat before the enemy can prevent the attainment of the MAGTF's objectives. If preemptive measures are successful, they allow current/future air and ground operations to continue without prohibitive interference. Preemptive measures include the following:

- Air strikes on enemy airfields that destroy or damage aircraft, facilities, or logistic support.
- Attacks on enemy command, control, and communications (C3) facilities, surveillance systems, and surface-to-air weapons.
- Airstrikes on the enemy's means of aircraft supply and support (e.g., railroads, convoys).
- Offensive antiair sweeps to destroy enemy aircraft.
- Airstrikes on TBM sites.

SEAD neutralizes, destroys or temporarily degrades surface-based enemy air defenses by destructive or disruptive means.

SEAD operations allow friendly aircraft to operate in airspace defended by enemy air defense systems. SEAD supports all air operations, including preemptive measures and local air superiority. Although SEAD is a task of OAAW, SEAD also supports functions of Marine aviation other than AAW, such as offensive air support (OAS), aerial reconnaissance, and assault support. SEAD is the application of sufficient, expedient force to facilitate achieving other missions or objectives. This force may be a part of a large-scale effort to suppress surface-based threats for the duration of a military operation. It also seeks to provide a window of opportunity—free from prohibitive interference, lasting a few minutes, hours or days—to conduct other missions.

Residual enemy air threats can exist after the application of preemptive measures and SEAD. Local air superiority measures prevent any residual enemy air threat from introducing prohibitive interference into MAGTF operations. Local air superiority measures include the use of offensive combat air patrols (CAPs) and pre-strike sweeps, escort and self-escort tactics or aircraft countermeasures and maneuvers. All levels of the aviation combat element (ACE) can plan and execute local air superiority measures.

Categories

SEAD is divided into two primary categories: preplanned SEAD, and reactive SEAD (RSEAD).

Preplanned SEAD

Preplanned SEAD is primarily an exercise in fire support planning. Fire support planning channels process requests for preplanned SEAD. Higher echelons generally plan and coordinate these requests. Normally, any SEAD mission allocated or apportioned through the normal air tasking order (ATO) cycle for an operation is preplanned SEAD. Preplanned SEAD targets permanent and semi-permanent targets such as strategic surface-to-air missiles (SAMs), early warning (EW) and ground control intercept (GCI) radar sites, C3 nodes, and passive detection systems. These systems can be located more easily with enough time to conduct mission planning. Preplanned SEAD may also target moveable or mobile threat systems.

Reactive SEAD

RSEAD suppresses or destroys "pop-up" surface-to-air threats. RSEAD missions are time sensitive and rely on standing operating procedures (SOPs) and training. RSEAD is primarily a fire support coordination issue, generally coordinated at lower echelons. RSEAD is any SEAD mission too urgent to wait for the next ATO cycle (i.e., requires execution within the next 24 hours). Depending on the nature of the supported mission, the presence of enemy air defense assets may require a SEAD effort in the next few minutes or hours. RSEAD targets typically include mobile antiaircraft artillery (AAA) and mobile or tactical SAMs, as well as smaller, more mobile EW, GCI, and local target acquisition radars. The enemy is likely to move these systems about the battlefield as a means of deception and to optimize the defense of critical sites and/or areas. Reactive SEAD is further subdivided into three types: immediate, deliberate, and alert RSEAD.

Immediate RSEAD

Immediate RSEAD occurs when a MAGTF platform or weapon system locates enemy air defense assets and targets them while it is in the process of conducting another mission. An example would be an AV-8B pilot who locates, identifies, and targets a surface-to-air threat while conducting armed reconnaissance against other targets. Immediate RSEAD affords the timeliest response to "pop-up" enemy air defense assets. If conducted successfully, there is no future requirement to locate or destroy the targeted threat system. Disadvantages include the following:

- The execution of a hasty, unplanned, and possibly uncoordinated attack.
- Lack of use of combined arms.
- Possible requirement for attackers to enter or continue operating in threat engagement envelopes.

Deliberate RSEAD

Deliberate RSEAD is a coordinated response with assets diverted from other missions against enemy air defense assets located with enough time to organize such a response. An example would be an enemy SA-X located and identified by an F/A-18 pilot while conducting close air support (CAS). This location information passes through the Marine air command and control system (MACCS). The tactical air commander may then order a deliberate RSEAD mission using assets available to the direct air support center (DASC). Deliberate RSEAD affords a timely response to a "pop-up" enemy air defense asset. Deliberate RSEAD also allows for a preplanned response. The deliberate RSEAD mission allows for a coordinated, combined arms attack. Disadvantages include the possible employment of less than

optimum ordnance and the potential requirement for attackers to enter threat engagement envelopes. Deliberate RSEAD is the response when an immediate RSEAD strike is neither feasible (e.g., lack of ordnance, immediate location data unavailable, etc.) nor sufficient (e.g., threat requires a coordinated response).

Alert RSEAD

Alert RSEAD responds to threats requiring dedicated RSEAD planning. Planners may use alert RSEAD against a particular surface-to-air system, when requiring a multi-axis attack, or after having discovered multiple previously unprosecuted air defense assets. If aircraft are used, they may be airborne or strip alert assets. Advantages include: dedicated planning, proper weaponeering, and using dedicated platforms or weapon systems (no assets diverted from other missions). Disadvantages include the lack of a timely response, timely threat locations, and available dedicated SEAD assets.

SEAD Missions

Concurrent

Concurrent SEAD implies that destructive or disruptive efforts occur simultaneously with other missions such as air interdiction (AI), armed reconnaissance (AR) or CAS, in a combined arms approach. If the enemy engages the targets entering his defended space, his weapons systems become vulnerable to the disruptive and destructive efforts of our SEAD assets. If the enemy does not respond, the supported mission may likely destroy his defended target(s) or otherwise accomplish the mission.

Sequential

Sequential SEAD implies that destructive or disruptive efforts are preemptive. These efforts must precede other mission(s) to introduce a window of opportunity during which MAGTF operations will be free from prohibitive interference. Sequential SEAD is often associated with an operation intended to systematically degrade an enemy integrated air defense system (IADS) as was done in Operation Desert Storm and Operation Allied Force.

Courses of Action

Destructive

Destructive (lethal) SEAD is classified as those actions taken to suppress enemy air defenses by destroying the targeted system. Mission objectives, threat system capabilities, and friendly asset capabilities influence these courses of action (COAs). Destructive SEAD includes surface delivered fires (ground or naval based), stand-off air-to-surface weapons, conventional air-to-ground munitions or electronic attack (EA) in the form of antiradiation missiles (ARMs).

Disruptive

Disruptive (nonlethal) SEAD includes EA (jamming or bulk chaff) to temporarily deny, degrade, deceive, delay or neutralize the targeted system. While intended to be destructive, high-speed antiradiation missile (HARM) can also be disruptive. Disruptive SEAD's intent is not necessarily to destroy a system, but rather to

reduce its capability to a level that allows the accomplishment of MAGTF objectives.

Relationship Between MAGTF and Joint SEAD

Joint suppression of enemy air defenses (J-SEAD) is a broad term that encompasses all SEAD activities provided by components of a joint force. The MAGTF can provide or receive J-SEAD.

J-SEAD creates conditions where friendly aircraft can conduct operations in enemy airspace minimizing the surface to air threat. It is part of a joint force's attempt to gain control of enemy airspace by minimizing or eliminating the threat presented by IADS.

In a joint environment, MAGTF assets may support joint task force (JTF) SEAD objectives. It is important to be familiar with J-SEAD terminology, and how MAGTF SEAD missions relate to the J-SEAD. Joint Publication (JP) 3-01.2, *Joint Doctrine for Offensive Operations Countering Air and Missile Threats*, separates J-SEAD into three categories: joint operations area (JOA)/area of responsibility (AOR); localized and opportune.

To summarize the relationship between MAGTF and J-SEAD, J-SEAD generally relates to missions concerning both geography and time. MAGTF SEAD types, preplanned and reactive, depend primarily on time. MAGTF SEAD types follow the MAGTF targeting cycle. MAGTF SEAD efforts are normally localized or opportune. The ACE may participate in the JOA/AOR SEAD effort by conducting an AI strike as part of the J-SEAD plan. MAGTF aviation missions flown in support of the MAGTF normally have more confined objectives, either by duration or area of effect (i.e., localized). If, while conducting CAS, AR, or AI missions, undetected

threat systems 'pop-up' and prevent the accomplishment of the MAGTF mission, aircrews may need to take immediate (i.e., opportune) disruptive or destructive COAs to accomplish their missions.

Joint Operations Area/Area of Responsibility

JOA/AOR SEAD creates increasingly favorable conditions for friendly operations by disabling specific enemy air defense system(s) (or major capabilities of those systems). JOA/AOR SEAD usually supports campaign level operations and targets high payoff air defense assets that will result in the greatest degradation of the enemy's total IADS. The immediate objective is to permit effective friendly air operations by protecting friendly airborne systems, interrupting selected elements of enemy air defenses, and establishing flexibility for friendly operation on both sides of the forward line of own troops (FLOT).

Localized

Localized SEAD normally has specified time and space limitations and supports specific operations or missions. It also contributes to local air superiority, facilitating joint operations in the area.

Opportune

Opportune SEAD is usually unplanned because of a lack of timely air defense threat identification information that would facilitate planned suppression. Opportune SEAD includes aircrew self-defense, targets of opportunity, targets acquired by observers or controllers, and targets acquired by aircrews. It is a continuous operation involving immediate response to acquired air defense targets of opportunity.

The joint force operation plan contains specific request procedures. JP 3-01.2 and the Air, Land, Sea Application (ALSA) *Multiservice Tactics, Techniques, and Procedures for the Suppression of Enemy Air Defenses*, contain more information on J-SEAD.

A Tactical Mission

SEAD is a tactical mission that supports other aviation missions. Rather than having an operational focus, SEAD is a supporting mission. All attacks on enemy air defenses are not SEAD. Likewise, SEAD is more than artillery-delivered suppression of known enemy air defense weapons during air operations.

To successfully conduct SEAD, the same requirements for targeting and planning exist as for deep air support (DAS), CAS, and other tactical missions. Targets are selected based on the commander's guidance and mission assessment. Once specific targets are decided, they are prioritized and known targets are plotted for attack. Detailed mission planning will determine the number of sorties, types of munitions used, and other factors required to achieve the desired effects on the target.

For example, the Marine expeditionary force (MEF) commander receives his mission from the joint force commander (JFC). He begins the Marine Corps Planning Process (MCPP) by conducting mission analysis. A product of mission analysis is a warning order. The ACE will receive the warning order and will begin parallel planning. Information will be passed back and forth between the ACE planners and the ACE liaison officers on the MEF operational planning team. The ACE would also use the MCPP to formulate its plans for the upcoming operation. A warning order would go from the wing to its groups. In this

manner, tactical level planning is conducted at all levels of command in the MAGTF.

Whether SEAD is preplanned or reactive, the battle damage assessment (BDA) will reveal the level of success of the missions. A decision to readdress targets will be made. The decision may have to occur airborne while the supported aircraft are enroute to their target. An example: part of the go/no-go criteria for an AI mission is that the SAMs defending an airfield be suppressed before the strike aircraft deliver ordnance. A combination of EA (jamming and antiradiation missiles [ARMs]) and decoys presents a deceptive strike feint, disrupts the SAMs' communications network, and destroys their targeting radars before strike aircraft reach the initial point (IP). As the strike aircraft near the IP, the mission commander's radar warning receiver (RWR) indicates that SAMs are still active in the target area. The mission commander must rapidly assess the threat and SEAD effectiveness and decide whether to—

- Continue the mission as briefed;
- 'Strip' a portion of the strike's aircraft to make their way to the SAM site(s) and destroy the launchers; or
- Abort the strike (based on go/no-go criteria).

Refer to MCWP 3-16, *Tactics techniques and Procedures for Fire Support Coordination*, MCWP 3-23, *Offensive Air Support*, MCWP 3-23.2, *Deep Air Support*, and MCRP 3-16.B, *The Joint Targeting Process and Procedures for Targeting Time-Critical Taragets* for more information on the joint targeting cycle and the MAGTF targeting cycle.

The Need for SEAD

The proliferation of inexpensive, reliable, lethal, ground-based air systems promises to increasingly complicate the MAGTF's ability to conduct its assigned mission. This applies to developed, emerging, and developing countries around the globe. These systems provide the capability to quickly deploy redundant, multispectral systems coordinated through robust command and control (C2) networks. As information technology continues to improve, software will become a more significant factor in the functionality of these weapons systems. Upgrades will be easier to incorporate, nearly impossible to detect, and thus much harder to counter. The trends also include a migration toward mobile and moveable or semi-permanent air defense systems, vice the larger, fixed systems of the past. This will make it harder to detect, locate, and subsequently target these systems.

The MAGTF commander must consider the need for SEAD and provide SEAD guidance for MAGTF operations. The decision to conduct SEAD depends on the following:

- MAGTF's mission, enemy, terrain and weather, troops and support available, time available (METT-T).
- Acceptable risk.
- Capabilities and complexity of enemy air defenses. Air defense effectiveness depends on the quality and quantity of weapons, integration, mutual support, and the skill level of the operator. The MAGTF commander, subordinate element commanders, and their staffs evaluate the enemy's capability to influence the MAGTF's use of aviation.

- Ability of friendly aircrews to evade enemy air defenses and of aircraft survivability equipment to deny or negate the threat weapons systems' engagements.

- Capabilities and availability of friendly systems to provide SEAD. If MAGTF air operations expose friendly aircraft to enemy air defenses, planners consider the capabilities and availability of SEAD-capable systems. Planners evaluate the impact on other MAGTF operations by the use of these systems to conduct SEAD. Enemy air defense effectiveness and the relative importance of MAGTF air operations may cause SEAD to be a high priority fire support mission for the MAGTF.

The MAGTF conducts SEAD planning, coordination, and execution continuously. SEAD requires close coordination between intelligence, fire support, and mission planners at each MAGTF echelon. Planners must—

- Determine the time available.

- Review the SEAD requirement and determine the MAGTF's capability to meet the requirement.

- Determine targets to attack and target location, the effects desired, and the need and means to conduct damage assessment.

- Identify SEAD assets available.

- Issue taskings or requests for additional support to meet the MAGTF SEAD requirement.

- Conduct liaison and coordination with other MAGTF elements.

- Evaluate SEAD effectiveness and determine the need for additional SEAD.

The Means of SEAD

Aviation and ground forces conduct SEAD to protect specific air missions. Effective SEAD requires unity of effort to achieve a combined arms effect. This requires extensive training, integration at every level, and detailed planning. A combined arms approach enhances the results against enemy air defenses while reducing the risk to friendly aircraft. The MAGTF performs SEAD by integrating air, ground, and naval combat power. The MAGTF uses the following means, optimally in combination, to conduct SEAD:

- **Fixed-wing attack—**Destructively strike targets with general purpose or precision-guided bombs, rockets, ARMs, and guns.
- **Attack helicopters—**Destructively strike targets with precision-guided munitions (PGM), rockets, and guns.
- **UAVs—**Used to facilitate SEAD with their ability to detect, identify, locate, and track SEAD targets; assess the effect of SEAD efforts; and relay this information in (near) real-time to cognizant C2 agencies within the MACCS as well as the JTF.
- **Electronic warfare—**EA-6Bs disrupt critical C2 information flow within an IADS, conduct EA against radars, and target air defense sites with ARMs.
- **Tanks, antitank weapons, and machine guns—**Destructively target individual vehicles and sites with precision/non-precision munitions.
- **Mortars and artillery—**Destroy and disrupt air defense assets with both guided and unguided munitions; range, accuracy, and responsiveness make artillery the most common indirect fire SEAD asset.

- **Naval surface fire support—**Destroy and disrupt air defense assets with both guided and unguided munitions, including cruise missiles.

Chapter 2
The Threat

"If you know the enemy and yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle." —Sun-Tzu

Assessing the Enemy

Combat staff planners at every level of the MAGTF must consider the threat's expected nature, composition, and ability to affect our aviation missions. The threat's nature and intensity influence the tactics and techniques selected during mission planning, and will help define what type(s) of SEAD assets must be dedicated to effectively suppress the threat. The same considerations identified with other MAGTF missions apply to SEAD operations; the mnemonic METT-T helps to identify the key components to be considered.

Sun-Tzu's statement remains valid today. To ensure victory, a great deal of effort must be exerted in assessing the enemy and identifying unique capabilities and limitations. With respect to SEAD, that analysis focuses on the specifics of the enemy's air defense organizational structure, weapon systems capabilities, physical deployment, C2 doctrine, and operator training and proficiency. MAGTF planners must analyze air defense capabilities, identify vulnerabilities, and exploit these weaknesses through SEAD efforts. This includes target area tactics, ordinance delivery profiles, and the integration of onboard aircraft

survivability equipment (ASE) with dedicated disruptive and destructive attack platforms.

The majority of this chapter will address the most potent threat to MAGTF aviation—IADS. The methodology used to analyze an IADS remains valid for all other air defense structures. It is beyond the scope of this manual to provide specific data on air defense and C2 equipment, and control strategies. Classified publications such as the AFTTP 3-1, Vol. II, *Threat Reference Guide and Countertactics (U)* and the *Missile & Space Intelligence Center's World Wide Threat Handbook (U)* are excellent resources for such specifics. Open-source references include books such as the *Jane's Information Group* series.

Integrated Air Defense System

The most significant threat to MAGTF aircraft is an organized, proficient IADS capable of correlating information from a host of long range, active and passive detection and cueing sources that employ systems capable of multiple engagements. The MAGTF will probably not be able nor required to suppress an entire IADS. It will focus on some portion of the IADS to open an avenue to conduct its mission. Whether conducting SEAD against an IADS, a locally integrated air defense system or an autonomous air defense unit, the MAGTF mission planner must organize his SEAD to subdue the threat and ensure the supported mission's success. IADS, regardless of complexity, equipment or type, consists of four components: the command element (CE), sensors, weapons systems, and C2 network.

Command Element

The CE exercises control over all other IADS components. Responsibility for the defense of a designated vital area rests with this organization. It possesses the authority to identify contacts and commit weapons against air targets in its AOR.

Sensors

Active and/or passive sensors allow the CE to detect, identify, and correlate/track aircraft and airborne weapons within its AOR. Sensors are normally positioned to detect hostile targets at as great a distance from the defended vital area as possible, and present the information in a usable manner to the IADS. The primary purpose of these sensors is to provide data for the IADS to establish a recognized air picture for the CE, via the C2 network.

Weapons Systems

The IADS will have some combination of interceptor aircraft, SAM systems, antiaircraft artillery (AAA), and jammers available to harass and destroy inbound aircraft and missiles. Actual composition ratios between different weapons system types vary greatly from country to country, and even within a single country depending on the criticality of specific vital areas. The IADS aims to overwhelm attacking aircraft with these complementary systems. Weapons systems are located in such a manner as to ensure mutual support is attained.

C2 Network

The command post, sensors, and weapons systems must be linked, providing the controlling agency with the ability to see detected aircraft, and effectively coordinate an economic yet sufficient response with available weapons. The effectiveness of an IADS hinges on the C2 network's speed and reliability for components to receive, evaluate, and forward information. In the most developed IADS, individual sensors and weapon systems are capable of autonomous operations, should they lose connectivity with adjacent and higher components. The C2 network is the critical element of an IADS. It is the means by which sensors, weapons, and the CE are integrated. Without the C2 network, there exists only an air defense, which is neither integrated nor a system.

Engagement Sequence

Every IADS should in most cases accomplish the following five tasks to engage enemy aircraft:

- Detect.
- Identify.
- Correlate/track.
- Target assignment.
- Weapons control.

If operating autonomously, these tasks may be completed organically, which may or may not increase air defense reaction time. If integrated into an IADS network, many of these tasks

may be performed by designated agencies, resulting in dissemination to other parts of the IADS. This process of integrating and correlating IADS is designed to have a synergistic effect, thus reducing the time required to complete the engagement sequence. This in theory makes the capability of a truly integrated air defense system much greater than the capability of the sum of its components. The rules of engagement (ROE) and C2 architecture are key to ensuring an IADS provides more efficient and responsive air defense coverage.

Detect

This is the first task completed in the engagement sequence. Without detection information, the engagement sequence cannot proceed. Target detection may be accomplished by a variety of different sensors, including EW radars, passive detection devices, signals intelligence (SIGINT), aircraft, and visual observation human intelligence (HUMINT).

Identify

Once a target has been detected, its identity must be established. The primary objective of identification is to definitively determine whether an aircraft is friendly or hostile. Detection sensors can help correlate air tracks with identification, friend or foe (IFF) responses, electronics intelligence (ELINT) analysis or visual observations.

Correlate/Track

Correlation involves the fusion of detection data from various sensors to establish the three-dimensional position of an

inbound target (range, azimuth, altitude). Correlation is required to focus weapons control systems in a particular area, minimizing the amount of time required to bring weapons to bear on the target.

Target Assignment

The target assignment is the handoff or designation of identified target(s) to a specific weapons system.

Weapons Control

Once a target is designated to an individual fire control/weapons system, the target must continue to be tracked for the duration of the engagement to guide munitions to impact.

Concept of Employment

The enemy deploys sensors and weapons to provide the earliest possible detection and engagement of attacking aircraft. The enemy organizes and conducts comprehensive radar, visual, and electronic surveillance of surrounding airspace. Coverage is emphasized across major avenues of aerial approach, and focuses on the protection of critical targets. Air defense weapons are specifically placed to achieve surprise, optimize individual strengths, and offset weaknesses. To protect critical assets, the enemy places air defense weapons to maintain mutual, overlapping fire support and employ multiple engagement zones. The enemy's objective is to interfere with attacking aircraft to the extent that it will prohibit the MAGTF in accomplishing its

mission. The two most important concepts in enemy air defense employment are:

- **Mutual support** or the ability to engage high priority targets with multiple weapons systems.
- **Economy of force** or the ability to avoid multiple, unwanted engagements on the same target.

The enemy uses his air defense weapons to protect his forces by denying the MAGTF the ability to conduct effective air operations. This does not require the enemy to destroy every aircraft. The enemy air defense system can achieve this by—

- Adversely influencing friendly aircrews' ability to conduct their mission effectively (causing mission aborts).
- Destroying aircraft when they come within effective range of enemy air defense weapons.

Achieving these goals permit the enemy to continue to protect designated vital areas. There are two types of air defense operations the MAGTF can expect to encounter: centralized and autonomous. Each threat environment is unique and requires a different level of effort to either disrupt or destroy.

Centralized IADS Engagement

In an IADS, the engagement sequence is carried out through its CE, sensors, weapons systems, and C2 network physically spread across the defended area. The following text illustrates how an IADS processes information using its four components through the five tasks of the engagement sequence.

An IADS must develop and maintain a recognized air picture reflecting all aircraft operating within or approaching its area of responsibility. Each sensor may only be able to detect and identify aircraft in a small portion of the airspace for which the IADS is responsible. Each sensor provides only a portion of the information required to develop a complete aircraft track. Filter centers within the IADS process track data from the various detection assets, correlate the data, and resolve multiple inputs of a single aircraft into a track. These filter centers distribute this correlated data throughout the IADS.

Identification results are forwarded up to the (senior) controlling agency. Accurate identification of all air targets within the defended airspace is critical if friendly air operations are being conducted simultaneously, to preclude fratricide. Data correlation and identification provides the air defense commander and his staff with the recognized air picture requisite to effective air defense. Dissemination of this data provides all elements of the IADS the current recognized air picture, increasing their situational awareness.

Target assignment is the decisionmaking process employed by the air defense commander. Basically, this is how and when the air defense commander decides which aircraft are to be engaged with particular air defense assets. In an IADS, filter centers feed their consolidated air pictures into a centralized command post (CCP), also known as the controlling agency, where authority exists to commit air defense weapon systems. It is through this task of the engagement sequence that the air defense commander ensures that the principles of mutual support and economy of force are applied. Air defense weapons continually provide their status, weapons state, and functionality to the CCP. With this information, augmented with standard operating responses and rules of engagement, the air defense commander determines

which aircraft pose the greatest threat to vital areas and how that threat is to be neutralized. It is critical that the air defense commander have continual access to an accurate, recognized air picture and constant access to subordinate weapons status.

Once targets are designated for engagement, the controlling agency issues appropriate orders to fire control units. Normally targets are assigned by the CCP to a specific fighter/interceptor, SAM or AAA headquarters unit. This headquarters coordinates target engagement within its individual fire units, and returns engagement results and updated equipment status to the CCP. In centralized control operations, the CCP may assign specific target tracks to a particular fire unit or weapon.

Autonomous Engagement

Forcing the components of an IADS to operate without cuing from centralized command and control stations will have the following effects:

- Individual weapons must detect air targets with organic sensors. Most visual and IR systems are denied the benefit of radar cueing information. Weapons systems with integrated organic radars must emit radar energy, making them vulnerable to detection, location, and attack by ARMs or other weapons. Additionally this radiation provides advanced warning to ingressing aircraft.

- When an antiaircraft weapon is operating autonomously, tracking data from outside sources is not available to it. Track information would have enabled the weapon system to employ its weapon much sooner than if the individual weapon system had to create a track on its own.

- Individual weapons rely on organic means for aircraft identification. Because this increases the chance of fratricide and greatly limits the ability of friendly aircraft to operate in the vicinity, it can force operators into restrictive firing conditions, such as the requirement to visually identify targets before engaging. Every delay increases the probability of MAGTF aircraft survival.

- Economy of force is nearly impossible to achieve. Targets may be engaged by many individual weapon systems within the local area. Missiles and aircraft may engage lower priority threats, depleting supplies available for higher threats to the vital area. An IADS can be classified as either territorial or tactical, depending on the type of areas they are designed to protect. Each will have unique equipment, command structures, capabilities, and limitations.

Territorial IADS

Territorial IADS are designed to protect large, fixed airspace such as defined borders or coastlines. They also defend vital areas within a country such as critical military, industrial, and population centers. Territorial IADS are widely used, and most likely encountered when conducting air operations within the boundaries of a hostile nation. Territorial IADS have the following characteristics:

- SAM and AAA sites are well prepared, and protected with both physical structures (bunkers, revetments, decoys) and other point defense SAM and AAA systems.

- SAMs and AAA pieces are normally longer range, fixed sites. Their relatively static nature is due to the size and extensive power requirements of associated equipment, and the volume of information required to/from supporting C2 network(s).

- Territorial IADS normally employ air-to-air interceptors to complement both strategic and tactical surface-to-air weapons, and extend the destructive engagement zones as far from defended vital areas as possible.
- Because component sites are normally fixed, C2 functions are primarily conducted via rigid media (e.g., telephone lines, fiber-optic cables, and land line data links). These media will be protected through burying and/or "hardening" to prevent disruption or damage. Such C2 networks are generally impervious to all but the most direct, destructive means of attack. Primary networks may have redundant connectivity, including laser and RF data links and voice communications.
- Territorial IADS normally have rigid, centralized command structures, including air defense districts (geographically designated areas of responsibilities), air defense zones, and CCPs to control each functional area.

Tactical IADS

Tactical air defense systems are designed to protect maneuvering forces, major headquarters, and logistic areas, etc., from air attack. Linked, local area defenses (i.e., an integrated threat) may also be considered a tactical IADS. Tactical IADS are most likely encountered when conducting MAGTF operations against maneuvering forces in the field. Tactical IADS have the following characteristics:

- Often employ mobile SAMs/AAA. Other air defense assets (other than small arms) do not normally defend these.
- SAMs/AAA pieces are normally short to medium range. A wide variety of aircraft may be employed to augment surface-based weapons. Examples include fixed-wing fighters, ground attack aircraft, and rotary-wing aircraft.

- C2 functions are normally conducted via less rigid media including RF voice communications, data link, and cellular telephone. Mobile systems will endeavor to hardwire their C2 work if given the opportunity (ground forces have paused momentarily to regroup or are in a defensive posture).
- Tactical IADS normally have less rigid, more decentralized command structures.

MAGTF air operations may face both types of IADS, either sequentially (flying over engaged ground forces to strike an industrial complex deeper within a hostile country's borders) or simultaneously (striking a maneuver force headquarters that is defended not only by its organic air defenses but falls within the coverage of the country's territorial defenses). The underlying tenet of successful SEAD against an IADS is to deny or delay the engagement sequence for as long as possible, allowing MAGTF aircraft the greatest opportunity to complete their mission.

Air defense command posts are the heart of the IADS. Their destruction or disruption provides the best chance of catastrophically affecting the IADS. Degrading the enemy's air defense C2 system will limit effective air defense coverage and reduce EW. Loss of these command posts breaks an IADS into individual components and destroys system integration. Loss of integration allows the MAGTF to attack and defeat individual components in detail.

An IADS as a whole uses three types of control—centralized, decentralized, and autonomous—to maximize its ability to rapidly engage hostile aircraft. The type of control exercised determines an IADS' flexibility in dealing with late-breaking or "pop-up" targets. The type of control implemented is dependent on the country's political-military relationship, equipment sophistication, the vital area to be defended, and personnel training levels.

Centralized Control

Also known as "top-down" control, the senior controlling agency directs target engagement. Before a firing unit can engage other targets, it must request permission from the controlling agency. Centralized control is used to minimize the likelihood of engaging friendly aircraft.

Advantages

- Minimizes the likelihood of engaging friendly aircraft.
- Individual operators focus on a single or a few actions with each target before advancing to the next.
- Individual radar and fire control operators require only basic training in specific system operations to fulfill their mission.

Disadvantages

- Senior controlling agency is susceptible to over-tasking, resulting in a failure of the entire system.
- Susceptible to slow decision processing, information overloading, and a lack of independent capability.
- Requires a high degree of training and operator proficiency at higher echelons of the IADS
- Difficult for operators accustomed to working within centralized control structure to perform well in an autonomous role.
- Centralized control relies on consistent, reliable information both to and from the senior controlling agency on which to base engagement decisions.

Decentralized Control

To prevent over-tasking critical elements within the IADS, decentralized control can be used by an IADS. This is the preferred control method within the MACCS. Controlling agencies monitor unit actions and make direct target assignments to units only when necessary to ensure proper fire distribution, prevent engagement of friendly aircraft or prevent simultaneous engagements of hostile targets. Decentralized control is only possible if intermediate echelon command posts are prepared and capable to operate without the direction of senior commanders. Today, technology advances have made decentralized control more feasible because of hardware component reliability and software simplicity. With such advances, operators with a more basic level of proficiency are capable of conducting complex and detailed engagements. However, decentralized control requires a high level of confidence in subordinate element commanders, and a great deal of individual operator training and proficiency at every level within the IADS. Relative advantages of centralized control become the 'friction areas' of decentralized control architectures; the vulnerabilities of centralized control become the strengths of decentralized control.

Autonomous Control

Individual air defense elements operate without direction from higher authority. Autonomous control is normally utilized only when communication links are disrupted, saturated or destroyed. Aircraft, SAM or AAA unit commanders assume full responsibility for the entire engagement sequence, without information from the rest of the IADS.

Capabilities

Enemy air defense capabilities greatly influence the timing and duration of SEAD, MAGTF tactics, and airspace coordination. SEAD delivered at the wrong time or for an inadequate duration will be ineffective. Aircrews may be able to fly over, under or around the air defense coverage to reduce the SEAD requirement. Planners consider the threat engagement envelope and aircraft maneuverability when designing airspace control measures. From the previous discussions, MAGTF SEAD mission planners can expect air defenses to incorporate the following capabilities.

Sensors

A wide variety of redundant, multispectral sensors will be employed by an IADS, to include the use of electro-optical (EO), infrared (IR), laser, and radio frequency (RF) systems. Both active sensors (radars) and passive sensors (electronic warfare support (ES) assets) will be employed. Aircraft will be used to extend the range of sensor systems. Acquisition and tracking sources will be capable of "handing off" data to guidance mechanisms in another spectrum (e.g., night vision goggle (NVG) acquisition to an IR or imaging guidance).

Weapons Systems

A variety of weapons systems (i.e., SAMs, AAA, aircraft) use multispectral guidance—including EO, IR, RF, millimeter wave, lasers, and radio electronic combat (REC) assets—that targets MAGTF radars, communications, and global positioning system (GPS) receivers with EA. In the near future, destructive

firepower will include advanced explosives, directed energy (such as RF and laser), and electromagnetic pulse weapons. These advances complicate our ability to effectively counter and suppress such threats.

C2 Network

Technological advances have increased the efficiency of C2 networks, which makes them increasingly more difficult to disrupt and destroy and rapidly decreases network reaction time. C2 networks often use buried hard wire links to ensure connectivity.

Redundancy

Redundancy allows commanders to use the most effective sensors, weapons systems, and C2 networks to conduct the engagement sequence. Redundancy provides multiple opportunities for successful completion of the five tasks of the IADS engagement sequence and guarantees continued effectiveness as IADS components are degraded or destroyed. Multiple sensors (e.g., ground based and airborne radars) may be used to cover the same sector of airspace. Several weapons systems may be able to target aircraft in a likely avenue of approach (SAMs and AAA). A C2 network may employ a hard wire data link, a hard wire voice link (telephone), radio voice communication, radio data link communication, and cellular telephone communication to pass the same information to various components of the IADS. Technological advances allow redundancy to be built into current and future IADS components, as well as within existing systems. This greatly complicates the SEAD effort required to suppress the variety of alternative sensor, weapons system, and C2 network resources.

Surprise, Mobility, and Deception

Surprise allows commanders to optimize air defense strengths and offset weaknesses. Using the precepts of mobility and deception, commanders can conduct coordinated, concentrated air defense at critical places and times in the battle. Commanders can provide air defense coverage at critical terrain features such as barriers or river crossing sites. Since the enemy cannot be strong everywhere, economy of force must apply. Therefore the enemy can certainly be expected to employ surprise tactics, using a combination of stationary and mobile systems and an effective deception plan to surprise our aircrews, maximizing destructive capability and negating MAGTF SEAD efforts. Advanced, mobile air defense systems greatly complicate the MAGTF's ability to detect, track, and destroy these elements with existing SEAD weapons, complementing both the enemy's deception and surprise plans.

Aggressive Action, Initiative, and Originality

Like all effective military leaders, air defense unit commanders employ aggressive action, initiative, and originality to exploit inherent capabilities of their equipment. They must be responsive to changes in the tactical situation as well. When the supported unit's mission changes, the air defense commander must reevaluate his unit's deployment. He must be aware of changes in the tactics and weapons employed by opposing aircrews.

Coordinated Action

Coordinated action between supported and supporting units and among air defense units emphasizes combined arms. Air defense

operations are not a series of separate and distinct actions unrelated to each other or to the conduct of the supported mission.

All-Around Security

An air defense system must provide all-around security not only for forward combat units but also to logistics units, lines of communications, and reserves. An air defense unit must provide security from attacks in any direction.

Radio Electronic Combat

The enemy uses REC to complement his ground-based air defense capability. REC integrates EW, physical destruction, SIGINT, and radio electronic concealment and deception. REC expands the IADS' detection, identification, and tracking abilities.

The enemy integrates the REC effort with other tactical actions. The enemy uses REC at critical moments to disrupt the C2, coordination, and execution of SEAD missions. If REC activities succeed, the attack on an IADS may degenerate from a coordinated operation to individual, ineffective attacks. The enemy will most likely use REC to—

- Provide an IADS with attack warning. This information allows air defense units to set the proper emission control posture to prevent SEAD targeting.
- Jam or deceive navigation equipment, air control, air-to-air and air-to-ground radars, and communications.
- Direct supporting arms against targets located by radio direction finding to suppress direct and indirect fire weapons performing SEAD.

Vulnerabilities

An enemy air defense system may be a complex, mutually supporting system with overlapping coverage. While it is a formidable system, it has vulnerabilities that the MAGTF can exploit.

Centralized Control

The complex nature of an enemy air defense system operating under centralized control is potentially its greatest weakness. While centralized control allows individual components to support each other, it may increase reaction time and information processing requirements of the engagement sequence for many of its air defense units. The mobility of air defense components also creates problems with centralized control. Fixed air defense systems usually have unchanging areas of responsibility and a reliable, redundant C2 network. When air defense systems move, surveillance and engagement zones can become confused, sectors of responsibility can vary, and C2 functions can become unreliable.

Autonomous Control

Autonomous control can present significant difficulties to an IADS. Individual weapons must detect air targets with organic sensors. Visual and IR systems are denied the benefit of radar cueing information. Organic radar/weapon systems must radiate sensors, making them vulnerable to detection, location, and hostile ARMs. This additional radiation provides advanced warning to ingressing aircraft.

Tracking data from outside sources is not available. Track information would have enabled the weapon system component to employ its weapon much sooner than if the individual weapon system component had to create a track on its own.

Individual weapons rely on organic means for aircraft identification. This increases the chance of fratricide and greatly limits the ability of friendly aircraft to operate in the vicinity. This may force operators into restrictive firing conditions, such as the requirement to visually identify targets before engaging. Every delay increases the probability of MAGTF aircraft survival.

Economy of force is nearly impossible to achieve. Targets may be engaged by many individual weapon systems within the local area. Missiles and aircraft may engage lower priority threats, depleting supplies available for greater threats to the vital area.

Misemployment

Enemy commanders sometimes fail to use air defense weapons as an integral part of combined arms operations. They may not recognize the full capability of the air threat. They may not correctly anticipate likely enemy COAs, opening gaps in the air defense coverage that the MAGTF can exploit.

Even the most sophisticated IADS is vulnerable to misemployment because of lack of operator training, skill or experience. Unfamiliarity with system operation can significantly reduce air defense system effectiveness.

Unfamiliarity with SOPs and rules of engagement can lead to fratricide or failure to engage a hostile aircraft.

Logistic Support

Sustainment of an IADS depends on logistics support. Surface-to-air weapons are particularly logistics dependent. Sensors, weapons systems, and C2 networks often require large amounts of electrical power over long periods of time to ensure around the clock coverage. All IADS components require frequent maintenance to ensure full mission capability. Weapons systems have a high rate of fire and limited stores of ammunition. If logistical support is denied, IADS operations will quickly degrade.

Trends

From World War I through Operations Desert Storm and Decisive Edge, air defense systems have continually influenced aviation employment.

Enemy sensors and weapons systems are becoming more lethal and capable as they make greater use of the electromagnetic spectrum. “Smart” weapons that utilize RF, IR or laser energy for targeting continue to become more prevalent. In addition to surface-to-air weapon systems, new technology is being applied to surface-to-surface, air-to-surface, air-to-air, and command, control, communications, computers, and intelligence (C4I). These air defense systems continue to be produced in large numbers and are often mobile, and thus harder to locate and destroy. Additionally, older weapon systems, once easily countered with onboard self-protection equipment, are being upgraded with new technologies to increase their lethality. Recent technology updates include modifications to tracking and guidance radars to prevent and delay RWR cueing, and the use of multiple guidance methods (RF and IR) that reduce the effectiveness of aircraft countermeasures.

These trends indicate that—regardless of the spectrum of conflict (low, medium or high)—any potential adversary may be armed with relatively inexpensive, easily obtainable, and extremely lethal, surface-to-air, air-to-air, air-to-surface, and surface-to-surface weapons systems. These weapons could be integrated into C2 networks and take advantage of advancing technology.

These trends, left unchallenged, are particularly threatening to the MAGTF. It is therefore imperative that the MAGTF be able to conduct effective SEAD operations.

Chapter 3
Planning

Responsibilities

The MAGTF commander publishes the MAGTF SEAD plan. The MAGTF SEAD plan ensures unity of effort by outlining important information, guidance, and procedures necessary to perform SEAD. The MAGTF SEAD plan is the basis for SEAD in the operation orders of the ACE and the ground combat element (GCE). The MAGTF CE coordinates the detailed planning of the ACE and GCE. The MAGTF SEAD plan, combined with the ACE and GCE operation orders, provides an integrated air-ground SEAD concept that increases MAGTF SEAD effectiveness.

Command Element

The MAGTF commander is responsible for the SEAD plan. This plan may require all MAGTF elements to execute SEAD at one time or another. The ACE, in close coordination with the GCE, conducts most of the detailed SEAD planning. Planning begins with receipt of the mission and continues throughout MAGTF operations. Specific CE planning responsibilities include but are not limited to—

- Providing an initial assessment of the enemy air defense threat to the ACE and GCE.
- Setting or changing SEAD priorities in accordance with the ACE commander's intent and planning guidance. These priorities determine resource allocation for conducting SEAD.

- Collecting the results of the detailed SEAD planning and publishing the MAGTF SEAD plan.
- Resolving conflicts between MAGTF elements supporting the MAGTF SEAD plan.
- Requesting external support (aircraft, supporting arms, EW) for SEAD requirements that are beyond the MAGTF's organic capability.
- Determining and updating the enemy air defense threat order of battle and passing the information to the ACE and GCE.
- Participating in J-SEAD planning and providing appropriate tasking to the ACE and GCE for J-SEAD requirements.

Aviation Combat Element

Specific ACE planning responsibilities include—

- Creating detailed plans for execution of MAGTF SEAD goals in close coordination with the GCE.
- Submitting SEAD requirements exceeding ACE capability to the GCE or MAGTF commander. Examples include intelligence gathering, processing and analysis support, fire support liaison personnel for the Marine tactical air command center (TACC) or indirect fire support.
- Recommending SEAD target priorities to the MAGTF commander.
- Issuing detailed SEAD mission planning and execution tasks to subordinate aviation commanders and control agencies.
- Determining detailed SEAD internal requirements such as types/quantities of ordnance, types of aircraft, and sortie allocation.

- Setting procedures for rapid attack of enemy air defense targets.
- Setting procedures for assessing and reporting battle damage.
- In coordination with the MAGTF intelligence officer, continuously estimating the enemy air defense threat, updating the enemy air defense order of battle, and determining enemy ability to influence air operations.
- Responding to the command element tasking for planning and executing J-SEAD.

Ground Combat Element

The enemy air defense threat can reduce the capability of the GCE to integrate air-ground operations and achieve a combined-arms effect. Within the GCE, the fire support coordination center (FSCC) has the lead role in SEAD planning. Specific GCE planning responsibilities include but are not limited to—

- Conducting SEAD planning in coordination with the ACE and consistent with the MAGTF commander's planning guidance.
- Requesting nonorganic intelligence assets to support continuous enemy air defense threat evaluation.
- Setting procedures for rapid reporting and dissemination of information about the enemy air defense system. This information includes all known, suspected or likely enemy air defense targets and the effectiveness of SEAD.
- Setting procedures for assessing and reporting battle damage.

- Developing detailed plans for attacking enemy air defense targets with GCE assets in accordance with the MAGTF SEAD plan. The GCE attacks SEAD targets with maneuver assets or by integrating them into the overall fire support plan.
- Coordinating GCE attacks of SEAD targets with higher, subordinate, and adjacent units as required.
- Submitting requirements for SEAD support that exceed the capabilities of the GCE or that are more suited for attack by another means.
- Responding to the command element tasking for planning and executing J-SEAD.

Planning Goals

The basic principle associated with conducting successful operations against an IADS is to force the various weapon systems to function autonomously. Any air defense weapon forced to operate in an autonomous role must perform the five mandatory functions of the IADS on its own. This breaks down the synergy of the IADS and limits the overall capability of the air defense commander to provide effective and efficient air defense. Attacking aircraft now need only be concerned with individual weapon systems if they pose an immediate threat. Forcing the components of an IADS to operate autonomously will have the following effects upon the five functions of an IADS.

Detection

Individual weapons must detect air targets with organic sensors. Depending upon the weapon system, this can be very difficult to accomplish in a timely manner. Visual systems are denied the

benefit of radar information. As radars/weapons systems radiate organic sensors, they are made vulnerable to detection and location, enhancing the capability of MAGTF ARMs and providing advanced warning to MAGTF aircraft.

Identification

Individual weapons systems must rely on organic means for aircraft identification. This increases the chance of fratricide and reduces the effectiveness of the enemy's aircraft operating in the presence of their own air defense systems. Identification difficulties can also force weapons systems into restrictive firing conditions (for example, visual identification). The delays caused by disrupting this function serve to increase the likelihood of MAGTF aircraft survival.

Correlation/Tracking

Correlation/tracking becomes much more difficult for IADS components to accomplish in the autonomous mode. Targeting data from higher sources cannot be passed to individual weapons systems, once again forcing these systems to accomplish this task on their own. Under normal circumstances, an aircraft approaching an IADS weapon system component would already have had a track (azimuth, elevation, range, course, airspeed, etc.) established in the "system," and that data would have been passed to the weapon system component(s). Established track information would enable weapon system component(s) to consummate a target engagement much more quickly.

Target Assignment

Target assignment or the decisionmaking process by which an air defense commander employs a particular weapon is now completely disrupted. Economy of force is now more difficult to achieve, as individual targets may be engaged by more than one weapon system within the IADS and some targets may not be engaged at all. The senior air defense commander cannot make these decisions because he lacks a clear picture of the battlespace.

Weapons Control

Weapons may be committed against targets that are already being engaged by other weapon systems. Without adequate weapons control, assets may be expended against lower priority threats, making these weapons unavailable for higher threats against the vital area. Table 3-1 describes the assets/means available to the MAGTF SEAD mission planner to target the five IADS functions.

Table 3-1. MAGTF SEAD Assets/Means.

IADS FUNCTION	MAGTF COUNTER	JTF COUNTER
DETECTION		
Radars	ARTY, VMAQ, VMFA, VMA, Recon, HMLA, Terrain Mask, Deception	VAQ, EC-130, USN/USAF Fixed-wing and Helicopter Hardkill, USA Indirect Fire Weapons, NGFS, Special Operations Forces
Aircraft	VMFA, VMA, LADD, Terrain Mask, Deception	USN/USAF Fixed-wing, USA SAM, USN DDG/CG

Table 3-1. MAGTF SEAD Assets/Means (Continued).

IADS FUNCTION	MAGTF COUNTER	JTF COUNTER
REC	EMCON, Terrain Mask, VMAQ, VMFA, VMA, HMLA, RADBN, Deception	VAQ, EC-130, Various Hardkill, Special Operations Forces
Visual Observer	Terrain Mask, ARTY, Recon, VMFA, VMA, HMLA, RADBN, Deception	Various Hardkill, Special Operations Forces
IDENTIFICATION		
EID	VMAQ, EMCON	VAQ, EC-130
VID	Same as Visual Observation	Same as Visual Observation
MRR	INTEL	INTEL
CORRELATION/TRACKING		
Radar	VMAQ, VMFA, VMA, HMLA, Recon, ARTY, Terrain Mask, Deception	VAQ, USN/USAF Fixed-wing, Helicopter Hardkill
Hard Wire	Recon, VMFA, VMA	Various Hardkill
RF Link	VMAQ, RADBN	VAQ, EC-130
Computer	NA	FIWC, AFIWC, Other IW Agencies
Fusion Node	VMFA, VMA, ARTY	Various Hardkill, C2W
TARGET ASSIGNMENT		
Commander	VMFA, VMA, ARTY, Deception (TALD)	Various Hardkill

Table 3-1. MAGTF SEAD Assets/Means (Continued).

IADS FUNCTION	MAGTF COUNTER	JTF COUNTER
WEAPONS CONTROL		
Hard Wire	RECON, VMFA, VMA	Various Hardkill
RF Link	VMAQ, RADBN	VAQ, EC-130
Computer	NA	FIWD, AFIWC
Control Node	VMFA, VMA, ARTY	Various Hardkill, C2W

SEAD in Support of a Mission to Destroy an IADS

During operations commanders determine an enemy's center of gravity (COG). In certain situations, the COG may be identified within a major city of the enemy's country and consequently the city is heavily defended by the IADS. In this case, planners may decide that the first phase of the operation should be to destroy the enemy's air defense capability. This would allow attacking the COG in subsequent phases with less risk to friendly aircrews. This plan requires parts of the IADS to be designated as primary targets. Therefore, MAGTF SEAD mission planners should consider the following actions against the four components of an IADS.

Command Posts

If the CCP is destroyed, control for that sector will default to a subordinate unit. This subordinate unit will generally have less cueing from higher-level sensors, and will thus be less able to complete the five functions of the IADS. Unfortunately, CCPs are

normally deeper within enemy territory and are usually very heavily defended.

Sensors

A determination of which sensors are critical to the entire IADS for cueing information is necessary. Nearly all weapons systems have organic sensors, which cannot be attacked. Of the sensors common to the entire IADS, the sensors that should be targeted first are those that cannot be degraded or disrupted by more traditional means (such as EA).

Weapons Systems

The most lethal/longest range threats that are not susceptible to EA or HARM should be destroyed.

C2 Network

The C2 network ties everything together to make the air defense system truly integrated. Oftentimes the C2 network can be severely disrupted by attacking the command posts, as these are the receivers of sensor information. Additionally, any C2 nodes/ relay stations/filter centers should be targeted. Targeting C2 nodes may offer the best chance of driving the IADS into an autonomous mode.

SEAD in Support of a Mission Conducted Within an IADS

When conducting a mission within airspace defended by an IADS, the MAGTF SEAD mission planner's goal is to suppress the air defense threat for a period of time, creating a sanctuary

within which the MAGTF mission can be conducted free from prohibitive interference.

Command Posts

Centralized command posts can not always be targeted in this scenario. If they can, only those CCPs that directly affect the MAGTF mission should be targeted.

Sensors

Sensors will normally be targeted with EA to the maximum extent possible. Sensors that are not susceptible to EA may have to be targeted. Only those sensors that can detect and pass targeting information to enemy air defense weapons interfering with the MAGTF mission should be targeted. In other words, if an enemy EW radar from a neighboring air defense sector is radiating, but cannot detect MAGTF aircraft because of terrain masking or extended range, assets should not be wasted targeting that sensor. Enemy aircraft should be targeted to the extent to which they can effect MAGTF operations.

Weapons Systems

Only those weapons systems interfering with the MAGTF mission should be targeted. For example, a strike package should ingress to the target area and avoid any SA-X AD system by terrain mastering techniques if the destruction of that system is not critical or will not interfere with the mission. Those AD systems which are unavoidable will obviously have to be targeted as part of the SEAD mission. In this scenario, ordnance should be allocated for the designated SEAD targets and the particular

nodes of the IADS that may prevent the accomplishment of the MAGTF SEAD mission.

C2 Network

The C2 network within the sector in which MAGTF aircraft are operating should be attacked as needed to complete the mission. The link from a distant EW radar that cannot detect MAGTF aircraft should not be attacked. After we have attacked the IADS, it is important to assess the damage that has been wrought upon the enemy. The mission planner should work closely with intelligence counterparts to receive an accurate assessment of damage to the IADS. Without this assessment, future operations cannot be properly planned.

RSEAD Planning

RSEAD planning is difficult because threat disposition, location, and type may not be known while planning is being conducted. The following fire support coordination measures will assist the mission planner.

SEAD Zones

SEAD zones are used to quickly correlate threat location with the TACC, FSCC, and DASC. See figure 3-1. Except for short of the fire support coordination line (FSCL), the appropriate land or amphibious force commander controls all air-to-surface and surface-to-surface attacks. This control is exercised through the operations staff or with pre-designated procedures.

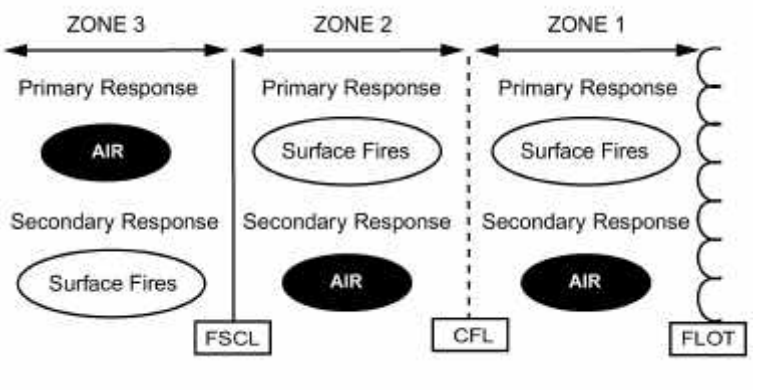

Figure 3-1. SEAD Zones.

SEAD zone 1 is the area from the FLOT to the coordinated fire line (CFL). The primary response for a "pop-up threat" in SEAD zone 1 is surface-delivered fires (ground and/or naval); the secondary response is airstrikes.

SEAD zone 2 is the area from the CFL to the FSCL. The primary response for a "pop-up" threat in SEAD zone 2 is surface fires. The secondary response is airstrikes. The area beyond the FSCL is identified as zone 3. Forces attacking targets beyond the FSCL must inform all affected commanders in sufficient time to allow necessary reaction to avoid fratricide, both in the air and on the ground. The establishment of an FSCL does not create a "free-fire area" beyond the FSCL. When targets are attacked beyond an FSCL, supporting element attacks must not produce adverse effects on or to the rear of the line. Attacks beyond the FSCL must be consistent with the establishing commander's priorities, timing, and desired effects, and deconflicted whenever possible with the supported headquarters. In exceptional circumstances, the inabil-

ity to conduct this coordination will not preclude the attack of targets beyond the FSCL. Failure to coordinate, however, may increase the risk of fratricide and waste limited resources. When CFLs are not established, zone 1 and 2 become zone 1.

ACE Commander's Guidance

Prior to conducting RSEAD mission planning, the following considerations should be addressed to the ACE commander for appropriate guidance:

- What is considered prohibitive interference? Prohibitive interference may be the loss of a certain number of aircraft, mission aborts, the presence of a particular threat, etc. Remember that prohibitive interference is subjective. It will depend upon the MAGTF mission, MAGTF asset capabilities, and allowable friendly attrition, etc. To ensure the MAGTF Commander can employ the principle of economy of force, the definition of prohibitive interference must be determined.
- Which threats warrant an RSEAD strike? Many threats can be effectively suppressed by organic MAGTF and/or J-SEAD assets (e.g., EA-6B) without dedicating other assets (e.g., artillery tubes, fixed and rotary-wing OAS aircraft) that may be needed to accomplish other, higher priority MAGTF missions.
- Who can authorize an RSEAD Strike? If a prohibitive threat that warrants an RSEAD strike has been located, it should be destroyed as soon as possible. Many air defense threats are mobile and therefore may not remain static for longer than several minutes or even seconds. Allowing airborne mission commanders to conduct RSEAD strikes will minimize response time and therefore increase the likelihood of RSEAD strike mission success. However, this delegated flexibility may not

allow the ACE commander the control needed to ensure that MAGTF assets are supporting other mission objectives.

- What assets will be allocated to conduct RSEAD? The MAGTF commander can choose either surface delivered or aviation fires to conduct RSEAD. The asset that can best accomplish the mission should be selected.
- If a dedicated RSEAD strike is required, which fixed wing/ rotary wing aircraft will be assigned the mission? The ACE commander will have to select assets that are available. If there are no available aircraft, he will have to divert aircraft from other missions to conduct the RSEAD mission.
- Will the threat permit the conduct of Immediate SEAD? The mission commander will have to decide if the aircraft on scene can conduct immediate SEAD through analysis of the air defense threat and the aircraft's capability to disrupt or destroy it without attrition.
- If a Deliberate RSEAD mission is required, will the ordnance on airborne assets be adequate to destroy the enemy air defense threat? The mission commander will have to decide if the aircraft assigned to his mission has the required ordnance to kill the threat and continue his assigned mission. If he delays his assigned mission to address the current threat, he will have to decide if that will alter the timing of his assigned mission and disrupt the MAGTF commander's overall mission.
- If an Alert RSEAD mission is required, what ordnance will be allocated to maximize the likelihood of target destruction? The TACC will have to decide if the alert aircraft are loaded with adequate munitions to kill the detected threat. If not, a decision must be made determining if there will be enough time to rearm the standby aircraft, destroy the threat, and accomplish the assigned mission.

- What assets are available to assist with the location of prohibitive threats? The MAGTF commander has unmanned aerial vehicles (UAVs), fixed wing/rotary wing aircraft, and joint assets available to him to aid in intelligence collection, planning, and targeting threats.

- Who has the authority to authorize the employment of ARMs from inside the FSCL? The TACC, Air Mission Commander, DASC or FSCC may all be given the authority to employ ARMs from inside the FSCL. The MAGTF commander will retain or grant (delegate) this authority as appropriate for the operation. His primary concern in determining this criteria will be flexibility and sustainment of operations.

- What probability of destruction is required to resume the MAGTF mission in that area (Sequential SEAD)? Will the supported MAGTF mission continue while RSEAD is being conducted (Concurrent SEAD)? If the threat is so severe that the entire MAGTF mission must be put on hold then the SEAD effort will be sequential SEAD. If the threat will allow the MAGTF mission to continue while it is attacked, then the SEAD effort will be concurrent.

- What Commander's critical information requirements (CCIRs) will be passed to the TACC before and after an RSEAD strike? Prior to the RSEAD strike, real time air defense system threat information is critical to SEAD mission planners to ensure effective execution of the sorties. Battle damage assessment information is critical immediately following a reactive SEAD strike. The ACE commander will pass all critical information to the MAGTF commander as real time as possible. This information is critical to the MAGTF commander for making a determination to resume or postpone the MAGTF mission. All members of the ACE from the individual aircrew to the TACC

must be aware of the MAGTF commander's information requirements and be able to pass them up the chain quickly.

Coordinating a Response

RSEAD is primarily a fire support coordination issue and is generally coordinated at lower echelons. In addition to the planning considerations already discussed, RSEAD planning must address threat location.

If threat location is known, the MAGTF SEAD mission planner should execute the decision aid in figure 3-2.

If the threat location is unknown, the MAGTF SEAD mission planner should be prepared to execute the decision matrix in figure 3-3, page 3-18.

RSEAD Manager

The RSEAD manager coordinates individual RSEAD strikes by—

- Correlating location information (mission reports, in-flight reports, etc.).
- Diverting aircraft and coordinating the strike via the DASC/ DASC(A), TACC or FSCC.
- Coordinating jamming and HARM employment (designating shooter(s) and times of impact(s)).
- Ensuring forward air controllers (FACs) or forward air controllers (airborne) (FAC [A]s) provide terminal control when necessary. Terminal control is required when the target is in close proximity to friendly forces (i.e., CAS). The RSEAD manager provides a threat brief.

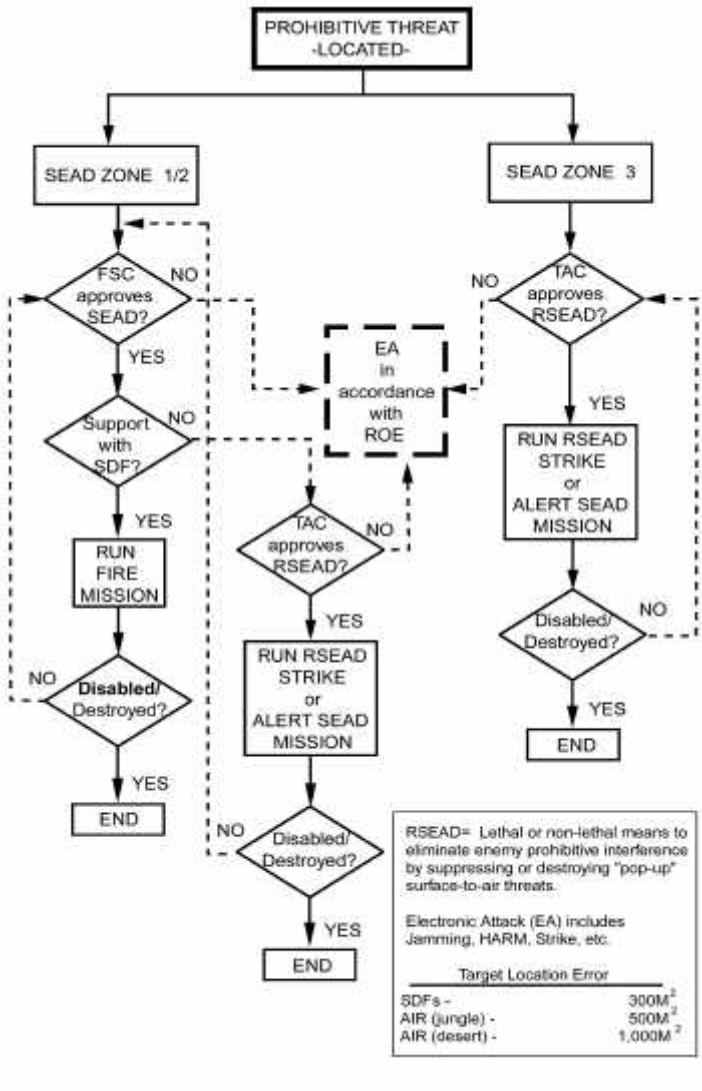

Figure 3-2. Located Threat Decision Aid.

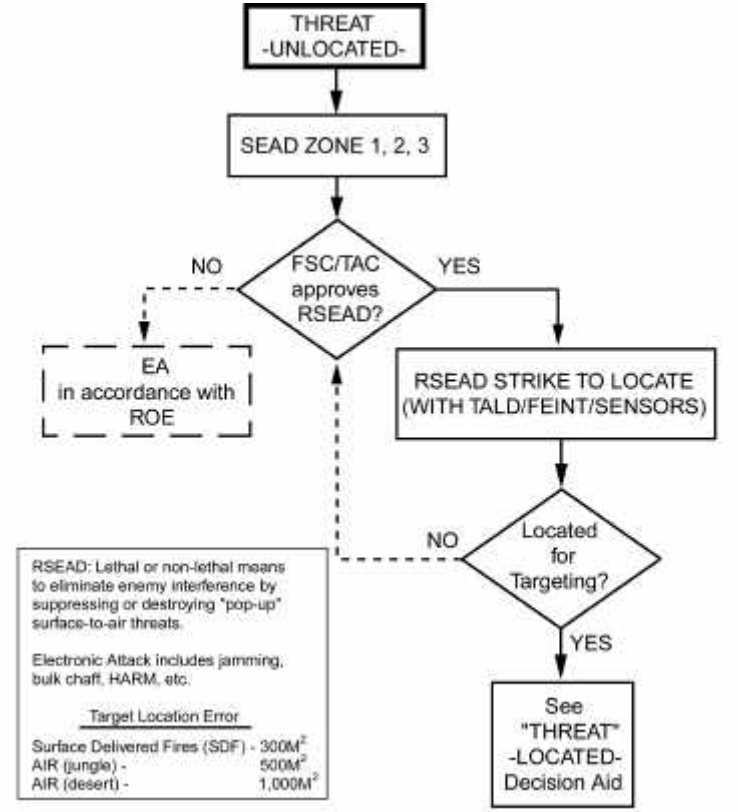

Figure 3-3. Unlocated Threat Decision Aid.

Typical RSEAD Mangers are FAC(A)s [FA-18D, AH-1W, UH-1N], and EA-6B (normally when no FAC(A) is present). Figure 3-4 on page 3-19 is a suggested checklist for RSEAD managers.

TARGET LOCATION		
UAV		
RWR		
SAM Launch Observed		
ES Confirmation		
SEAD ZONE		
1		
2		
Coordination Accomplished?		
Pass information to appropriate authority via DASC/TAOC.		
RSEAD PACKAGE COMPOSITION		
FAC(A)/Escort	/	
Strike A/C:	/	
	/	
Package Check-in (TAD)	Primary	Secondary
THREAT BRIEF		
Type		
Location		
Ingress CP/IP		
Egress CP/IP		
TOT		
COORDINATE		
Package Composition		
Ordnance Available		
HARM Shooter(s)		
Target Mark	WP/Rocket/HARM/Laser Code	
CODEWORDS		
Harm Shot		
Continue		
Abort		

Figure 3-4. RSEAD Manager Checklist.

Adjusting the Plan

The MAGTF SEAD mission planner and the ACE must continually adjust the MAGTF SEAD Plan. A continual assessment of SEAD effectiveness allows planners to select and update appropriate targets.

Chapter 4
Execution

The goal of MAGTF SEAD execution is the accomplishment of the supported MAGTF mission. Each MAGTF element must understand its role to guarantee the suppression of appropriate targets, prevent duplication of effort, and prevent friendly interference or fratricide.

Intelligence Collection and Dissemination

Effective SEAD requires aggressive, continuous intelligence collection and responsive dissemination of target data. Timely and accurate threat assessment permits decisive attacks by the MAGTF. The collection plan for SEAD targets must use all ground and aviation assets available. The MAGTF links its collection effort to joint, theater, and national-level collection resources. Table 4-1 identifies sources of collection to include in the collection effort.

Table 4-1. Sources of Collection/Dissemination.

JTF	ACE	GCE
National Theater Collection Assets	TERPES	Radio Battalion
Adjacent Units	Aerial Recon Aircraft (FA-18D, UAV)	Forward Observers
HUMINT	EA-6B Electronic Warfare Support Air-crew Mission Reports Forward Air Controllers (Airborne)	Forward Air Controllers NGFS Spotters Combat/Recon Units

Collection/Dissemination of Targets

Collection/dissemination of targets is critical to effective SEAD planning and execution. The MAGTF ACE and GCE G-2 maintain liaison with the JTF J-2. The MAGTF ACE can receive imagery intelligence (IMINT) through the use of aerial reconnaissance assets (FA-18D ATARS, UAVs); ELINT from VMAQ squadrons (in the form of EA-6B ES, national systems data from the Tactical Electronic Reconnaissance Processing and Evaluation System [TERPES]); and HUMINT from aircrew mission reports and FAC(A)s. The MACCS agencies collect, maintain, and exchange information on enemy air defenses, including damage assessment and targeting information from all of these sources. The GCE can receive HUMINT from forward observers, FACs, naval gunfire spotters, and various combat/ reconnaissance units. The GCE can receive ELINT from the radio battalion. Intelligence information must be compiled on the four components of the enemy IADS: command posts, sensors, weapons systems, and C2 networks.

Command Posts

Where are enemy IADS command posts located? Are they critical? Are they vulnerable? Do they control enemy air defenses in the area where MAGTF operations will be conducted?

Sensors

Where are enemy sensors located, to include ground-based radars, likely fighter and airborne early warning (AEW) CAPS, radio-electronic combat assets, and visual observers? Are they critical? Are they vulnerable? What frequencies are enemy radars

and AEW assets using? What friendly systems are enemy passive REC assets searching for?

Weapons Systems

Where are enemy SAM/AAA systems located? Are they critical? Are they vulnerable? What are the electromagnetic parametrics of enemy weapons systems radars? Do enemy weapons systems have an IR/EO/laser capability? What friendly systems are enemy REC assets attempting to conduct EA against?

C2 Networks

Where are enemy IADS C2 nodes? Are they critical? Are they vulnerable? Do they control enemy air defenses in the area where MAGTF operations will be conducted? How are IADS command posts, sensors, and weapons systems connected?

Target Location Accuracy

Target locations must be determined as accurately as possible. Intelligence sections provide target location and the accuracy and reliability of their source to appropriate agencies. These agencies use this information to confirm preplanned SEAD targets and determine attack means for RSEAD targets. Required location data accuracy will depend on the friendly weapon system in use. The employment of EA (jamming, HARM, bulk chaff) will require different threat locations data accuracy than the employment of CBUs, laser-guided bombs (LGBs), PGMs or artillery.

Damage Assessment

Intelligence collection must determine damage assessment. The assets delineated in table 4-1 can be used to determine damage assessment. If the MAGTF mission cannot be continued until SEAD (preplanned or reactive) has destroyed and/or suppressed a target(s), it is absolutely essential that timely damage assessment is passed to the MAGTF commander.

Requesting SEAD

Preplanned SEAD

Preplanned SEAD is primarily a fire support planning issue. The unit requesting an air mission begins by identifying known or suspected enemy air defenses affecting the supported air mission. Requesters list threats in the remarks block of the joint tactical air strike request (JTAR), CAS briefing form or assault support request (ASR) form along with organic SEAD assets available. The FSCC assesses SEAD requirements and assigns appropriate and available SEAD assets. When the preplanned air request reaches the Marine TACC, the ACE decides if more SEAD support is necessary. The ACE may assign a SEAD package to support the mission. It may request additional SEAD support from the GCE, ground unit support or indirect fire support. If the GCE or combat service support element (CSSE) cannot support ACE SEAD requirements because of higher priorities or limited assets, the ACE passes the SEAD requirement to the MAGTF commander. The MAGTF commander may reorder priorities or re-quest external SEAD support.

Reactive SEAD

Reactive SEAD is primarily a fire support coordination issue. The chance of duplicating efforts are highest for RSEAD. Rapid coordination is essential to execute RSEAD while threat location is known. Standardized procedures, such as RSEAD strike cards, simplify rapid coordination and execution.

Coordination

Timing and Delivery of Fires

MCWP 3-16.6, *Supporting Arms Observer, Spotter, and Controller*, describes three techniques for timing the delivery of fires: synchronized clock, elapsed time, and event-oriented. One technique at a time must be selected. All units and agencies providing or coordinating SEAD must know and understand this technique. SOPs and operation orders identify their preferred order of use.

Coordination with Ground Forces

Coordination with ground forces may be necessary because of target location in relation to friendly forces, the presence of fire support coordination measures such as the FSCL or fire support restrictions. Examples include coordination of EW to prevent interference from friendly operations and coordination of SEAD fires to prevent fratricide.

Airspace Coordination

Airspace coordination integrates aviation with surface-delivered fires and other combat forces without restricting fires or unnecessarily delaying ground operations. Airspace coordination offers a reasonable measure of protection to aircrews from friendly fires.

Airspace coordination methods include formal airspace coordination areas (ACAs) and separation techniques (informal ACAs). Formal and informal ACAs should be designed to allow the greatest freedom of action for air missions and surface fire support. Airspace coordination methods also depend on the aircraft delivery profile.

Airspace coordination requirements and methods are different for preplanned and RSEAD because of time available. Preplanned SEAD allows enough time for planners to conduct detailed airspace coordination, to include changing aircraft routing and artillery fire mission assignments, and establishing formal ACAs. The lack of time available for RSEAD usually means the use of more informal airspace coordination, the use of already existing airspace coordination measures, or rapid coordination through the DASC or FSCC.

MCWP 3-25, *Control of Aircraft and Missiles*, and MCWP 3-16, *Techniques and Procedures for Fire Support Coordination* (under development), contain detailed discussions of methods, techniques, and procedures for airspace coordination.

Separation Techniques

Aircraft and SEAD fires may be separated by distance (lateral, altitude or a combination of altitude and lateral) or by time.

Separation by distance is preferred because it may permit the continuous attack of SEAD targets and require less detailed coordination. If distance separation is too restrictive on aircrews, time separation may be used to provide protection from friendly fires. Time separation requires the most detailed coordination. Select the separation technique that requires the least coordination but still provides adequate flexibility and protection to aircrews.

Lateral Separation

Lateral separation is effective for coordinating SEAD against targets that are safely separated from flight routes. This technique is used when aircraft can be routed away from SEAD trajectories and targets and when they will not cross gun-target lines. Terminal controllers must know the gun-target line so they can restrict aircrews from crossing trajectories. Establishing a temporary, informal ACA is one method of maintaining lateral separation.

Altitude Separation

Altitude separation is effective when aircrews can safely remain above or below direct or indirect fire trajectories, i.e., gun-target line. Altitude separation can be limited to a specific area to give aircrews more freedom to maneuver. Establishing a temporary ACA is one method of maintaining altitude separation.

Altitude and Lateral Separation

This technique requires aircrews to remain laterally displaced and above or below direct or indirect fire trajectories, i.e., gun-target line. Aircraft maneuvering requirements may dictate that firing

units deliver SEAD by high angle or reduced charge. A temporary ACA is one method of maintaining altitude and lateral separation.

Time Separation

Time separation requires the most detailed coordination and may be required when aircraft cannot be routed away from indirect fire trajectories or SEAD targets. This technique requires the timing of SEAD fires to be coordinated with the routing of aircraft so that even though aircrews and SEAD fires may occupy the same space, they do not do so at the same time. Timing for SEAD fires is based on a specific aircraft event time; e.g., time-on-target/time-to-target, L-hour, or UAV mission area arrival time. In immediate SEAD missions, the aircraft event time becomes the "zero hour" for scheduling. The preferred method for coordinating timing is to use a previously established synchronized clock. If a synchronized clock is not available, an elapsed time may be used to coordinate timing.

Combined Arms

The MAGTF achieves a combined-arms effect by using all its combat capabilities. As part of this combined-arms team, aviation can have a decisive role in assuring success in battle. To use aviation in combined-arms operations, the MAGTF—

- Defines aviation goals and SEAD requirements. Planners set SEAD requirements that increase friendly capabilities and exploit threat weaknesses.
- Develops an aggressive targeting plan.

- Identifies and attacks high-payoff enemy air defense targets early and continuously.
- Identifies and reports all elements of the enemy air defense system upon detection.

Enemy air defenses can influence aviation's ability to contribute to the combined-arms effort. Effective SEAD can reduce or eliminate enemy interference with MAGTF air operations, thus allowing the MAGTF commander to accomplish his mission.

Appendix A. Glossary

Section I. Acronyms

AAA . . . . . antiaircraft artillery
AAW . . . . . antiair warfare
ACA . . . . . airspace coordination area
ACE . . . . . aviation combat element
AEW . . . . . airborne early warning
AI . . . . . air interdiction
ALSA . . . . . Air Land Sea Application
AOR . . . . . area of responsibility
AR . . . . . armed reconnaissance
ARM . . . . . antiradiation missile
ASE . . . . . aircraft survivability equipment
ASR . . . . . assault support request
ATO. . . . . air tasking order

BDA . . . . . battle damage assessment

C2 . . . . . command and control
C3 . . . . . command, control, and communications
C4I. . . . . command, control, communications, computers, and intelligence
CAP . . . . . combat air patrol
CAS . . . . . close air support
CBU. . . . . cluster bomb unit
CCIR . . . . . commander's critical information requirements
CCP . . . . . centralized command post
CE . . . . . command element
CFL . . . . . coordinated fire line
COA . . . . . course of action

COG. . . . . center of gravity
CSSE . . . . . combat service support element
DAS. . . . . deep air support
DASC . . . . . direct air support center
DASC(A). . . . . direct air support center (airborne)

EA . . . . . electronic attack
ELINT . . . . . electronics intelligence
EO . . . . . electro-optical
ES . . . . . electronic warfare support
EW. . . . . early warning

FAC. . . . . forward air controller
FAC(A) . . . . . forward air controller (airborne)
FLOT. . . . . forward line of own troops
FMFM . . . . . Fleet Marine Force Manual
FSCC. . . . . fire support coordination center
FSCL . . . . . fire support coordination line

GBU. . . . . guided bomb unit
GCI . . . . . ground control intercept
GCE. . . . . ground combat element
GPS . . . . . global positioning system

HARM. . . . . high-speed antiradiation missile
HUMINT. . . . . human intelligence

IADS . . . . . integrated air defense system
IFF . . . . . identification, friend or foe
IMINT . . . . . imagery intelligence
IP . . . . . initial point
IR. . . . . infrared

JDAM . . . . . joint direct attack munition

JFC . . . . . joint force commander
JOA . . . . . joint operations area
J-SEAD . . . . . joint suppression of enemy air defenses
JSOW . . . . . joint standoff weapon
JTAR . . . . . joint tactical air strike request
JTF . . . . . joint task force

LGB . . . . . laser-guided bomb

MACCS . . . . . Marine air command and control system
MAGTF . . . . . Marine air-ground task force
MCPP . . . . . Marine Corps Planning Process
MCWP . . . . . Marine Corps warfighting publication
MEF . . . . . Marine expeditionary force
METT-T . . . . . mission, enemy, terrain and weather, troops and support available time available
MOOTW . . . . . military operations other than war

NVG . . . . . night vision goggle

OAAW . . . . . offensive antiair warfare
OAS . . . . . offensive air support

PGM . . . . . precision-guided munitions

REC . . . . . radio electronic combat
RF . . . . . radio frequency
ROE . . . . . rules of engagement
RSEAD . . . . . reactive SEAD
RWR . . . . . radar warning receiver

SAM . . . . . surface-to-air missile
SEAD . . . . . suppression of enemy air defenses

SIGINT . . . . . signals intelligence
SLAM . . . . . stand-off land attack missile
SOP . . . . . standing operating procedure
TAC . . . . . theater air commander
TACC . . . . . tactical air command center (USMC); tactical air control center (USN)
TBM . . . . . tactical ballistic missile
TERPES . . . . . Tactical Electronic Reconnaissance Processing and Evaluation System
TM . . . . . tactical missile

UAV . . . . . unmanned aerial vehicle

Section II. Definitions

air contingency MAGTF—An on-call, combat-ready MAGTF that deploys by airlift. Air contingency MAGTFs vary in size based on mission requirements and the availability of airlift Because they deploy by air, they generally have a limited organic logistics capability, and require an arrival airfield. Air contingency MAGTFs usually are activated to respond to developing crises, and may deploy independently or in conjunction with other expeditionary forces. Also called ACM. See also aviation combat element; combat service support element; ground combat element; Marine air-ground task force; Marine expeditionary force; Marine expeditionary force (forward); Marine expeditionary unit; special purpose Marine air-ground task force; task force. (Proposed change to JP 1-02)

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. (JP 1-02)

air interdiction—Air operations conducted to destroy, neutralize, or delay the enemy's military potential before it can be brought to bear effectively against friendly forces at such distance from friendly forces that detailed integration of each air mission with the fire and movement of friendly forces is not required. (JP 1-02)

air reconnaissance—The acquisition of intelligence information by employing visual observation and/or sensors in air vehicles. (JP 1-02)

air superiority—That degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related land, sea and air forces at a given time and place without prohibitive interference by the opposing force. (JP 1-02)

air threat levels—The conditions which relate to the enemy's air defense capability against airborne friendly aircraft. There are three levels of air threat: a. low—An air threat environment which permits combat operations and support to proceed without prohibitive interference. Associated tactics and techniques do not normally require extraordinary measures for preplanned or immediate support. b. medium—An air threat environment in which the specific aircraft performance and weapons system capability allow acceptable exposure time to enemy air defenses. This air threat environment restricts the flexibility of tactics in the immediate target/objective area. It is an environment in which the enemy may have limited radar and/or electro-optical acquisition capability at medium ranges, but the air defense system is not supported by fully integrated fire control systems. c. high—An air threat environment created by an opposing force possessing air defense combat power including integrated fire control systems and electronic warfare capabilities which would seriously diminish the ability of friendly forces to provide necessary air support. This air threat environment might preclude missions such as immediate close air support, as the requirement for effective radio communications and coordination may not be possible. (MCRP 5-12C)

antiair warfare—A U.S. Navy/U.S. 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. (JP 1-02)

armed reconnaissance—A mission with the primary purpose of locating and attacking targets of opportunity, i.e., enemy materiel, personnel, and facilities, in assigned general areas or along assigned ground communications routes, and not for the purpose of attacking specific briefed targets. (JP 1-02)

aviation combat element—The core element of a Marine air-ground task force that is task-organized to conduct aviation operations. The aviation combat element provides all or a portion of the six functions of Marine aviation necessary to accomplish the Marine air-ground task force's mission. These functions are anti-air warfare, offensive air support, assault support, electronic warfare, air reconnaissance, and control of aircraft and missiles. The aviation combat element is usually composed of an aviation unit headquarters and various other aviation units or their detachments. It can vary in size from a small aviation detachment of specifically required aircraft to one or more Marine aircraft wings. The aviation combat element may contain other Service or foreign military forces assigned or attached to the Marine air-ground task force. The aviation combat element itself is not a formal command. Also called ACE. See also combat service support element; command element; ground combat element; Marine air-ground task force; Marine expeditionary force; Marine expeditionary force (Forward); Marine expeditionary unit; special purpose Marine air-ground task force; task force.

close air support—Air action by fixed and rotary-wing aircraft against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission

with the fire and movement of those forces. Also called CAS. (JP 1-02)

combat service support element—The core element of a Marine air-ground task force that is task-organized to provide the combat service support necessary to accomplish the Marine air-ground task force mission. The combat service support element varies in size from a small detachment to one or more force service support groups. It provides supply, maintenance, transportation, general engineering, health services, and a variety of other services to the Marine air-ground task force. It may also contain other Service or foreign military forces assigned or attached to the MAGTF. The combat service support element itself is not a formal command. Also called CSSE. See also aviation combat element; command element; ground combat element; Marine air-ground task force; Marine expeditionary force; Marine expeditionary force (Forward); Marine expeditionary unit; special purpose Marine air-ground task force; task force.

combined arms—The full integration of combat arms in such a way that to counteract one, the enemy must become more vulnerable to another. (MCRP 5-12C)

command element—The core element of a Marine air-ground task force that is the headquarters. The command element is composed of the commander, general or executive and special staff sections, headquarters section, and requisite communications support, intelligence and reconnaissance forces, necessary to accomplish the MAGTF's mission. The command element provides command and control, intelligence, and other support essential for effective planning and execution of operations by the other elements of the Marine air-ground task force. The command element varies in size and composition and may contain other Service or foreign military forces assigned or attached to the

MAGTF. Also called CE. See also aviation combat element; combat service support element; ground combat element; Marine air-ground task force; Marine expeditionary force; Marine expeditionary force (Forward); Marine expeditionary unit; special purpose Marine air-ground task force; task force.

communications intelligence—See electronic warfare.

concept of operations—A verbal or graphic statement, in broad outline, of a commander's assumptions or intent in regard to an operation or series of operations. The concept of operations frequently is embodied in campaign plans and operation plans; in the latter case, particularly when the plans cover a series of connected operations to be carried out simultaneously or in succession. The concept is designed to give an overall picture of the operation. It is included primarily for additional clarity of purpose. Also called commander's concept. (JP 1-02)

deception—Those measures designed to mislead the enemy by manipulation, distortion, or falsification of evidence to induce him to react in a manner prejudicial to his interests. (JP 1-02)

deep air support—Air action against enemy targets at such a distance from friendly forces that detailed integration of each mission with fire and movement of friendly forces is not required. Deep air support missions are flown on either side of the fire support coordination line; the lack of a requirement for close coordination with the fire and movement of friendly forces is the qualifying factor. (MCRP 5-12C)

direct air support center—The principal air control agency of the U.S. Marine air command and control system responsible for the direction and control of air operations directly supporting the ground combat element. It processes and coordinates requests for

immediate air support and coordinates air missions requiring integration with ground forces and other supporting arms. It normally collocates with the senior fire support coordination center within the ground combat element and is subordinate to the tactical air command center. Also called DASC. (JP 1-02)

direct support—A mission requiring a force to support another specific force and authorizing it to answer directly the supported force's request for assistance. (JP 1-02)

electronic warfare—Any military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or to attack the enemy. Also called EW. The three major subdivisions within electronic warfare are: electronic attack, electronic protection, and electronic warfare support. a. electronic attack. That division of electronic warfare involving the use of electromagnetic, directed energy, or antiradiation weapons to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability. Also called EA. EA includes: 1) actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception, and 2) employment of weapons that use either electromagnetic or directed energy as their primary destructive mechanism (lasers, radio frequency weapons, particle beams). b. electronic protection. That division of electronic warfare involving actions taken to protect personnel, facilities, and equipment from any effects of friendly or enemy employment of electronic warfare that degrade, neutralize, or destroy friendly combat capability. Also called EP. c. electronic warfare support. That division of electronic warfare involving actions tasked by, or under direct control of, an operational commander to search for, intercept, identify, and locate sources of intentional and unintentional radiated electromagnetic energy for the purpose of immediate threat recognition. Thus,

electronic warfare support provides information required for immediate decisions involving electronic warfare operations and other tactical actions such as threat avoidance, targeting, and homing. Also called ES. Electronic warfare support data can be used to produce signals intelligence (SIGINT), both communications intelligence (COMINT), and electronics intelligence (ELINT). (JP 1-02)

fire support—Fires that directly support land, maritime, amphibious, and special operations forces to engage enemy forces, combat formations, and facilities in pursuit of tactical and operational objectives. (JP 1-02). In Marine Corps usage, assistance to elements of the Marine air-ground task force engaged with the enemy rendered by other firing units, including (but not limited to) artillery, mortars, naval surface fire support, and offensive air support (MCRP 5-12C).

fire support coordination center—A single location in which are centralized communications facilities and personnel incident to the coordination of all forms of fire support. (JP 1-02)

fire support coordination line—A fire support coordination measure that is established and adjusted by appropriate land or amphibious force commanders within their boundaries in consultation with superior, subordinate, supporting, and affected commanders. Fire support coordination lines (FSCLs) facilitate the expeditious attack of surface targets of opportunity beyond the coordinating measure. An FSCL does not divide an area of operations by defining a boundary between close and deep operations or a zone for close air support. The FSCL applies to all fires of air, land, and sea-based weapon systems using any type of ammunition. Forces attacking targets beyond an FSCL must inform all affected commanders in sufficient time to allow necessary reaction to avoid fratricide. Supporting elements attacking targets

beyond the FSCL must ensure that the attack will not produce adverse effects on, or to the rear of, the line. Short of an FSCL, all air-to-ground and surface-to-surface attack operations are controlled by the appropriate land or amphibious force commander. The FSCL should follow well defined terrain features. Coordination of attacks beyond the FSCL is especially critical to commanders of air, land, and special operations forces. In exceptional circumstances, the inability to conduct this coordination will not preclude the attack of targets beyond the FSCL. However, failure to do so may increase the risk of fratricide and could waste limited resources. Also called FSCL. (JP 1-02)

forward air controller—An officer (aviator/pilot) member of the tactical air control party who, from a forward ground or airborne position, controls aircraft in close air support of ground troops. (JP 1-02)

forward air controller (airborne)—A specifically trained and qualified aviation officer who exercises control from the air of aircraft engaged in close air support of ground troops. The forward air controller (airborne) is normally an airborne extension of the tactical air control party. Also called FAC(A). (JP 1-02)

forward looking infrared—An airborne, electro-optical thermal imaging device that detects far-infrared energy, converts the energy into an electronic signal, and provides a visible image for day or night viewing. Also called FLIR. (JP 1-02)

forward operating base—An airfield used to support tactical operations without establishing full support facilities. The base may be used for an extended time period. Support by a main operating base will be required to provide backup support for a forward operating base. Also called FOB. (JP 1-02)

general support—That support which is given to the supported force as a whole and not to any particular subdivision thereof. (JP 1-02)

ground combat element—The core element of a Marine air-ground task force that is task-organized to conduct ground operations. It is usually constructed around an infantry organization but can vary in size from a small ground unit of any type, to one or more Marine divisions that can be independently maneuvered under the direction of the MAGTF commander. It includes appropriate ground combat and combat support forces and may contain other Service or foreign military forces assigned or attached to the Marine air-ground task force. The ground combat element itself is not a formal command. Also called GCE. See also aviation combat element; combat service support element; command element; Marine air-ground task force; Marine expeditionary force; Marine expeditionary force (Forward); Marine expeditionary unit; special purpose Marine air-ground task force; task force.

immediate air support—Air support to meet specific requests which arise during the course of a battle and which by their nature cannot be planned in advance. (JP 1-02)

maneuver warfare—A warfighting philosophy that seeks to shatter the enemy's cohesion through a variety of rapid, focused, and unexpected actions which create a turbulent and rapidly deteriorating situation with which the enemy cannot cope.
(MCRP 5-12C)

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. (JP 1-02)

Marine air-ground task force—The Marine Corps principal organization for all missions across the range of military operations, composed of forces task-organized under a single commander capable of responding rapidly to a contingency anywhere in the world. The types of forces in the MAGTF are functionally grouped into four core elements: a command element, an aviation combat element, a ground combat element, and a combat service support element. The four core elements are categories of forces, not formal commands. The basic structure of the Marine air-ground task force never varies, though the number, size, and type of Marine Corps units comprising each of its four elements will always be mission dependent. The flexibility of the organizational structure allows for one or more subordinate MAGTFs, other Service and/or foreign military forces, to be assigned or attached. Also called MAGTF. See also aviation combat element; combat service support element; command element; ground combat element; Marine expeditionary force; Marine expeditionary force (Forward); Marine expeditionary unit; special purpose Marine air-ground task force; task force.

Marine expeditionary brigade—A Marine air-ground task force that is constructed around a reinforced infantry regiment, a composite Marine aircraft group, and a brigade service support group. The Marine expeditionary brigade (MEB), commanded by a general officer, is task-organized to meet the requirements of a specific situation. It can function as part of a joint task force, or as the lead echelon of the Marine expeditionary force (MEF), or alone. It varies in size and composition, and is larger than a Marine expeditionary unit but smaller than a MEF. The MEB is

capable of conducting missions across the full range of military operations. Also called MEB.

Marine expeditionary force—The largest Marine air-ground task force and the Marine Corps principal warfighting organization, particularly for larger crises or contingencies. It is task-organized around a permanent command element and normally contains one or more Marine divisions, Marine aircraft wings, and Marine force service support groups. The Marine expeditionary force is capable of missions across the range of military operations, including amphibious assault and sustained operations ashore in any environment. It can operate from a sea base, a land base, or both. Also called MEF.

Marine expeditionary force (Forward)—A designated lead echelon of a Marine expeditionary force, task-organized to meet the requirements of a specific situation. A Marine expeditionary force (Forward) varies in size and composition, and may be commanded by the Marine expeditionary force commander personally or by another designated commander. It may be tasked with preparing for the subsequent arrival of the rest of the MEF/joint/combined forces, and/or the conduct of other specified tasks, at the discretion of the MEF commander. A Marine expeditionary force (Forward) may also be a stand-alone MAGTF, task-organized for a mission in which a MEF is not required. Also called MEF (Fwd).

Marine expeditionary unit—A Marine air-ground task force that is constructed around an infantry battalion reinforced, a helicopter squadron reinforced, and a task-organized combat service support element. It normally fulfills Marine Corps forward seabased deployment requirements. The Marine expeditionary unit provides an immediate reaction capability for crisis response and is capable of limited combat operations. It may contain other Ser-

vice or foreign military forces assigned or attached. Also called MEU. See also aviation combat element; combat service support element; command element; ground combat element; Marine air-ground task force; Marine expeditionary force; Marine expeditionary force (Forward); Marine expeditionary unit (special operations capable); special purpose Marine air-ground task force; task force.

Marine expeditionary unit (special operations capable)—The Marine Corps standard, forward-deployed, sea-based expeditionary organization. The MEU(SOC) is a MEU, augmented with selected personnel and equipment, that is trained and equipped with an enhanced capability to conduct amphibious operations and a variety of specialized missions, of limited scope and duration. These capabilities include specialized demolition, clandestine reconnaissance and surveillance, raids, in-extremis hostage recovery, and enabling operations for follow-on forces. The Marine expeditionary unit (special operations capable) is not a special operations force but, when directed by the National Command Authorities, the combatant commander in chief, and/or other operational commander, may conduct limited special operations in extremis, when other forces are inappropriate or unavailable. It may also contain other Service or foreign military forces assigned or attached to the Marine air-ground task force. Also called MEU (SOC). See also aviation combat element; combat service support element; command element; ground combat element; Marine air-ground task force; Marine expeditionary force; Marine expeditionary force (Forward); Marine expeditionary unit; special purpose Marine air-ground task force; task force.

offensive air support—Those air operations conducted against enemy installations, facilities, and personnel to directly assist the attainment of MAGTF objectives by the destruction of enemy

resources or the isolation of the enemy's military forces. Also called OAS. (MCRP 5-12C)

operations security—A process of identifying critical information and subsequently analyzing friendly actions attendant to military operations and other activities to: a. Identify those actions that can be observed by adversary intelligence systems. b. Determine indicators hostile intelligence systems might obtain that could be interpreted or pieced together to derive critical information in time to be useful to adversaries. c. Select and execute measures that eliminate or reduce to an acceptable level the vulnerabilities of friendly actions to adversary exploitation. Also called OPSEC. (JP 1-02)

preplanned air support—Air support in accordance with a program, planned in advance of operations. (JP 1-02)

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

special purpose Marine air-ground task force—A Marine air-ground task force organized, trained and equipped with narrowly focused capabilities. It is designed to accomplish a specific mission, often of limited scope and duration. It may be any size, but normally it is a relatively small force—the size of a Marine expeditionary unit or smaller. It may contain other Service or foreign military forces assigned or attached to the Marine air-ground task force. Also called SPMAGTF. See also aviation combat element; combat service support element; command element; ground combat element; Marine air-ground task force; Marine expeditionary force; Marine expeditionary force (Forward); Marine expeditionary unit; task force.

suppression of enemy air defenses—That activity which neutralizes, destroys, or temporarily degrades surface-based enemy air defenses by destructive and/or disruptive means. Also called SEAD. (JP 1-02)

surface-to-air weapon—A surface-launched weapon for use against airborne targets. Future developments in air defense systems may lead to the employment of weapons other than missiles. Examples include rockets, directed-energy weapons, and air defense guns. (JP 1-02)

tactical air command center—The principal U.S. 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 U. S. Marine air command and control system which 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. (JP 1-02)

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

tactical air coordinator (airborne)—An officer who coordinates, from an aircraft, the action of combat aircraft engaged in close support of ground or sea forces. (JP 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. (JP 1-02)

tactical air operation—An air operation involving the employment of air power in coordination with ground or naval forces to: a. gain and maintain air superiority; b. prevent movement of enemy forces into and within the objective area and to seek out and destroy these forces and their supporting installations; c. join with ground or naval forces in operations within the objective area, in order to assist directly in attainment of their immediate objective. (JP 1-02)

tactical air operations center—The principal air control agency of the U.S. Marine air command and control system responsible for airspace control and management. It provides real time surveillance, direction, positive control, and navigational assistance for friendly aircraft. It performs real time direction and control of all antiair warfare operations, to include manned interceptors and surface-to-air weapons. It is subordinate to the tactical air command center. Also called TAOC. (JP 1-02)

time on station—The time that an aircraft can actually spend performing its assigned mission. It does not include the time transiting to and from the operating site. Also called TOS. (MCRP 5-12C)

Appendix B
References

Joint Publications (JPs)

0-2	Unified Action Armed Forced (UNAAF)
1-02	Department of Defense Dictionary of Military and Associated Terms
3-0	Doctrine for Joint Operations
3-01.2	Joint Doctrine for Offensive Operations Countering Air and Missile Threats
3-52	Doctrine for Joint Airspace Control in a Combat Zone
3-56.1	Command and Control for Joint Air Operations
5-0	Doctrine for Planning Joint Operations

Marine Corps Doctrinal Publications (MCDPs)

1	Warfighting
1-1	Strategy
1-2	Campaigning
1-3	Tactics
2	Intelligence
3	Expeditionary Operations
4	Logistics
5	Planning
6	Command and Control

Marine Corps Warfighting Publications (MCWPs)

2-1	Intelligence Operations
3-2	Aviation Operations
3-22	Antiair Warfare
3-23	Offensive Air Support
3-23.1	Close Air Support
3-23.2	Deep Air Support
3-25	Control of Aircraft and Missiles
3-41.1	Rear Area Operations
5-1	Marine Corps Planning Process

Marine Corps Reference Publications (MCRPs)

3-16B The Joint Targeting Process and Procedures for Targeting Time-Critical Elements

5-12C Marine Corps Supplement to the Department of Defense Dictionary of Military and Associated Terms

5-12D Organization of Marine Corps Forces

Fleet Marine Force Manuals (FMFMs)

5-70 MAGTF Aviation Planning

5-71 Aviation Planning Documents

Miscellaneous

Air, Land, Sea Application (ALSA) Publication, Multiservice Tactics, Techniques, and Procedures for the Suppression of Enemy Air Defenses