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BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

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FOREWORD

Antiair warfare within the U. S. Marine Corps was forged in combat primarily during World War II when Marine aircraft and antiaircraft artillery were stationed throughout the Pacific basin. Campaigns for Guadalcanal and the Marshall Islands and other operations shaped today's concepts. Marine defense battalions employed ground-based air defense assets. Congressional Medal of Honor recipients Lieutenant Colonel Gregory "Pappy" Boyington, Captain Joe Foss, and other Marine aviators flew fighter sweep, combat air patrol, escort, and assorted offensive antiair warfare missions. They were among the first aviators to perform multirole antiair warfare tasks designed to protect friendly forces and gain air superiority.

Today's Marine air-ground task force (MAGTF) has a unique antiair warfare capability. Multimission-capable aircraft, a ground-based short air defense missile system, and a robust Marine air command and control system (MACCS) are tremendous force multipliers for MAGTF and joint force commanders.

Marine Corps Warfighting Publication (MCWP) 3-22, *Antiair Warfare*, focuses on the tactics, techniques, and procedures of antiair warfare operations. It details how the MAGTF accomplishes antiair warfare tasks at the operational and tactical levels of war and how antiair warfare capabilities tie into the joint force architecture and operations. From this publication Marines of all ranks and military occupational specialties will understand how antiair warfare operations are conducted and how they impact on MAGTF operations. Further, they will comprehend their role in antiair warfare operations and grasp the nature and contributions of antiair warfare to combined arms operations.

This publication supersedes Fleet Marine Force Manual (FMFM) 5-50, *Antiair Warfare*, 22 June 1994.

Reviewed and approved this date.

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Antiair Warfare

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CHAPTER 1. FUNDAMENTALS

Antiair warfare is 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. (Joint Pub [JP] 1-02, *Department of Defense Dictionary of Military and Associated Terms*) Antiair warfare (AAW) integrates all offensive and defensive actions against enemy aircraft, surface-to-air weapons, and theater missiles into a singular, indivisible set of operations. AAW, along with assault support, offensive air support, air reconnaissance, electronic warfare, and control of aircraft and missiles, is one of the six functions of Marine aviation. AAW is sometimes incorrectly considered an exclusive responsibility of the Marine air-ground task force's (MAGTF's) aviation combat element (ACE). Each member of the MAGTF participates directly or indirectly.

AAW serves two purposes: force protection and air superiority. Force protection is those actions taken to guard friendly forces from attack or disruption by enemy forces. In AAW, it concerns those actions taken to defend the MAGTF against enemy air and missile attacks. Air superiority is 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)

Force protection and air superiority are complementary goals of antiair warfare. They provide the MAGTF with defense against enemy air and missile attacks and a reasonable level of confidence so maneuver can be conducted without interference from the enemy's air and missile capabilities.

Force protection and air superiority actions form a cycle. A strong defense against enemy air attack achieves air superiority. Forces are reasonably protected from enemy air and missile attack. What truly separates force protection from air superiority is how the outcome is achieved.

TYPES OF ANTIAIR WARFARE OPERATIONS

In *Joint Vision 2010*, the Chairman, Joint Chiefs of Staff, highlights full-dimensional protection as one of the four new operational concepts for future joint forces. With the aim of defending forces, *Joint Vision 2010* states that this concept will be proactive, incorporating both offensive and defensive actions that may extend well into areas of enemy operations.

Applying this concept to AAW, we see that the intent of AAW is to protect and defend the MAGTF and its battlespace from enemy air and missile attack and take the fight to the enemy. AAW is an enabler for other MAGTF ground, combat service support, and aviation operations. The MAGTF conducts two types of antiair warfare operations: offensive antiair warfare and air defense.

Offensive Antiair Warfare

Offensive antiair warfare (OAAW) is those operations conducted against enemy air assets and air defense systems before they can be launched or assume an attacking role. OAAW operations in or near the objective area consist mainly of air attacks to destroy or neutralize hostile aircraft, airfields, radars, air defense systems, and supporting areas. Examples of the enemy's air and missile threat include aircraft, surface-to-air weapons, and theater missiles. To destroy or neutralize the enemy's air and missile threat, OAAW operations target enemy air capabilities and infrastructure, which include not only the weapons themselves, but launch platforms, airfields, air defense systems, command and control nodes, and support facilities. As OAAW takes the fight to the enemy, it also takes the initiative to gain air superiority while providing robust force protection. See chapter 2.

Air Defense

Air defense operations include 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 defense consists of active and passive measures to protect our forces against attack from enemy aircraft and missiles.

Active air defense is direct defensive action taken to destroy, nullify, or reduce the effectiveness of hostile air and missile threats against friendly forces and assets. It includes the use of aircraft, air defense weapons, electronic warfare, and other available weapons. (JP 1-02)

Passive air defense includes all measures, other than active air defense, taken to minimize the effectiveness of hostile air action. These measures include deception, dispersion, and using protective construction and camouflage. See chapter 3.

PRINCIPLES

The conduct of AAW is based on destruction-in depth, mutual support, and centralized command and decentralized control. The MAGTF must apply these principles to achieve and preserve force protection and air superiority to accomplish its mission. While these principles are most readily apparent to air defense operations, they apply equally to offensive antiair warfare operations.

Destruction-in-Depth

Destruction-in-depth consists of threat detection and destruction that begins as far from the vital area (a designated area or installation to be defended by air defense units) as possible and continues as long as the threat exists. The enemy's ability to impede the MAGTF's freedom of operations determines the degree of threat and the depth of destruction.

In air defense operations, the senior commander, e.g., MAGTF, area air defense or joint force, achieves the full impact of destruction-in-depth by integrating all available air defense resources within his/her zone, area of operations or area of responsibility. The senior commander has the option of dividing the air defense area into sectors and assigning responsibilities for each sector. The senior commander then positions assets so that enemy aircraft and missiles encounter an ever increasing volume of fire (both horizontally and vertically) as they approach the vital area, and, if aircraft survive, as they egress.

In OAAW operations, destruction-in-depth may involve an expanding effort to negate the enemy's ability to deny our aircraft freedom of action. OAAW operations may progress concentrically from our area of operations, concentrate on a particular zone or area or focus along a particular axis into the battlespace controlled by the threat.

Mutual Support

Mutual support is support that units provide each other against an enemy. The decision to provide mutual support is based on a unit's assigned tasks, its position relative to other units and to the enemy, and its inherent capabilities. By employing mutual support, the MAGTF ensures continuous engagement, improves the survivability of AAW assets, decreases the chances of hostile aircraft or missiles penetrating the vital area, and increases the chance of gaining and retaining air superiority.

Units achieve mutual support by integrating, employing, and positioning AAW assets to provide overlapping detection coverage and engagement envelopes. Proper integration, employment, and location of AAW assets ensures that several AAW units have the same assigned target within their range. This integrated and overlapping pattern of mutual support and continuity of engagement reduces degradation of the AAW system that can result from the loss of any AAW asset.

Centralized Command and Decentralized Control

The MAGTF commander has overall responsibility for MAGTF aviation operations. The MAGTF commander delegates the authority for control, coordination, planning, and supervising MAGTF aviation operations to the ACE commander. Centralized command of AAW promotes coordinated operations and economy of force and aids in integrating all AAW assets into a cohesive AAW capability. Decentralized control allows a shorter decision cycle and enables decisionmaking at the lowest level possible. It minimizes friendly losses and permits subordinate AAW units to react immediately to an air threat unless overruled by higher authority. The MAGTF's ability to function under centralized command and decentralized control provides it with an integrated air defense system (IADS) that has minimum reaction time, maximum damage resistance, and inherent self-sufficiency.

Although a higher authority may delegate specific authority to subordinate commanders, the higher authority still monitors AAW units' actions. The higher authority only makes direct target assignments to units for proper fire distribution, maximum efficiency of target engagement, and to prevent engagement of friendly aircraft.

The ACE commander determines the AAW tasks he/she must personally supervise and then delegates authority for tasks that do not require his/her attention. When exercising centralized command, the ACE commander delegates authority for control of various Marine aviation functions to MACCS agencies. The ACE commander normally delegates the authority for AAW operations to his/her sector antiair warfare coordinator (SAAWC). For effective decentralized control, the ACE commander relies on his/her SAAWC and subordinate commanders' judgment and their ability to understand the commander's intent. See the MCWP 3-25 aviation series for more information.

THEATER AIR DEFENSE

Theater air defense is the integrated employment of the joint force commander's forces to destroy or neutralize enemy offensive aircraft and theater missiles to protect friendly forces or vital interests. It includes the process of theater missile defense (sometimes called theater air and missile defense). Theater air defense is a joint force responsibility, includes offensive and defensive aspects, integrates all joint force air defense assets, and establishes a joint force command structure for its operations. The four operational elements of theater air defense follow.

Active Air Defense

Active air defense operations protect against attack by destroying air and missile threats or airborne launch platforms in flight. These operations may include a multi-tiered defense-in-depth against enemy air and missile threats. Air, land, sea, space, and special operations assets conduct active air defense. Active air defense operations also include electronic warfare attack operations that disrupt the enemy's remote or on-board guidance systems.

Passive Air Defense

Passive air defense measures operations reduce the vulnerability and minimize the effects of damage caused by enemy air and missile threats. Passive air defense includes early warning; nuclear, biological, and chemical protection measures; counter-surveillance; deception; camouflage and concealment; hardening; electronic protection; mobility; dispersal; redundancy; recovery; and reconstitution.

Attack Operations

Attack operations are offensive operations taken by air, land, sea, space or special operations forces designed to destroy, disrupt or neutralize enemy air and missile threats and communications on the ground or as close to their originating source as possible. Attack operations also destroy, disrupt or neutralize the enemy's logistics installations that support air operations and reconnaissance, surveillance, and target acquisition platforms. Theater air defense attack operations correspond to offensive antiair warfare.

Command, Control, Communications, Computers, and Intelligence

Command, control, communications, computers, and intelligence (C4I) is an integrated system of doctrine, procedures, organizational structures, facilities, communications, computers, and supporting intelligence. It provides command authorities at all levels with timely and accurate data on friendly and enemy theater air defense actions and the data and systems to plan, direct, and control friendly theater air defense operations. C4I includes aircraft and missile warning sensors and ground stations. The MAGTF performs these procedures through the MACCS.

THREAT LEVELS

The MAGTF orients on the enemy to determine its strengths and weaknesses. Evaluating enemy aircraft and the missile threat helps determine what is needed to achieve force protection and air superiority. This evaluation is expressed as threat levels.

Threat levels determine the extent of AAW required and may help determine how the MAGTF task-organizes. The threat levels low, medium, and high are general with no clear separation between each level. Levels may overlap or change based on mission, enemy, terrain and weather, troops and support available-time available (METT-T). For example, enemy air defense systems that pose a low or medium threat to one type of aircraft may pose a high threat to another type of aircraft. Likewise, enemy aircraft that pose a high threat to an air command and control agency during daylight hours may be only a low threat to the same platoon during hours of darkness.

Based on current intelligence, determining the threat level helps aircrews, surface-to-air weapons operators, and MACCS operators prepare tactics for a particular situation and environment. Determining threat levels serves as a point of departure for estimating enemy capabilities and should not be used as the singular measure of the degree of AAW means required. The threat is normally characterized as either sophisticated or nonsophisticated, based on the—

- Type, quantity, and quality of individual weapons and weapons systems.
- Command and control systems used to integrate weapons systems.
- Quality of the command.
- Type, quantity, and quality of training.
- Ability to conduct coordinated and sophisticated tactics (multiaxis, diversion, deception, integration of electronic attack).
- Navigation and air-to-ground targeting capability.

Low Threat

A low threat level allows MAGTF operations to proceed without prohibitive interference. A low threat environment includes small arms and medium antiaircraft weapons and limited optical acquisition antiaircraft artillery with no integrated fire control systems.

Medium Threat

A medium threat level allows acceptable exposure time of friendly aircraft to enemy air defenses or acceptable interference by enemy aircraft to MAGTF operations. This threat level can restrict the MAGTF commander's flexibility. A medium threat environment has—

- A limited radar or electro-optic acquisition capability that is not supported by a fully integrated fire control system.
- A fully integrated fire control system that is degraded due to terrain, weather or other factors.
- Low-technology theater missile capabilities.

High Threat

A high threat level exists when the enemy has an air defense system that includes integrated fire control systems and electronic warfare capabilities. This threat level severely affects the MAGTF's ability to conduct operations. A high threat environment has—

- Command and control systems.
- Mobile or strategic surface-to-air missiles.
- Early warning radars.
- Electronic warfare systems.
- Integrated air defense/fire control systems.
- Interceptor aircraft.
- Mid- to high-technology theater missile capabilities.

CAPABILITIES

The MAGTF has a variety of organic capabilities to conduct AAW operations including aircraft, ground-based air defense weapons, artillery, reconnaissance forces, and air command and control facilities. MAGTF organic AAW capabilities include both lethal and non-lethal means.

Multiple role weapons platforms and equipment suites provide commanders with maximum flexibility. For example, MAGTF fixed-wing aircraft can perform offensive AAW and air defense missions. The F/A-18 can fire a variety of air-to-air missiles, employ high speed antiradiation missiles, and drop ordnance against OAAW targets. Air command and control suites can coordinate and control OAAW and active/passive defense measures.

The MAGTF's AAW resources are fully capable of integrating with, and in some cases, providing enabling functions for, joint and multinational operations against enemy aircraft and missile threats.

The MAGTF does not possess an organic capability to defend itself against tactical ballistic missiles. Planners must identify those assets that require protection and then work with the other Services' air defense planners to ensure that MAGTF assets are protected.

With this understanding of the function of AAW and a review of some general capabilities, philosophies, and fundamentals, we can now transition to detailed discussions of how the MAGTF conducts AAW operations. It should be noted that MAGTF AAW operations will rarely, if ever, be the singular source for operations against the enemy's aircraft and missile threat. It can be expected that all military operations will be joint operations. MAGTF AAW activities will be conducted to support the MAGTF's single battle concept, but to also meet the needs and objectives of the joint force commander.

CHAPTER 2. OFFENSIVE ANTIAIR WARFARE

Offensive antiair warfare (OAAW) reduces or neutralizes the enemy's air and missile threat before it launches or assumes an attacking role. In time critical targets, it destroys their capability to conduct further operations after the weapon is launched. OAAW attacks the enemy's abilities to attack friendly resources with aircraft and missiles and to defend itself against attack by friendly aircraft and missiles. OAAW has two purposes: to gain air superiority and protect friendly forces.

OAAW is the Marine Corps equivalent of Joint doctrine's offensive counterair (OCA). See JP 3-01, *Joint Doctrine for Countering Air and Missile Threats*. OCA is offensive operations to destroy, disrupt or neutralize enemy aircraft, missiles, launch platforms, and their supporting structures and systems both before and after launch, but as close to their source as possible. (JP 1-02)

OAAW operations are characterized by responsiveness, bold actions, and initiative to gain a decisive advantage over the enemy. They focus on a particular function of the enemy's combat potential—its air and missile forces. Because OAAW operations strive to destroy enemy air and missile resources as near to their source as possible, *OAAW is the preferred method of conducting antiair warfare.* OAAW allows us to take the enemy on our terms and when and where we choose.

OAAW operations are not specific to the MAGTF's ACE. They are a responsibility of the entire MAGTF and impact on all MAGTF operations. The MAGTF conducts OAAW operations with a variety of organic resources (aircraft, electronic warfare, artillery, surveillance, and ground forces). The MAGTF can also request joint force, theater, and national assets, e.g., the joint surveillance target attack radar system, satellites, special operating forces, army tactical missile system or aircraft.

OAAW embodies the tenets of maneuver warfare described in Marine Corps Doctrinal Publication (MCDP) 1, *Warfighting*. It uses maneuver, tempo, and surprise to gain physical and psychological advantages over the enemy. It seeks to shatter the cohesion of the enemy's systems through rapid, violent actions. In OAAW, the enemy's system may include any air-oriented weapon, command and control or infrastructure system that poses a threat to MAGTF aviation resources. System components that may be attacked in are manned or unmanned aircraft, surface-to-air weapons, theater missiles, airfields, air command and control facilities or the enemy's aviation supporting infrastructure.

TASKS

OAAW operations include four tasks:

- Preemptive measures.
- Suppression of enemy air defenses (SEAD).
- Local air superiority measures.
- Reactive measures.

Preemptive Measures

Preemptive measures attempt to weaken the enemy's air and missile threat before the enemy can use air and missile forces and air defense systems against the MAGTF. They are usually conducted in the early phase of an operation but can be a continuous process throughout an operation. Examples of preemptive measures are—

- Air strikes against theater missile systems.
- Attacks against enemy command and control facilities and surveillance systems.
- Air strikes against airfields to destroy or damage aircraft.
- Air-to-air sweeps.
- Air strikes against enemy aircraft supply, support, and infrastructure.

If successful, preemptive measures allow later aviation and ground operations to proceed without prohibitive interference from air and missile attacks. Preemptive measures are further categorized as major preemptive measures and continuous preemptive measures.

Major Preemptive Measures

Major preemptive measures are conducted by the ACE and other MAGTF combat assets. They require detailed planning at the highest level, i.e., the MAGTF, and allocation of the maximum number of available aircraft and other assets. Major preemptive measures require the ACE to plan combined strikes to

destroy or degrade the enemy's integrated air defense system (IADS).

Major preemptive measures are conducted for a limited time and usually during the following occasions:

- During prelanding operations.
- If an influx of new enemy equipment prevents or severely limits the use of friendly air assets.
- If an enemy IADS border is reached by the MAGTF.
- If the MAGTF augments the indigenous forces of a country fighting against a well-established enemy IADS.
- If the MAGTF commander's intent is to degrade an enemy IADS.

When planning and conducting major preemptive measures, MAGTF commanders must weigh competing considerations to determine the level of effort used to support the operation. During the initial stages of a conflict, the need to conduct major preemptive measures may lead the MAGTF commander to designate the ACE as the MAGTF's main effort. Some considerations include—

- All available assets.
- Allocating the necessary support and air defense aircraft to support the operation.
- Allocating only those aircraft necessary for the effective defense of ground combat element (GCE) positions.
- Developing a support plan that identifies targets that must be destroyed.
- Giving suppression of enemy air defense (SEAD) support requests received from the ACE to the GCE a high priority.
- Having general support artillery forces support the plan, except fires such as counter fires or final protective fires.
- Developing a follow-up plan to exploit vulnerabilities and opportunities; e.g. ground attack, follow-on OAAW operations, massed close air support, and destruction of resupply efforts.

Continuous Preemptive Measures

Continuous preemptive measures constitute most MAGTF OAAW operations. There are two types of continuous preemptive measures: those short of the fire support coordination line (FSCL) and those beyond the FSCL.

Continuous preemptive measures short of the FSCL allow OAAW assets to conduct ongoing efforts to destroy the enemy IADS on the friendly side of the FSCL. Thus, continuous preemptive measures require detailed coordination between the ACE and the GCE. Continuous preemptive measures short of the FSCL reduce or eliminate the effects of the enemy IADS on other MAGTF operations that support the GCE; e.g., offensive air support or assault support. Although the MAGTF commander can establish no-fly zones for any threat system that could deny airspace to a specific type of aircraft, the ACE should plan and conduct continuous preemptive measures short of the FSCL against as many elements of the enemy IADS as assets will allow. Such attacks reduce future needs, saturate the enemy IADS, force the enemy to expend additional ordnance, and use deception to confuse the enemy.

Continuous preemptive measures short of the FSCL can also employ ground operations. Ground operations can include attacks by infantry, artillery, armor or special operations force units to destroy essential elements of the enemy IADS short of the FSCL. Ground units can capture or destroy elements of the enemy integrated air defense system, or they can provide terminal control for OAAW air strikes against elements of the enemy IADS. Again, detailed coordination between the ACE and GCE is required.

The significant differences between the two strikes lie in the level of intensity, number of assets assigned to the mission, and degree of coordination with ground forces. Continuous preemptive measures beyond the FSCL do not require coordination with the GCE but do require coordination with the MAGTF and within the ACE.

Continuous preemptive measures beyond the FSCL can also be executed using ground operations. Ground operations can include raids or attacks by reconnaissance, long range artillery or other units to destroy essential elements of the enemy IADS beyond the FSCL. Large teams can capture or destroy enemy aircraft and missile capabilities. Small teams can provide terminal control for OAAW air strikes. Resupply, linkup time with friendly forces, and withdrawal methods are primary considerations in employing ground units and teams conducting these operations beyond the FSCL.

Continuous and decisive OAAW operations against the enemy IADS beyond the FSCL focus on destroying the enemy's aircraft, long-range surface-to-air missiles, and early warning systems. This allows

medium-altitude tactics, attacks from the rear, and (at a minimum) low-altitude tactics against an enemy that no longer has early warning capability. Continuous preemptive measures beyond the FSCL can damage or destroy the enemy's aircraft and surface-to-surface missile assets and supporting infrastructure in such a way that these resources cannot bring their power to bear against friendly assets or cannot sustain air and missile attacks.

Suppression of Enemy Air Defenses

Suppression of enemy air defenses are activities which neutralize, destroy or temporarily degrade surface-based enemy air defense by destructive and/or disruptive means. (JP 1-02) SEAD operations allow friendly aircraft to operate in airspace defended by an enemy IADS. As the most commonly implemented OAAW task, SEAD can support all aviation operations, including OAAW's preemptive measures, local air superiority, and reactionary measures. Factors that determine if SEAD should be used include the—

- MAGTF's mission.
- Capabilities and complexity of the enemy IADS. Effectiveness of the enemy's IADS depends on the quality and quantity of the enemy's weapons mix and ability to integrate and support its elements.
- Capabilities and availability of friendly weapons systems.
- Ability of friendly aircrews to invade enemy air defenses.

The ACE plans SEAD missions but the ACE and the GCE should execute SEAD together. SEAD may be applied only at critical times that will allow the MAGTF to proceed without prohibitive interference from the enemy air defense system. SEAD is designed to suppress, disrupt, neutralize, destroy or temporarily degrade enemy air defenses in a specific area. Destruction may involve an inordinate number of assets while suppression may be more efficient. On the other hand, the MAGTF may choose to destroy enemy assets rather than neutralize or degrade them for each air mission. Initially, suppression, disruption, neutralization and degradation may be more cost-effective, but over the duration, a concentrated preemptive effort by the ACE to destroy enemy air defense assets may save the MAGTF significant time, effort, and ordnance.

SEAD is accomplished by destructive and/or disruptive means and attacks using lethal and nonlethal means. These means, alone or combined, include aircraft, direct and indirect fire weapons, ground forces, and command and control warfare (both deception and electronic warfare). SEAD supports specific aviation operations and can be conducted with preemptive measures. OAAW planning should address situations where SEAD employment is anticipated. SEAD can be employed in direct confrontation of the enemy's air defense with ground forces, air forces, naval forces, and instances involving command and control warfare.

SEAD can be conducted short of and beyond the FSCL and requires coordination with ground forces. An example of SEAD short of the FSCL is artillery fires supporting a close air support mission. SEAD beyond the FSCL does not require coordination with ground forces, but does require coordination with the MAGTF and within the ACE. An example of SEAD beyond the FSCL is antiradiation missile attacks in support of an air interdiction mission.

See MCWP 3-22.2, *Suppression of Enemy Air Defenses* and JP 3-01.4, *Joint Tactics, Techniques, and Procedures for Joint Suppression of Enemy Air Defenses (J-SEAD)*, for more information.

Local Air Superiority Measures

Residual enemy air and surface-to-air weapons threats can exist after preemptive measures and SEAD. Local air superiority measures prevent any residual enemy air threat from prohibitively interfering with MAGTF operations in a specific zone of action. Local air superiority measures can include offensive combat air patrols (CAPs) and sweeps, escort and self-escort tactics or aircraft countermeasures and maneuvers. All levels of the ACE can plan and execute local air superiority measures.

Reactive Measures

Reactive measures are the use of offensive firepower in response to an immediate threat. Typically, reactive measures are used against time critical targets, such as attacks against a theater missile transporter-erector launcher following a missile launch or a pop-up surface-to-air missile system. Targets attacked by reactive measures will likely be extremely mobile. Because time is essential when attacking these targets, planners must—

- Minimize response time and heighten their ability to attack by including antiradiation missiles as part of the standard loadout on capable aircraft.
- Use electronic warfare support to identify meteorological or tracking radars which may indicate an impending launch or attack.
- Divert aircraft to attack the target.
- Establish preplanned, on-call aircraft to attack time critical targets.

In the case of the latter two instances, commander's intent translated through target priorities and apportionment decisions, will be the determining factor as to available resources. Reactive measures are the least preferred method of conducting OAAW, but they are often the only available option.

PRINCIPLES

The MAGTF conducts OAAW operations using the principles of location, destruction, deception, intimidation, and combined arms.

Location

Location uses surveillance, reconnaissance, and intelligence resources (including detection, identification, and evaluation) to locate high priority OAAW targets. Information from these resources complements and supplements each other, and is used to pinpoint high priority targets quickly for scheduled or immediate OAAW missions. An example of using an innovative means of locating enemy resources is by employing the unmanned aerial vehicle (UAV). The UAV is rapidly becoming the surveillance, reconnaissance and intelligence gathering platform of choice due to it's inherent low probability of detection, extended loitering time, and low attrition rate. It is especially useful in gathering targeting information before OAAW strike missions.

The ACE and the MAGTF should develop plans that emphasize the aggressive employment of all available air and ground sources to pinpoint highly lethal and mobile enemy systems accurately and quickly. These plans should also address the timely collection and dissemination of combat information on the location of OAAW targets.

Mobile air defense systems; e.g., antiaircraft artillery or surface-to-air missiles and theater missile transporter-erector launchers pose unique challenges to OAAW location techniques. A thorough intelligence preparation of the battlespace (IPB) is necessary for locating these lucrative OAAW targets. IPB should focus on systems' engagement envelopes, comparing the engagement envelopes and system capabilities with the assets they protect, and available terrain that can be used to maximize or mask their engagement potential. Theater missiles provide the enemy with the potential to employ weapons of mass destruction against the rear area. The high mobility of the theater missile transporter-erector launcher allows the enemy to shoot and move to hide sites extremely quickly. For these threats, IPB should identify potential launch sites, hiding sites, and supporting infrastructure to expedite targeting. Additional considerations for OAAW intelligence requirements are discussed on page 2-5.

Destruction

Destruction eliminates the enemy's aircraft and missile threat at its source, preferably before launch or attack. Destruction is often preferred to neutralizing enemy air defenses or SEAD because it conserves and preserves MAGTF resources. If preemptive measures destroy OAAW targets early in the operation, the target can no longer threaten friendly aircraft or forces. If the enemy knows the MAGTF can destroy aircraft, theater missiles, and air defense assets at their source before they launch or attack, the enemy may be intimidated into spreading these assets throughout the battlespace to protect them. The enemy then loses the ability to rapidly mass forces and to capitalize on mutual support and massing of fires to protect assets.

Deception

Deception occurs when the enemy is misled by the manipulation, distortion or falsification of information. Effective deception diverts enemy attention away from OAAW assets and their intended targets. Deception denies the enemy the ability to mass forces against OAAW assets because the enemy is uncertain when, where, and how the OAAW strike will occur. Deception confuses the enemy, saturates air defense systems with conflicting or erroneous information, and makes the enemy react in a way that is not in his/her best interest. For example, deception can cause the enemy to expend ordnance that will assist us in locating the enemy's weapon system; i.e., backblast, or radiate surveillance, target acquisition, and fire control radars, thus pinpointing them for attack. See chapter 5 for more information.

Intimidation

Intimidation uses fear to coerce the enemy into or deter him/her from action. Effective intimidation tactics can cause the enemy to position systems and assets less aggressively, make the enemy reluctant to employ assets, or force the enemy to adopt complex emission control plans. Intimidation tactics can include aggressive reconnaissance, surveillance, and location; quick, destructive reactions; and effective deception. The enemy's reluctance to employ air defense systems allows friendly aircrews to use optimum tactics without undue restriction.

Combined Arms

Combined arms integrates firepower and mobility to produce a desired effect on the enemy. The effects of combined arms (integration) will place the enemy in a dilemma by attacking with more than one combat capability of the MAGTF.In defending against combined arms operations, the enemy will attempt to counter one combat arm, which makes the enemy vulnerable to attack by another combat arm. Combined arms effects can be achieved by lethal methods, nonlethal methods or a combination of both. Examples of combined arms in OAAW are artillery and aircraft, jamming and air attack, and ground attack and air attack.

Combined arms tactics, techniques, and procedures (TTP) can enhance the effectiveness of the MAGTF's combat arms attacks against the enemy and therefore reduce or nullify the enemy's ability to conduct aviation-related operations. Examples of combined arms in OAAW include artillery fire to suppress antiaircraft defenses while attack aircraft deliver ordnance to destroy the OAAW target or electronic attack to suppress the enemy's ability to detect OAAW aircraft while other aircraft employ antiradiation missiles against the target. In the first example, if the enemy fails to move the system to avoid engagement by artillery, he/she remains vulnerable to both artillery and aircraft attack. If the enemy moves the antiaircraft system to avoid the artillery attack, the enemy sacrifices established cover, concealment, and the ability to employ weapons against the attacking aircraft, making the enemy highly vulnerable to attack from the aircraft. In the second example, if the enemy attempts to power through the jamming, this provides a stronger signal for the antiradiation missile. If the enemy continues to radiate in an attempt to acquire targets, he/she remains vulnerable to electronic attack.

INTELLIGENCE REQUIREMENTS

The complexity of OAAW operations requires dedicated intelligence support, including organic MAGTF intelligence assets and nonorganic (joint, theater, and national-level) intelligence assets. Commanders determine and articulate their intelligence requirements. As a starting point, a commander's OAAW intelligence requirements should include a description of enemy air and missile and air defense threats, their location and status, reaction time for warning and direction; target intelligence; and follow-up battle damage assessments.

Typically, as IPB is performed and the enemy order of battle becomes clearer, intelligence requirements change. Once intelligence/data is received, it must be converted into a usable format that contains relevant data and disseminated to OAAW planners in a timely manner.

The MAGTF staff coordinates the ACE's intelligence requirements for all air-related elements of an OAAW mission. The MAGTF staff also coordinates the execution of SEAD operations for the GCE and ACE. To stay current with OAAW operations, GCE and ACE commanders should stay appraised of threat changes, anticipate new intelligence requirements for future operational phases, and effectively articulate those requirements to their intelligence personnel.

TYPES OF OAAW MISSIONS

OAAW missions will likely be preplanned, scheduled missions but can be preplanned, on-call or immediate missions depending on the tactical situation. OAAW missions are surface attacks, fighter sweeps, SEADs, electronic attacks, escorts, and time critical target attacks. See figure 2-1.

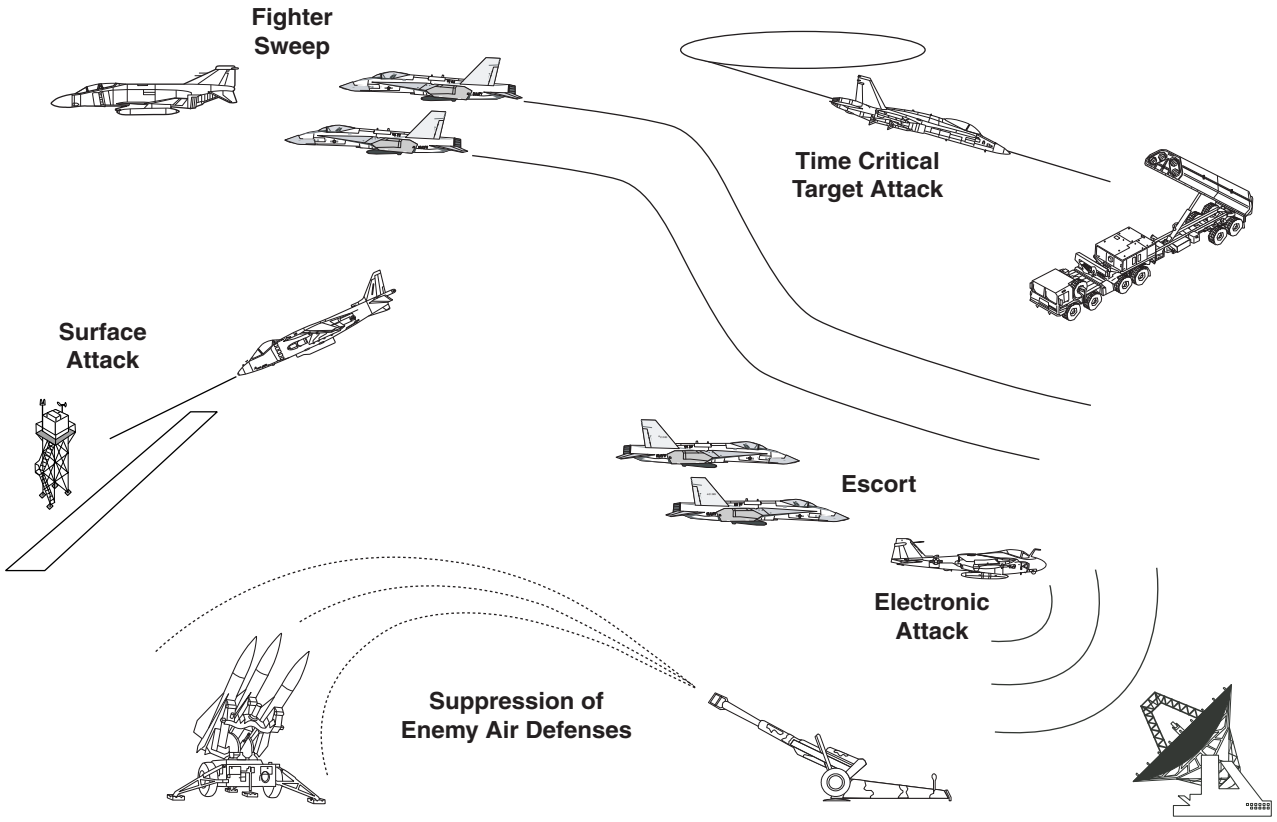

Figure 2-1. Six Type of OAAW Missions.

Surface Attack

Surface attacks destroy or disrupt the enemy's air and missile threats by engaging the enemy forces and support structure before his/her combat potential can be brought to bear. Examples include missions against airfields, surface-to-air missile sites, theater missile launchers' hiding sites, and aviation supply depots/points. The goal of surface attacks is to destroy the enemy's aircraft and missile capabilities while the weapons are still on the ground and to prevent them from launching. Likewise, attacks against the enemy support infrastructure can deny the enemy any capability to rebuild, repair or sustain further air and missile attacks. Surface attacks are typically conducted in the MAGTF's deep operations area but can be conducted in the close operations area if necessary. Aircraft are normally the MAGTF resource to conduct surface attacks. But, depending on the location of the target and available assets, surface attacks may be conducted by other MAGTF or joint force resources such as artillery, land attack missiles or ground forces.

Fighter Sweep

Sweep missions are purely offensive missions used to gain air superiority by seeking out and destroying enemy airborne aircraft or other targets of opportunity in a specific area. Sweeps are often used to clear ingress and egress paths to and from a target of enemy defensive aircraft and surface-to-air missile threats. Sweeps can be conducted independently or in support of a strike package (pre-strike sweep), the latter being conducted before strike execution. Depending on the importance of the target and the amount of risk acceptable by the commander, the success or failure of the sweep can be used as go/no go criteria for the strike package.

Escort

Escort missions support a specific mission over or near enemy territory. Escorts may be assigned to high value airborne assets such as electronic warfare aircraft, airborne command and control platforms, tankers, airlift or strike packages. In strike packages,

escorts may either precede or accompany the package. Escorts can be either attached or detached where escort aircraft fly as part of the formation when attached and separate when detached. In either case, the escorts' primary function is to defend the strike aircraft against attack by enemy aircraft and missiles. The escort's mission is principally defensive, but it can assume an offensive role if sufficient early warning is received to proactively attack a target or if targets of opportunity that pose a potential threat to the supported event should arise.

Suppression of Enemy Air Defenses

SEAD missions typically support OAAW strike packages and close air support missions and can be executed by a variety of lethal and nonlethal resources. SEAD missions can be conducted as preplanned, scheduled; preplanned, on-call; or immediate missions.

Electronic Attack

Electronic attack includes actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception, and employment of weapons that use either electromagnetic or directed energy as their primary destructive mechanism (lasers, radio frequency weapons, particle beams). (JP 1-02) Electronic attack is 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. Electronic attack can be used to deceive, disrupt, degrade or suppress an enemy's air surveillance capabilities, thus denying the enemy the ability to acquire and engage targets.

Time Critical Target Attack

Attacks against time critical targets are principally reactive. They occur as a result of an unanticipated threat presenting itself, and because of the nature of the threat, present a fleeting opportunity for engagement. Examples of time critical targets include mobile surface-to-air missile sites and theater missile launchers. *Theater missile attack operations are used to prevent the launch of theater missiles by attacking each element of the overall system, denying or disrupting employment of additional theater missiles* (JP 3-01.5, *Doctrine for Joint Theater Missile Defense*). Theater missile attack operations also destroy theater missile launch platforms after the missile has been launched. Attacking theater missiles before they launch and attacking their supporting infrastructure is the preferred method of conducting theater missile attack operations.

SURVEILLANCE

Surveillance plays a key role in OAAW operations. Information from surveillance can locate and identify OAAW targets and estimate enemy intentions. Active surveillance includes the use of airborne or ground resources to actively search for OAAW targets. Active surveillance resources include radars, unmanned aerial vehicles, reconnaissance aircraft or ground forces. Passive surveillance uses emissions in the electromagnetic or infrared spectrums to locate and categorize OAAW threats. Passive surveillance assets include electronic warfare aircraft or ground stations and satellites.

WEAPONS EMPLOYMENT

Weapons employment for OAAW operations is based on the enemy threat and target and the capabilities, limitations, and requirements of each OAAW system. Effective countermeasures, such as sweeps, air strikes, SEAD, self-protection, and deception used against the enemy threat increase OAAW operations effectiveness. Normally, employment of any resource in support of OAAW is based on the mission and the target.

Airborne OAAW Target

Normally, OAAW operations employed against airborne targets consist of sweeps. Support for sweeps can include ground- or airborne-controlled interception/early warning systems, electronic warfare assets, and tankers. Sweeps can be employed as part of a support element for a coordinated OAAW strike against a ground target.

Ground OAAW Target

OAAW operations employed against ground targets usually consist of aircraft organized into a strike element, a support element, and a command and control element.

The strike element delivers the decisive effect on the surface OAAW target. Its purpose is to destroy or neutralize the target before enemy air and air defense assets can launch or assume an attacking role against the MAGTF. The target and desired weapons effects dictate the type, number, and weapons load of the strike element.

The support element provides support to the strike element. It is tailored to each specific mission. The support element can include electronic warfare aircraft, sweeps, close escort/self-escort aircraft, UAVs, SEAD aircraft, and tankers. The enemy air and ground threat determines the number of electronic warfare platforms, CAPs, UAVs, and suppression aircraft. Tankers are apportioned as necessary. The support element uses military deception to confuse the enemy air and ground threat and to mask OAAW objectives.

Command and control is critical to successful integration, coordination, and direction of the strike and support elements. The command and control element is tailored to each specific OAAW mission. It also aids rapid assessment and evaluation of mission effectiveness. The command and control element can include airborne or ground-based platforms. An OAAW coordinator and OAAW manager can be used to coordinate OAAW missions and integrate them with other AAW operations.

REQUEST PROCEDURES

Based on input from the GCE, ACE, and combat service support element (CSSE) commanders, the MAGTF commander establishes request procedures for OAAW assets.These procedures are based on OAAW priorities and objectives. Requests for OAAW support are based on the MAGTF's main effort, enemy air force and air defense threat, and targeting information.The ACE, GCE, and CSSE submit requests for OAAW support, including nonorganic assets, to the MAGTF commander.The ACE commander continuously coordinates OAAW requests with the MAGTF, GCE, and CSSE commanders, including procedures for handling targets of opportunity, electronic warfare, and SEAD.

Requests for OAAW missions can be preplanned or immediate. If MAGTF OAAW requirements are submitted according to a plan, i.e., in advance of an operation, they are preplanned. OAAW requirements submitted by MAGTF units and agencies in response to unanticipated situations are immediate requests. A preplanned request can be scheduled to be conducted at a specific time, against a specific target, etc. or on-call, preloaded for a particular target type/target area and placed in a ground or airborne alert status. As preplanned requests are processed, fire support coordination centers, the MAGTF force fires coordination center, and intelligence sections update threat data and assignment of assets to counter each threat.

Requests for preplanned, scheduled OAAW warfare missions identify the target, target areas or landing zone and the known or suspected enemy air defense that may impact mission accomplishment. Requests should also contain the MAGTF and or GCE assets assigned to counter the threat and coordination information for artillery-provided SEAD missions. Coordination information for any MAGTF or GCE furnished electronic warfare and intelligence assets should also be included.

Occasionally, the ACE requests support from the MAGTF or GCE if they have assets that can contribute to the OAAW effort. ACE-GCE coordination for SEAD and electronic warfare requests can occur via the tactical air command center (TACC), direct air support center (DASC) or the GCE fire support coordination center (FSCC) interface. If the GCE cannot provide support to the ACE because of higher priorities or limited assets, the request is forwarded by the ACE and or GCE to the MAGTF commander for resolution.

TASKING

After priorities, objectives, and requirements are established, the ACE commander and his/her staff plan the employment of aviation assets to support needed OAAW operations. Tasking must address the needs of supporting assets, including electronic warfare, tanker, and airborne early warning and control aircraft. Planners should coordinate tasking to ensure effective use of air and ground assets to achieve the desired OAAW results. Tasking coordination must include MAGTF and GCE assets that may be required to support OAAW operations, such as reconnaissance units, radio battalion, and artillery. The ACE commander tasks ground-based ACE assets through the ACE operations order and specific aircraft assets through the ATO.

Aircraft missions in support of OAAW operations are tasked as either preplanned, scheduled; preplanned, on-call; or immediate. Preplanned missions are performed according to a program planned in advance of operations and based on MAGTF requirements or requests. Preplanned missions normally permit detailed coordination.

Preplanned, Scheduled Air Missions

Preplanned, scheduled air missions allow detailed coordination and economical use of aircraft and ordnance. The ACE schedules these air missions based on the MAGTF's OAAW needs. Missions must meet MAGTF priorities, objectives, and requirements based on the known or suspected enemy air and air defense threat. The ACE uses preplanned, scheduled air missions to task aircraft to attack known enemy OAAW targets during preemptive measures and SEAD. Support assets, including fighters, tankers or electronic warfare should be tasked. The TACC determines if additional SEAD support is required. If the TACC cannot provide the required assets, it requests the GCE provide SEAD support.

Preplanned, On-Call Air Missions

The ACE schedules preplanned, on-call air missions to augment preplanned, scheduled air missions. These missions focus on periods of anticipated increases in the enemy air threat to the MAGTF. Preplanned, on-call air missions have the appropriate air-to-air and air-to-ground ordnance loaded and assume a ground (strip) or airborne alert status.

Using ground-alert aircraft for preplanned, on-call air missions has several advantages. The TACC or its designated agency, i.e., the tactical air operations center (TAOC) or DASC has a higher degree of control over assets. Onstation time for the aircraft is maximized for action and mission support. Aircrews can obtain exact target coordinates and brief tactics and routing before they launch. The TACC can ensure that prerequisites for mission support are available.

Using airborne alert aircraft for preplanned, on-call missions also has several advantages. Airborne, on-call missions provide minimal reaction time to respond to a threat. Battlespace situational awareness can be gained from observation or from threat information passed by voice or data link to the aircraft from the TAOC. Disadvantages of airborne alert aircraft are—

- Reduced control by the TACC.
- Aircrews may obtain coordinates and routing before launch.
- Aircrews may have to brief tactics airborne while coordinating with other aircraft and control agencies.
- An inability to ensure that the appropriate support prerequisites are met.
- A limited time on station.

Immediate Air Missions

Immediate air missions may be required if high tempo operations are conducted and if enemy capabilities are underestimated, in response to a pop-up threat or in reaction to a time critical target. Aircraft can be diverted to an immediate air mission at any time. As always, the decision to divert aircraft must be made with respect to the MAGTF commander's intent and target priorities. Requests for immediate air missions require the immediate assessment of enemy air defenses and the establishment of SEAD support requirements. To speed the tasking of aircraft, the ACE predetermines and publishes SEAD support requirements, such as on-call SEAD packages. Identifying SEAD targets and assigning firing units should occur at the lowest possible fire support coordinator's level within the GCE. It is preferred that an aircrew be briefed prior to launch, but this may increase reaction time. If limited assets preclude the assignment of preplanned missions to cover a possible threat, then possible secondary missions are assigned to an aircrew. This provides advance notice and flexibility to an aircrew and the Marine air command and control system (MACCS), and permits the optimum use of assets for a particular mission.

COMMAND AND CONTROL REQUIREMENTS

After the airspace control plan and airspace control order are promulgated and the ATO and special instructions (SPINS) issued, the MACCS coordinates the execution, employment, and assessment of OAAW missions. Command and control ties individual missions into a cohesive operation by providing ground-controlled interception, target assignment, surveillance, and coordination for air and ground assets conducting OAAW.

MACCS agencies use positive and procedural air control methods to command and control OAAW operations. The senior agency afloat or ashore has overall command responsibility. The ACE commander

has centralized command and decentralized control authority of MAGTF OAAW assets. If tasked by the ACE commander, the Marine SAAWC can exercise control of these assets. OAAW coordinators and managers positions can also coordinate OAAW operations. Nonorganic assets, such as airborne warning and control system or airborne early warning and control aircraft, can enhance or augment command and control of MAGTF OAAW. See figure 2-2.

ASSESSMENT

Assessing the effectiveness in OAAW operations can be determined if the commander's desired objective has been reached. At the operational level of war, the commander's objective may be attaining air superiority. At the tactical level, effectiveness in reaching the commander's goal will likely be achieved in part, such as local air superiority to enable a strike package to conduct its mission, which when put together meets the commander's overall objectives. Efficient use of resources does not automatically constitute effectiveness. Efficient use of OAAW assets may have conserved assets for use elsewhere. The ultimate determination of whether those assets were used effectively must be weighed as to attainment of the desired result.

Tangible evidence of effectiveness can be determined by several methods including personal reports (such as pilot reports or reports from forward observers or forward air controllers) and battle damage assessments. Personal reports can provide immediate feedback on the observed effect on a target, but are often subject to the individual's perspective and the fog of war. Battle damage assessments can measure the effectiveness of ordnance delivered on a target. These methods may include personal observation or

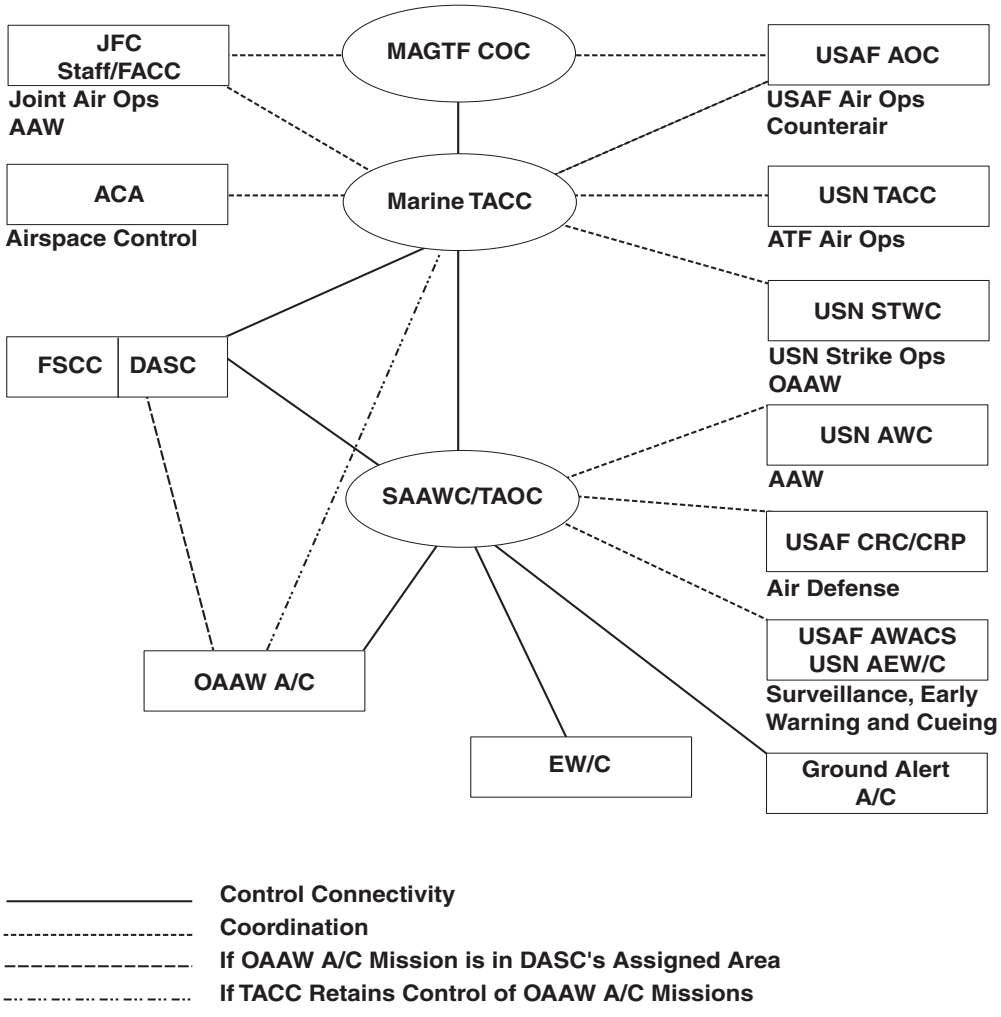

Figure 2-2. MAGTF Command and Control for OAAW.

multisensor imagery from reconnaissance platforms such as satellites and UAVs. Battle damage assessments can provide ample data to determine the effectiveness of an attack, but may be subject to the interpretation of the individual analyzing the data.

Intangible evidence can also assess the effectiveness of OAAW operations, including reports from electronic warfare aircraft and lack of observed aviation, ground-based air defense or theater missile activity. Intangible methods of measurements, although an important part of building the overall effectiveness picture, can be misleading. Lack of electronic emissions from a surface-to-air missile site does not necessarily mean the site was destroyed or neutralized, only that the site is no longer transmitting. Lack of aircraft activity can also be translated into preparation for a forthcoming air attack.

Assessing the effectiveness of OAAW operations will ultimately paint a picture for the MAGTF commander. Based on this assessment, the commander may decide that the OAAW objectives achieved or that additional OAAW sorties must be dedicated toward the campaign.

CAPABILITIES

Many of the MAGTF's capabilities depend on its task organization.

The MAGTF has a variety of organic resources to conduct OAAW missions, including aircraft, ground forces, artillery, and electronic warfare platforms. These resources can be combined to place the targeted enemy capability in a dilemma.

From dispersed locations, MAGTF aircraft can quickly respond and mass (if necessary) to support OAAW requirements. Aircraft response capabilities allow the MAGTF commander to bring overwhelming firepower to bear on attacking enemy aircraft or mobile air defense systems.

The variety of weapons and the type of command and control used in OAAW operations enhance the MAGTF's flexibility in target assignment, weapons engagement, and weapons control.

MAGTF aircraft can operate from forward operating bases, aircraft carriers, and amphibious ships to extend their effective radius of action. Establishing forward arming and refueling points can further assist this capability.

Successful employment of OAAW to protect the MAGTF has a tremendous impact on the morale of enemy and friendly troops. The presence of friendly aircraft and the absence of enemy aircraft increase the confidence of ground-based forces and facilitate rapid accomplishment of the MAGTF's mission. The presence of friendly aircraft can decrease the enemy forces' morale, restrict their actions, restrict/eliminate their ability to conduct aviation operations, and restrict their ability to apply combat power. For enemy forces, losing control of the air can be a significant factor in their defeat.

CHAPTER 3. AIR DEFENSE

Air defense operations include 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. Air defense operations provide the basis for force protection against attacks by enemy aircraft and missiles. However, air defense operations cannot be viewed as purely defensive. Integrating air defenses helps maintain local air superiority, allowing friendly forces freedom of action unconfined by attacks by the enemy's air and missile forces.

Defensive counterair (DCA) is the equivalent joint doctrine for Marine Corps air defense operations and is covered in JP 3-01. DCA is all defensive measures designed to detect, identify, intercept, and destroy or negate enemy forces attempting to attack or penetrate the friendly air environment. Examples of DCA missions are area defense, point defense, and high value airborne asset (HVAA) combat air patrol (CAP).

Air defense is principally reactive. Employment of air defense fires depends on actions by enemy aircraft and missiles. MAGTF air defense operations use the three principles of antiair warfare—destruction-in-depth, mutual support, and centralized command and decentralized control—to provide a responsive, integrated air defense capability to protect vital MAGTF assets.

Air defense includes active and passive measures. The MAGTF's ACE is responsible for the coordination, control, and execution of air defense operations and provides the preponderance of active air defense resources. However, each MAGTF element contributes to the overall air defense effort through their organic weapons and employment of passive air defense measures.

The MAGTF uses a variety of assets to conduct air defense operations, ranging from fighter aircraft and surface-to-air weapons to air command and control agency radars. However, due to the limited number of MAGTF assets available for air defense operations and the wide range of threats, air defense operations are more effectively conducted during joint operations when significantly more assets are available. The MAGTF integrates its capabilities into the theater air defense network, and when necessary, requests additional air defense assets from the joint force commander to augment its own capabilities.

Effective air defense combines and synchronizes the actions of all available air defense assets to form an integrated air defense system (IADS). Although the MAGTF does not have a medium-range, medium-altitude radar SAM, it can field an organic IADS of air command and control facilities, aircraft, and short range air defense (SHORAD) surface-to-air weapons, and project that capability ashore. The true integration of air defense is through the Marine air command and control system (MACCS). The MACCS—

- Synchronizes, coordinates, and controls MAGTF, other Service, and multinational air defense actions within a designated sector or area.
- Interfaces and shares air defense information with joint and multinational partners.
- Coordinates joint air defense operations within a sector or region.
- Acts as an enabler to coordinate air defense operations for a joint force within a theater or joint operations area (under the supervision of the joint force commander or his/her designated agent).

The MACCS facilitates joint/multinational air defense operations and participates as a contributor to the joint force's overall area air defense plan.

MAGTF air defense assets are employed based on the intelligence estimate of the threat, air defense priorities, AAW and air defense principles, and air defense employment principles and guidelines. Aircraft, surface-to-air weapons, and command and control agencies that make up the MAGTF's IADS, and their supporting intelligence, electronic warfare, and communications support are employed based on the enemy air threat to the MAGTF's vital areas. Vital areas can be areas where there are sources of strength —centers of gravity—that need to be protected from air and missile attack or they can be a vulnerability that needs additional defense to prevent them from becoming a critical vulnerability.

ACTIVE AIR DEFENSE

Active air defense uses available aircraft, air defense weapons, and electronic warfare to achieve its goal. It can also employ weapons that are not typically used in an air defense role. Active air defense tasks are

surveillance, weapons control and coordination, and destruction.

Surveillance

Surveillance activities detect, identify, and evaluate all air tracks to provide an accurate, recognizable air picture. A recognizable air picture created through integration and dissemination of surveillance data allows commanders to prioritize target engagements to assign air defense assets. Effective surveillance enables efficient weapons control, coordination, and employment.

The tactical air operations center (TAOC) uses its long-range radars and digital information link capabilities to coordinate the MAGTF's surveillance operations. The TAOC's surveillance section detects, identifies, and evaluates air targets within its assigned sector. The tactical air command center (TACC) (or tactical air direction center, if applicable) typically reports surveillance data to agencies outside the MAGTF.

Terrain masking and the inherent limitations of ground-based radars to detect low-altitude aircraft require the TAOC's surveillance capability be supplemented. If available, airborne early warning and control platforms and nonorganic systems can supplement the TAOC and reduce or eliminate these limitations. Other surveillance means, including surface-to-air weapon systems' radars and aircraft radars, must be integrated to provide the best air picture possible.

Employment of the TAOC and airborne early warning and control systems does not guarantee that all aircraft and missiles will be detected. Visual detection capabilities provided by Stinger units, CAPs, other aircraft, and ground troops must be integrated on a near-real-time basis to round out the surveillance capability.

Regardless of the detection means, the target detection reporting process must be timely to enable target engagement. A common reference system speeds the surveillance process. When a common reference system is not practical, a single reference point for reporting is paramount.

All AAW assets must have access to surveillance information. The ability to inform the MAGTF of threat detection and potential encroachment is critical for force protection and engagement. Surveillance information must be streamlined and rapidly passed to initiate the appropriate response to the threat. The ability to cross-tell information from visual or manual systems to automated agencies and vice versa must be established.

A redundant communications system allows dissemination of surveillance information within the MAGTF. The communications system allows weapons in the same vicinity to exchange detection data at the lowest level possible. This affords the best reaction time without disrupting the continuous information flow to the TAOC, combat operations center, and other key information nodes. The communications system must allow rapid reporting of visual sightings to the TAOC under any conditions at any time. The TAOC broadcasts threat information to required MAGTF units, who in turn further monitor and disseminate the information, and take action as necessary. The surveillance process consists of detection, identification, and evaluation.

Detection

Detection locates air tracks in and around the air defense sector. Radar, weapon systems, visual means or intelligence sources perform detection. Detection must occur quickly at maximum range to optimize reaction time for identification, weapon selection, and employment.

Identification

Rapid and positive identification of all air tracks in and around the air defense sector is essential for an effective IADS. Positive identification protects friendly aircraft from fratricide and allows early identification, long range identification, and destruction of enemy aircraft as far from the vital area as possible. Identification requires a combination of electronic, visual, and intelligence means to be effective. Decentralized control can streamline identification by delegating responsibility to a weapons system operator if organic surveillance means cannot provide timely identification of unknown air tracks. Identification can also be streamlined by using preplanned procedures and implementing the least restrictive rules of engagement (ROE) possible.

Once the MAGTF surveillance system detects an aircraft, the system uses a process of elimination, known as an identification matrix, to identify the aircraft as either friendly or hostile. Ideally, friendly aircraft operating in the MAGTF's sector of responsibility are under the control of a MACCS agency and are updated as friendly. This should aid in differentiating them from hostile aircraft. However,

the mission, flight profile or number of friendly aircraft may make it difficult to maintain positive, continuous contact with all friendly aircraft in the controlled airspace. This difficulty is complicated by the limited low-altitude tracking capability of ground-based radar systems and the saturation of the surveillance system's identification capabilities.

Generally, friendly outbound aircraft do not pose a significant identification problem because—

- They just departed from friendly airfields or ships and have had positive contact with a controlling agency that can alert the IADS.
- Or their flight direction poses a lesser threat to the MAGTF's vital areas than aircraft approaching from the extremes of the MAGTF's area of operations.

Once an aircraft performs its mission and returns through the IADS, it may present a higher threat profile. If so, the higher threat profile complicates identification because—

- The aircraft's flight direction is inbound (toward a vital area) and the tactics used to evade the enemy's air defense system may be similar to the tactics used to defeat the MAGTF's IADS.
- The aircraft may not be under positive control of a MACCS agency.
- The aircraft's mission may be forward of the FSCL, outside the MAGTF's area of operations or is under the procedural control of a MACCS or other air command and control agency; therefore its exact location is unknown.

Aviation planners must use procedural control measures to protect returning friendly aircraft from hostile fires and simultaneously place them in time and space where they can be positively identified to protect them from friendly fires. These control measures—return to force procedures, minimum risk routes, air corridors, etc.—must be simple to understand and execute, and they must consider the limitations of the MAGTF IADS. During the execution phase, planners reevaluate ROE and identification criteria determined during planning and establish updated identification procedures based on the tactical situation.

Evaluation

After a target is detected and identified, it is evaluated. The process of evaluation further defines the air picture. It identifies the threats by prioritizing air tracks, and the target's engagement priority is determined based on its immediate threat to the vital area. By continuously evaluating air tracks and updating the air picture, AAW units can effectively apply the air defense required.

Weapons Control and Coordination

Weapons control and coordination involves selecting and assigning the appropriate weapon to a particular air track and directing, controlling, and coordinating weapons employment. Weapons assignment depends on the identified target position and the position of available air defense weapons. Through effective integration and coordination, engagement and weapons use can occur across sector boundaries. Air defense actions should focus on engaging targets that pose the greatest, immediate threat as soon as possible with the first weapons system either available or capable of destroying them. These engagements should occur as far from the vital area as practical without compromising mutual support within the IADS. Controllers should assign mutually supporting weapons systems in case one or more of the initial engagements fail.

IADS effectiveness results from shifting from one degree of control to another. The selected degree of control depends on the ROE, the air picture, and the ability to communicate with the weapons systems. The degree of control can vary from centralized to decentralized. Under certain conditions, air defense units may conduct autonomous operations. Effective coordination of air defense assets must occur.

Destruction

Destruction is a process that either destroys enemy aircraft or missiles, or prevents them from completing their mission. Aggressive ROE and situational awareness gained from the air picture aid weapons employment and destroying the enemy air threat.

PASSIVE AIR DEFENSE

Passive air defense reduces or nullifies the effects of hostile air action, including theater missiles. Passive air defense provides essential individual and collective protection to friendly forces and critical assets. *Passive air defense is a responsibility of commanders at*

all levels. Passive air defense complicates the enemy's targeting ability and ordnance delivery and increases the survivability of friendly forces under attack.

Tactical Warnings

Tactical warning measures provide timely dissemination of information on the likely or imminent threat of attack by aircraft or theater missiles. Tactical warnings can be general warnings that aircraft or missile launches have occurred, or specific warnings to designated units or areas that are in danger of attack. Tactical warnings should include the warning itself and likely targets. *If the threat is a theater ballistic missile, the likely area of missile impact as indicated by the projected circular error of probability ellipse should be included, and, if known, the time to missile impact or aircraft attack.* Tactical warnings can be communicated through wide or local area networks, radio messages, sound or visual alarms, and voice.

Reducing Enemy Targeting Effectiveness

Methods for reducing the enemy's targeting effectiveness focus on ways to deny the enemy information about the location of friendly units or, if the enemy has that information, making target acquisition more difficult.

Operations Security

The communications security, signature reduction, and security aspects of operations security deny enemy sensor and reconnaissance assets timely acquisition and identification of friendly targets. Examples of operations security measures used for passive air defense are: emission control measures, cover, and concealment.

Camouflage

Camouflage is the use of natural or artificial material on personnel, objects or tactical positions with the aim of confusing, misleading or evading the enemy. (JP 1-02) Camouflage disguises friendly positions from the enemy.

Deception

Deception misleads the enemy by manipulating, distorting or falsifying friendly actions. Deception misleads the enemy on location, type or intention of friendly units. Well-executed deceptive measures can cause the enemy to deplete his/her aircraft and missile resources by attacking false targets, missing intended targets, and denying the enemy accurate battle damage assessment. Decoys and chaff are among the most commonly used deception measures.

Mobility

Mobility reduces vulnerability to attack by aircraft and missiles and increases the survivability of certain systems by limiting them to exposure of reconnaissance and targeting. Mobility contributes to deception by moving assets frequently to mislead enemy reconnaissance efforts in locating friendly assets.

Reducing Vulnerability

Protective Construction

Protective construction of assets reduces vulnerability to attacks. It limits or negates damage to friendly resources by providing protective coverage around the resource. Protective construction may be as basic as building sandbag walls around facilities or as elaborate as constructing revetments for aircraft.

Redundancy and Robustness

A way to retain combat power is to duplicate critical vulnerabilities that are particularly vulnerable to attack by aircraft and missiles. Critical capabilities include soft targets, such as key command and control nodes, sensors, and fixed sites such as airfields. Planning for alternate agency responsibilities, ensuring duplication or alternate paths of communication, and preparing alternate locations for operations are ways to achieve redundancy and robustness.

Dispersal

Dispersing assets reduces their vulnerability to attack by decreasing their concentration and making the target less lucrative. Dispersing assets forces the enemy to use more aircraft or missiles or conduct reattacks to neutralize or potentially destroy the target. Dispersal can also mislead the enemy as to the occupation or use of a particular location.

Nuclear, Biological, and Chemical Defense

Aircraft and missiles are among the most common delivery methods for weapons of mass destruction. Although the best method for nullifying this threat is destroying the weapons at their source or destroying the enemy's ability to manufacture the weapons, preparing for a biological or chemical attack and operating within chemically or biologically contaminated areas are necessary requirements.

Passive air defense against these weapons include contamination avoidance, force protection, and decontamination. Contamination avoidance includes detecting, identifying, and reporting the presence of nuclear, biological or chemical agents or materials. Force protection includes individual and collective protection measures to negate or minimize the effects of various agents or materials. Decontamination removes the hazards from personnel and equipment, minimizes the spread of the contaminant, and restores normal operations.

Recovery and Reconstitution

Recovery and reconstitution refers to the ability of a unit to be restored to a desired level of combat effectiveness commensurate with mission requirements and available resources after an attack. (JP 3-01.5) Recovery and reconstitution efforts may include reestablishing or reinforcing command and control; replacing personnel, equipment, and supplies; and repairing damage.

PRINCIPLES

Location, destruction, reduction, and confusion maximize destruction and minimize the effects of enemy air and missile attacks.

Location

Locating the target is the first step in air defense operations. The target must be detected, identified, and evaluated prior to engagement. Surveillance, reconnaissance, and intelligence help locate targets. Information from air and ground sources complements and supplements each other. The ACE and the MAGTF should develop plans that emphasize the vigorous employment of all available air and ground sources to locate enemy air and missile assets quickly after they launch or during their attack. Timely collection and dissemination of combat information to a friendly IADS aids in locating the enemy's air threat.

Destruction

Destruction eliminates the enemy's air assets after they are launched or while they are attacking. The complete destruction of enemy air assets is preferred to reducing or nullifying the impact of the enemy's attacks on MAGTF operations. Detailed planning and coordination is essential to integrating and destroying the enemy's air threat. The ACE coordinates and plans air defense missions between the MACCS and existing fighter engagement zones (FEZ), missile engagement zones (MEZ), short range air defense (SHORAD) engagement zone (SHORADEZ) or within a joint engagement zone (JEZ). MAGTF aircraft and surface-to-air weapons support each other to achieve complete destruction of the enemy's air threat. This mutual support demoralizes the enemy by diverting his/her attention from the primary target and reduces his/her ability to destroy MAGTF assets. Electronic warfare, chaff, deception, and concurrent ground operations can be used in concert with these principles to confuse the enemy.

Reduction

Reduction is the process of lessening, diminishing or decreasing the size, number or effect of the enemy's air and missile threat after it is launched or while it is attacking. By reducing the number of enemy air assets after they launch or before they penetrate the MAGTF's IADS and approach the vital area, the MAGTF lessens the enemy threat. Reducing or eliminating the enemy's air assets that deliver ordnance increases the MAGTF's ability to survive the attack, facilitate maneuver, and complete its mission. The MAGTF can also use dispersion, deception, and mobility to lessen the effect of enemy air action on MAGTF operations.

Comprehensive planning and the subsequent execution of that plan stress the reduction or elimination of the enemy's assets and their effect on MAGTF targets. Reduction and elimination must be stressed during all levels of MAGTF planning, including down to the individual Marine. Planning and execution should outline methods of survivability (cover, concealment, camouflage and protective construction).

Confusion

Confusion is the act of throwing enemy air assets into a state of disorder and disarray. The MAGTF attempts to disrupt the cohesiveness of the enemy's attack by locating, destroying, and reducing the enemy air threat after it launches or while attacking. Early location of enemy air assets allows the MAGTF's IADS to direct, steadily increase, and overlap its fires. This destroys or reduces the enemy threat, eliminates the enemy's element of surprise, and increases the enemy's losses. If location, destruction, and reduction succeed, the enemy is left in a state of confusion. Weapons delivery

and target acquisition systems are degraded or made inoperable. The enemy then becomes overwhelmed, distracted, and disoriented; concentration decreases; locating a target is more difficult.

INTELLIGENCE REQUIREMENTS

Air defense operations require diverse resources and extensive integration and coordination to function cohesively. Air defense operations require intelligence information from organic assets, MAGTF assets, and nonorganic assets to determine the scope of the enemy air threat. Nonorganic assets, including joint, theater, or national-level, may require approval at the joint force, theater, or higher level.

Once air defense orders are issued, the MAGTF staff coordinates and determines air defense intelligence requirements based on the mission. The ACE commander identifies his/her intelligence requirements by submitting information requirements. At a minimum, air defense operations require information on the threat capabilities, description, location, status, warning, and direction of the enemy air threat from intelligence sources.

ACTIVE AIR DEFENSE APPLICATIONS

Area Defense

Area defense uses a combination of weapon systems; e.g., aircraft, surface-to-air weapons, and electronic warfare to defend broad areas. There can be specialized applications of area defense when friendly assets requiring protection are spread over a large geographical area with defined threat boundaries.

Point Defense

Point defense protects limited areas and is normally used in defense of vital areas of forces or installations.

Self-Defense

Self-defense allows friendly units to defend themselves against direct attacks or threats of attack through the use of organic weapons and systems. *The right of self-defense is inherent to all ROE and weapon control procedures.*

Supporting Missions

Defensive counterair missions support area, point, and self-defense.

Surface-to-air missile fires defend point targets and/or vital areas from attack by aircraft and missiles. Extremely mobile or man-portable surface-to-air weapons fires are used offensively by establishing aircraft ambushes.

Small arms fires, including M-16s and machineguns, are used in self-defense roles.

WEAPONS EMPLOYMENT

Weapons employment is based on the air defense sectors assigned to the MAGTF and the sector's corresponding surveillance area, destruction area, and vital area. Air defense sectors are typically designated by the joint force commander through his/her area air defense commander (AADC) if one is designated. Based on input from the aviation, ground, and combat service support element commanders, the MAGTF commander recommends to the joint force commander the air defense sectors and responsibilities to be assigned to the MAGTF.

Regardless of the MAGTF's role in the operation, its assigned air defense sector should correspond with its area of operations and, depending on the air control abilities of other members of the joint force, can potentially be larger than the MAGTF area of operations. The MAGTF commander (with input from the ACE, GCE, and CSSE) defines vital areas, destruction areas, and surveillance areas within his/her air defense sectors. Weapons systems are placed within the air defense sector to provide an effective defense of the MAGTF's vital area. See chapter 6 for more information.

WEAPONS MANAGEMENT

Weapons management is integrating and coordinating assets allocated for the air defense mission and operation of the MAGTF IADS. Weapons management responsibilities exist at various levels within the ACE, starting with the ACE commander down to the control agency, missile unit, or individual aircrew; e.g., TAOC, SAAWC or weapon platforms.

See chapters 4 and 6 for information on command and control relationships and air defense weapons management responsibilities within the MAGTF.

REQUEST PROCEDURES

Requests for the MAGTF's airborne air defense resources are completed the same way as offensive antiair warfare sorties. Joint force sorties for air defense are requested through the joint force commander or his/her designated agent; i.e., the AADC who consolidates the requests and allocates resources for theater air defense.

For surface-to-air missiles, coordination between the requesting unit and the ACE commander (through the chain of command) is appropriate. Requests for assets external to the MAGTF are forwarded to the joint force commander or his/her designated agent; i.e., the AADC for distribution of joint force assets.

TASKING

After priorities, objectives, and requirements are established, the ACE commander and his/her staff plan the tasking of aviation assets to support air defense operations. Tasking also must address the needs of supporting assets, such as electronic warfare, tanker, and airborne early warning and control aircraft. Planners should coordinate tasking to ensure effective use of air and ground assets and aid in the establishment of air defense through air intercept (fighter engagement) zones, SHORADEZ, and depending on availability, MEZs for radar SAMs. To fulfill air defense requirements, the ACE commander tasks ground-based ACE assets via the operation order. Specific aircraft assets are tasked through the MAGTF ATO. Preplanned aircraft missions are planned in advance of an operation, and based on previous MAGTF requirements/requests. Preplanned missions permit detailed coordination and can be scheduled or on-call. Aircraft tasked to support air defense operations are assigned preplanned scheduled, preplanned on-call, or immediate missions.

Preplanned, Scheduled Air Missions

The ACE schedules preplanned air missions based on the MAGTF's air defense needs. These missions provide air defense of vital areas based on the known or suspected enemy air threat. Preplanned, scheduled air missions also support air defense operations, such as tanker, airborne early warning and control aircraft, and electronic warfare. Preplanned, scheduled air missions are executed at a specific time; e.g., a CAP mission is assigned a specific launch time and time to be on station. Preplanned, scheduled air missions allow detailed coordination and economical use of aircraft and ordnance.

Preplanned, On-Call Air Missions

The ACE schedules preplanned, on-call air missions to assist scheduled missions. These missions focus on periods of anticipated increases in the enemy air threat to the MAGTF. Preplanned, on-call air missions load the appropriate air-to-air ordnance and assume ground (strip) or airborne alert status. Ground alert CAP aircraft provide several advantages. The TACC or its designated agency, such as the TAOC, has a higher degree of control over assets. The aircrew can obtain target/airborne threat location. Tactics and routing can be briefed before launch. The TACC can also ensure that mission support prerequisites are provided. Onstation time increases with on-call aircraft.

Airborne alert CAP aircraft provide several advantages: minimal reaction time, battlespace situational awareness gained from observation, and the TAOC providing real-time threat information to data link-equipped aircraft. Disadvantages are a reduced ability to ensure that support prerequisites are met and a limited time onstation.

Immediate Air Missions

Immediate air missions may be required if high tempo operations are conducted or if the MAGTF's IADS becomes saturated by enemy air assets. Immediate air missions to augment the air defense effort may involve tasking aircraft not traditionally associated with air defense, such as AV-8B Harriers or AH-1W Cobras.

Aircraft can be diverted to an immediate mission at any time. It is preferred that an aircrew diverted to an immediate mission is briefed on the deck but this increases reaction time. If there are not enough assets to assign preplanned missions to cover possible threats, then possible secondary missions are assigned

to an aircrew. Aircraft eligible for airborne diverts should include air-to-air ordnance in addition to its air-to-ground ordnance. Including guidance for divert procedures and conditions in the MAGTF operations order can provide the MACCS and aircrews with some notice and flexibility to determine which assets may provide the best mission results. Before aircraft are diverted, the diverting authority should ensure that the mission change is in keeping with the MAGTF commander's intent.

COMMAND AND CONTROL REQUIREMENTS

Command and control coordinates and integrates the execution and employment of air defense assets after the air defense plan and airspace control plan/airspace control order are promulgated and the MAGTF ATO and special instructions are issued. It ties individual missions and engagements into a cohesive air defense by providing ground-controlled interception, target assignment, surveillance, and coordination for CAPs and surface-to-air weapons. MACCS agencies, positive and procedural control measures, and communications provide the elements for command and control of air defense assets and operations. Nonorganic assets, including airborne warning and control system and airborne early warning and control aircraft, can enhance or augment command and control of MAGTF air defense assets.

The ACE commander executes command of air defense resources in the MAGTF. The ACE commander exercises centralized command and decentralized control authority of MAGTF air defense assets. The ACE commander delegates the authority for supervision, management, and coordination of air defense operations within the MAGTF air defense sectors to the SAAWC. The SAAWC is the MAGTF commander's air defense battle manager but is not an air command and control agency.

The ACE commander delegates the authority for real-time control of air defense assets to the TAOC. The TACC supervises and the TAOC executes control of the MAGTF's IADS. Control of air defense operations can be decentralized or centralized. The maximum degree of decentralized control is achieved through establishing effective procedural control measures, including WEZs and ROE/RTF procedures. When operating under decentralized control, weapons platforms conduct engagements based on the established weapons control status and ROE. Under centralized control, weapons platforms evaluate targets based on the established **weapons control status** and **ROE** and then **request permission** to engage the target from the TAOC. Engagements are conducted only on approval or direction of the TAOC unless the target meets the criteria for **self-defense**.

Communications provide the means to execute command and control of air defense operations. Communications paths between the TACC, Marine aircraft units, forward operating bases, the TAOC, and air defense platforms are critical for air defense operations to succeed.

ASSESSMENT

Because of the MAGTF's limited air defense resources and the need to protect its assets, the MAGTF commander strives to be efficient with the employment of his/her air defense assets. However, efficiency should not be sacrificed for the cost of lost resources. The MAGTF commander determines the degree of risk he/she is willing to accept. The degree of risk translates into allocating air defense resources to protect designated air defense priorities.

Although destroying the attacking aircraft or missile is usually desired, it is not the only gauge to assess the effectiveness of an IADS. Other examples of assessing effectiveness include—

- Turning away an aircraft before its attack through lethal or nonlethal means.
- Deflecting a missile warhead so that it cannot reach its target or create collateral damage affecting its target.
- Using passive measures to cause the enemy to attack positions where there are no friendly forces.
- Demonstrating such strength and integration of air defenses that the enemy does not attack.

There may be times when an aircraft or missile can penetrate the air defense system and succeed in its attack. Using the principle of destruction-in-depth, it is key that the aircraft or theater missile launch platform be destroyed after the attack to prevent future attacks. Attacking an aircraft during its egress from the target area is an air defense function. Actions against aircraft

on the ground or transporter-erector launchers is a task of OAAW.

CAPABILITIES

Many of the MAGTF air defense capabilities depend on its task organization. The MAGTF possesses active air defense weapons systems, including aircraft and surface-to-air-missiles.

Decentralized control of air defense assets allows the MAGTF to rapidly respond to aircraft and missile threats.

The MAGTF's organic air surveillance radars, augmented by data linked information, provide long range air defense surveillance of the battlespace.

The MAGTF's air defense resources can integrate with joint and multinational forces to contribute to the joint force commander's concept for theater air defense.

The MAGTF's organic air defense assets provides flexibility with engagement of aircraft threats. This flexibility also provides the IADS with a capability for sustainment. (Surface-to-air missile units are not limited by aircraft time on station restraints.)

Darkness and limited periods of visibility brought on by weather, smoke, etc., can impede effective employment of optically guided air defense systems. Radar ducting can have adverse affects on target acquisition.

Without a medium range, medium altitude radar SAM, the MAGTF lacks the ability to destroy enemy aircraft and missiles at medium altitudes until they are within weapons release parameters. Augmenting joint air defense assets is critical to deny the enemy altitude sanctuaries against the MAGTF's low altitude surface-to-air missile.

As with OAAW operations, an air defense aircraft's time on station is limited by distance to and from their station, station altitude, and other related factors. Tanker aircraft or employment of ground alert aircraft help eliminate this problem.

Line of sight is affected by the curvature of the Earth and other obstructions, such as intervening terrain. Terrain can mask areas from radar and communications coverage. Line of sight and terrain masking affect all radars and certain communications media. Proper sight selection; placement of radars and communications equipment; and airborne radars (command and control and on-board weapons radars) can augment the MAGTF's organic ground-based surveillance and minimize line of sight and terrain masking effects.

Phasing of AAW (air defense) functions ashore can be a time-intensive process and create a greater reliance on sea-based air defense assets. Incremental phasing of control ashore and the early introduction of air defense assets ashore can speed the process.

The enemy's use of jamming, destruction, and electronic deception can adversely affect air defense operations. The enemy can employ electronic attack against MAGTF air defense radars; command and control voice and data communications; and air controllers. Susceptibility to electronic attack can be minimized by understanding the enemy's electronic warfare capabilities and training, and by employing proper electronic protection; e.g., using decoys, brevity codes, chattermark procedures or frequency hopping radios.

CHAPTER 4. COMMAND AND CONTROL

Command is the authority that a commander in the military service lawfully exercises over subordinates by virtue of rank or assignment. (JP 1-02) Control is the physical or psychological pressures exerted with the intent to assure that an agent or group will respond as directed. (JP 1-02). Command and control is the means by which a commander recognizes what needs to be done and sees to it that appropriate actions are taken (MCDP 6, *Command and Control*). Command and control provides unity and purpose to the myriad of actions performed by a military unit.

Command and control consists of people, information, and a support structure. Blending these elements takes advantage of each element's attributes and builds a comprehensive picture of the battlespace. Those involved in planning and execution of AAW operations can decide what actions will compel the enemy to do our will.

The ACE commander is responsible to the MAGTF commander for the conduct of AAW operations. Other element commanders provide planning, resources, and logistics support to the ACE commander. All element commanders must be involved to lend unity of effort to the MAGTF commander's single battle.

The ACE commander normally delegates authority for the detailed planning and execution of AAW operations to the Marine air command and control system (MACCS). From his/her command post at the tactical air command center (TACC), the ACE commander or his/her designated agent provides centralized command and decentralized control over the execution of AAW operations.

Varying degrees of control and operations can exist within AAW operations and depend on particular situations. Several types of control exist that can be used exclusively or combined to achieve the desired degree of autonomy in operations.

AIR CONTROL

Air control is the authority delegated to MACCS subordinate elements to direct the physical maneuver of in-flight aircraft or to direct an aircraft or surface-to-air weapons unit to engage a specific target. Tasks that maneuver aircraft or direct a surface-to-air weapons unit to engage a particular target are air control tasks. An air controller performs air control when he/she directs an aviator to maneuver his/her aircraft. A missile controller performs air control when he/she directs a surface-to-air weapons unit to engage a particular target. Agencies and individuals that perform air control functions include the—

- Tactical air operations center (TAOC) and its early warning and control (EW/C) sites.
- Direct air support center (DASC).
- Marine air traffic control detachments (MATCDs).
- Designated controllers and coordinators, e.g.; tactical air coordinators (airborne), assault support coordinators, forward air controllers (airborne), forward air controllers, and in some instances, the aircraft flight leader.
- Surface-to-air weapons unit leaders. They perform air control when they direct subordinate elements to engage a particular target.

Air control information is usually single-mission related. Communications occur between the aircrew/surface-to-air weapons unit and the air/weapons controller. Air control consists of airspace control and airspace management. See figure 4-1.

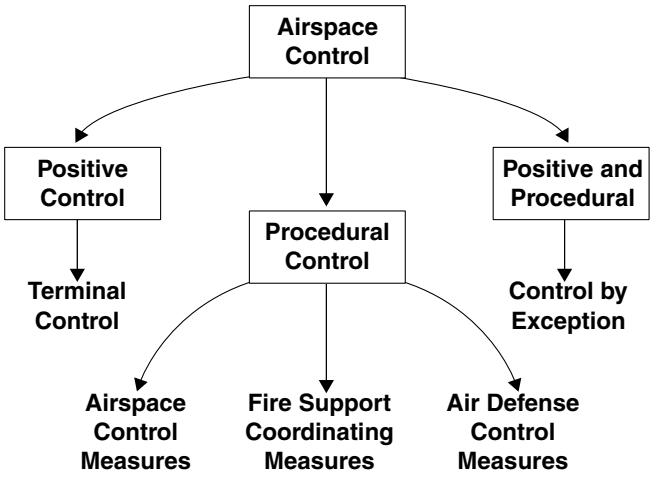

Figure 4-1. Airspace Control Methods.

Airspace Control Methods

Airspace control is the authority given to a commander to direct airspace users so that airspace is used efficiently and effectively. The unit commander

responsible for a particular block of airspace, type of mission, or type of aircraft has airspace control authority. Airspace control coordinates, integrates, regulates, and uses a defined airspace and aids in identifying all airspace users. Coordination is that degree of authority necessary to achieve effective, efficient, and flexible use of airspace without providing command authority. Integration is the need to combine requirements for the use of airspace in the interest of achieving a common goal at the lowest possible level. Regulation is the requirement to supervise activities in the airspace to provide for flight safety and denotes the authority required for such safety. Identification produces timely engagement of enemy aircraft while reducing the potential for fratricide.

Airspace control measures are published in the airspace control order, airspace control plan, and special instructions to the air tasking order (ATO). Airspace control measures and procedures are disseminated to all airspace users and control agencies. Airspace control does not include the authority to approve, disapprove, deny, or delay aviation operations.

Positive Control

Positive control relies on positive tracking, direction, and identifying aircraft to exercise airspace control. It is conducted electronically by agencies equipped with radar; identification, friend, or foe (IFF) interrogators and receivers; beacons; computers; digital data links; and communications equipment. Generally, two conditions must exist for a commander to exercise positive control: the means to identify and locate airspace users and the ability to maintain continuous communications with them. Agencies that exercise positive control include the TAOC, EW/C sites, and MATCDs.

Positive control facilities are subject to attack and sabotage. They may be restricted by line of sight coverage, electronic interference, and limited communications. Positive air control agencies must have back-up procedures to compensate for failure of part or all of their positive control systems.

Terminal control is the authority to direct the maneuver of aircraft which are delivering ordnance, passengers, or cargo to a specific location or target. Terminal controllers require specialized training that differs from other air controllers. The TAOC, EW/C sites, MATCDs, forward air controllers, forward air controllers (airborne), and other designated agencies, units, and individuals perform terminal control of AAW operations.

Procedural Control

Procedural control relies on previously agreed upon and promulgated orders and procedures. Included in these orders and procedures are airspace control measures, fire support coordinating measures, and air defense control measures. Procedural control divides the airspace by volume and time and uses weapons control statuses to manage aviation operations. It is less vulnerable to interference by electronic and physical attack and ensures continuity of operations under adverse environmental conditions. It also serves as a backup system if positive control is used. The TACC, tactical air direction center (TADC), SAAWC, TAOC, EW/C sites, DASC, MATCDs, base defense zone (BDZ), low altitude air defense (LAAD) units, controllers, and coordinators exercise procedural control in support of AAW operations.

Typically, aircraft operating in the main battle area provide a rapid and flexible response to meet the MAGTF maneuver forces' requirements. The freedom of movement required to conduct AAW operations makes individual control of aircraft extremely difficult. To control and direct the movement of aircraft in the main battle area, the MAGTF commander establishes procedural control by assigning sectors of responsibility for each MAGTF air defense unit and publishing rules of engagement (ROE) that specify target engagement conditions. Air defense units, particularly those operating in the main battle area, are managed by procedural control techniques to facilitate this freedom of movement.

Combined Control Methods

In the absence of unlimited command and control assets, the optimal method of controlling aircraft and missiles conducting AAW operations is by combining positive and procedural control. Usually, procedural control is implemented to cover positive control limitations.The vision of an established procedural control system augmented by positive control capabilities allows for a different combination control technique; i.e., positive control by exception. Under positive control by exception, control agencies provide positive control to aviation assets not as a normal process but in exceptional cases where the positive control agency's information is better (or more current) than that of the aviation asset conducting AAW operations. See MCWP 3-25, *Control of*

Aircraft and Missiles, for more information on airspace control methods.

AIRSPACE CONTROL MEASURES

Airspace control measures exercise the procedural control measures of airspace control, air defense, and fire support coordinating measures. Used with air defense and fire support coordinating measures, airspace control measures maximize the effectiveness of combat operations by promoting safe, efficient, and flexible use of airspace. Airspace control measures can outline or modify hostile criteria or serve as a tool for identifying targets and coordinating fires.

Airspace control measures are normally published in the operation order, airspace control order, airspace control plan, and special instructions to the ATO. Airspace control measures should be disseminated to the appropriate MACCS agencies; fire support coordinating agencies; aircraft units; and surface-to-air weapons units to ensure coordination and integration of the airspace, supporting arms, and AAW operations.

Requests for establishing airspace control measures are forwarded to the joint force commander or his/her designated agent (the airspace control authority) for implementing through the airspace control order. Typical airspace control measures used by a MAGTF follow.

Amphibious Objective Area

The amphibious objective area (AOA) is a geographical area that includes the amphibious task force's (ATF's) objectives and the sea, air, and land required to conduct operations, secure objectives, and accomplish the ATF's mission.The combatant commander, Service component commander or the joint force commander identifies the AOA in the initiating directive. As part of an ATF, the landing force (MAGTF) conducts aviation operations, including AAW, within the AOA by using MACCS capabilities to conduct airspace control of its aviation operations.

Airspace Control Area and Sector

An airspace control area is airspace that is laterally defined by the boundaries of a component's area of operations. Typically, the joint force commander assigns airspace control areas to the MAGTF that correspond to the MAGTF's area of operations. An airspace control sector is a subdivision of an airspace control area. The joint force commander may also assign an airspace control sector to the MAGTF. The MAGTF commander is responsible for all aviation operations within his/her assigned airspace control area or sector.

Air Control Points

Air control points route aircrews to their targets and provide a ready means of conducting fire support coordination. They must be easily identified from the air and support the MAGTF's scheme of maneuver. If possible, air control points should be used by a variety of aircraft. The TACC determines each control point's intended use based on the tactical situation and promulgates that information through the daily ATO. Air control points can serve one or more functions simultaneously. They are not specifically limited to AAW functions; i.e., multiple use control points. Air control points can be designated as—

- Entry/exit.
- En route.
- Orbit/holding.
- Contact.
- Initial.
- Rendezvous.
- Egress control.
- Penetration.

Ingress, Egress, and Return to Force Control Procedures

The most difficult aspect of air defense is planning for friendly aviation operations that support the MAGTF but protect it from air attack. Friendly aircraft en route to and returning from combat missions need to avoid enemy air defense systems yet be visible to friendly air defense systems. These control procedures must allow friendly aircraft to move safely throughout the MAGTF airspace by utilizing predictable flight paths for positive identification of friendly aircraft by friendly air defense units and agencies.

Control procedures must be disseminated to all appropriate units and agencies (MACCS agencies, air controllers and coordinators, aircraft, and SAW units). They must be thoroughly examined, especially for safe passage of friendly aircraft through restricted areas. Control procedures should maximize the safety of the defended area while minimizing the possibility of fratricide. When planning control procedures, the planner must understand the MAGTF's capabilities and the enemy's air defense surveillance, weapon

platforms, and friendly aircraft. Ingress, egress, and return to force (RTF) control procedures use—

- Ingress/egress corridors and routes; e.g., low-level transit routes (LLTRs) and MRRs.
- Control points.
- Visual identification (VID).
- Tactical air navigation (TACAN) system.
- IFF equipment.
- Altitude and airspeed restrictions.
- Lame duck procedures (when aircraft have no communications, no IFF, are battle damaged, etc.).
- Positive control procedures.
- Airspace coordination areas (ACAs).

Joint Airspace Control Measures

Effective integration of MAGTF aviation operations in joint operations is based on coordinating altitude, high density airspace control zone (HIDACZ), restricted operations area (ROA)/restricted operations zone (ROZ), minimum risk routes (MRR), and standard use Army aircraft flight route (SAAFR). See JP 3-52, *Joint Doctrine for Joint Airspace Control in the Combat Zone*; MCWP 3-25; MCWP 3-25.1, *Integrated Combat Airspace Command and Control (ICAC2)*; and MCWP 3-25.2, *Multi-Service Procedures for Theater Air-Ground Systems (TAGS) Multiservice Manual* for more information on joint airspace control and joint airspace control measures.

FIRE SUPPORT COORDINATING MEASURES

Fire support coordinating measures assign responsibilities for the control officers and for the coordination of fires with maneuver. If used properly, these measures allow a commander to open areas of the battlespace for rapid engagement of targets or to restrict and control fires. Fire support coordinating measures also safeguard friendly forces and impact directly on AAW operations, especially OAAW and SEAD. See chapter 2. Fire support coordinating measures are either permissive or restrictive.

Permissive Fire Support Coordinating Measures

Permissive fire support coordinating measures facilitate the attack of targets. Permissive measures permit the target engagement beyond the line or into an area without further coordination. An example of a permissive fire support coordinating measure is the FSCL. In OAAW, the rapid conduct of a surface attack against an enemy airfield or surface-to-air missile unit lying beyond the FSCL would not require detailed coordination with ground maneuver units. Thus, planning and execution of the mission is facilitated by the relatively limited coordination required to conduct the surface attack.

Restrictive Fire Support Coordinating Measures

Restrictive fire support coordinating measures provide safeguards for friendly forces. A restrictive measure imposes certain requirements for specific coordination prior to the engagement of those targets affected by the measure. An example of a restrictive fire support coordinating measure is a no-fire area. The no-fire area serves to protect friendly resources (or other assets) from attack by friendly forces or their affects, including OAAW missions. Permission for OAAW operations within a no-fire area must be obtained from the establishing authority except in cases of self-defense. See MCWP 3-25, appendix D.

AIR DEFENSE CONTROL MEASURES

Air defense control measures refer to airspace control measures that involve areas and zones used specifically for air defense actions. They are established to maximize the effectiveness of air defense operations while minimizing interference with other operations. Air defense control measures complement airspace control and fire support coordinating measures.

Air defense control measures within the MAGTF's airspace are normally recommended by the SAAWC to the TACC concurrently with recommendations to the sector, regional, or area air defense commander. The area air defense commander is the establishing authority for air defense control measures in joint operations. The area air defense commander submits proposed air defense control measures to the airspace control authority for deconfliction with other airspace control measures and subsequent inclusion in the airspace control order. Air defense control measures follow.

Air Defense Action Area

The air defense action area and the airspace above it are areas within which friendly aircraft or surface-to-air weapons are normally given preference to conduct air defense operations except under specific conditions (MCWP 3-25.1). An air defense action area is an engagement area used for preference of a specific weapons system over another without excluding the other from use under certain operational conditions. From an airspace control perspective, an air defense action area provides airspace users with location of air defense areas for mission planning purposes. The air defense action area is designated by the area air defense commander.

Air Defense Area

An air defense area is a specifically defined airspace for which air defense must be planned and provided (MCWP 3-25.1). It defines, in an area of operations, the area to be defended. An air defense area is a planning (division of responsibility) aid; it is not an airspace control measure. The air defense area is delineated by the area air defense commander.

Air Defense Identification Zone

An air defense identification zone (ADIZ) consists of airspace of defined dimensions that require ready identification, location, and control of airborne vehicles. This zone is normally the transition between procedural control (outside) and positive control (inside) in an area of operations (MCWP 3-25.1). Typically, an ADIZ is used for sovereign national boundaries or in the case of areas of operations, for identification into the rear areas.

Air Defense Operations Area

An air defense operations area is an area and the airspace above it within which procedures are establish to minimize mutual interference between air defense and other operations. It may include one or more air defense areas, air defense action areas, ADIZs, or firepower umbrellas (MCWP 3-25.1). Air defense operations areas are not used for airspace control, but to aid in planning and division of responsibility. From an airspace control perspective, these areas provide airspace users with the location of air defense operations for mission planning.

Weapons Engagement Zone

The weapons engagement zone (WEZ) consists of defined dimensions of airspace within which the responsibility for engagement normally rests with a particular weapon system. These include fighter engagement zones (FEZs), various types of missile engagement zones (MEZs), and joint engagement zones (JEZs). Design of the WEZ depends on specific weapons system capabilities. The area air defense commander defines the WEZ.

Fighter Engagement Zone

In air defense, a fighter engagement zone (FEZ) is that airspace of defined dimensions within which the responsibility for engagement normally rests with fighter aircraft. FEZs are an alternative type of engagement operation if the detailed control aspects of joint engagement operations cannot be met. The FEZ is an air defense control measure. From an air defense perspective, the FEZ is normally used when fighter aircraft have the clear operational advantage over surface-based systems.

These advantages could include range, density of fire, ROE, or coordination requirements. From an airspace control perspective, FEZs provides airspace users with engagement zone location for fighter aircraft for mission planning. Coordination and flexibility within the combat airspace control system may be a limiting factor. Surface-to-air missile systems will not be allowed to fire weapons into a FEZ unless targets are positively identified as hostile, identified and/or assigned by a higher authority or firing in self-defense. All fires must be in accordance with the ROE. The area air defense commander establishes the FEZ.

Missile Engagement Zone

A MEZ is an airspace of defined dimensions within which the responsibility for engagement normally rests with missiles. In joint doctrine, MEZs are divided into high-altitude and low-altitude MEZs.The principal differences between the two are the type of missile system being employed and the altitude limits of the MEZ. The area air defense commander designates the MEZ.

Short-Range Air Defense Engagement Zone

A short-range air defense engagement zone (SHORADEZ) is that airspace of defined dimensions

within which multiple air defense systems (surface-to-air missiles and aircraft) are simultaneously employed to engage air threats.

Joint Engagement Zone

A JEZ is airspace of specified dimensions within which multiple air defense weapon systems (surface-to-air weapons and aircraft) are simultaneously employed to engage air threats. JEZs are highly dependent on correct differentiation between friendly, neutral, and enemy aircraft. The area air defense commander establishes the JEZ.

Base Defense Zone

The base defense zone (BDZ) is an air defense zone established around an air base (or forward operating base) and limited to the engagement envelope of short-range air defense weapons systems defending that base. Base defense zones have specific entry, exit, and identification, friend or foe procedures established. (JP 1-02) In the MAGTF, low altitude air defense (LAAD) assets employ at BDZs. LAAD assets will integrate with the MATCD operating at the forward operating base around the BDZ. Pre-planned BDZs are published in the airspace control plan; requests for activating these zones are made to the ACE or MAGTF commander. Three critical elements are required to establish a BDZ:

- Controlling agency; e.g., MATCD, TAOC or a joint/multinational air traffic control system.
- Radar.
- Weapons system.

Vital Area

A vital area is a designated area or installation to be defended by air defense units. (JP 1-02) It contains facilities, units, and installations for the MAGTF to accomplish its mission. More than one vital area can exist, depending on the scope of the operation. Vital areas include airfields, command and control systems, CSS units, GCE units, and the MAGTF command element. The MAGTF commander identifies vital areas through his/her air defense priorities.

Air Direction

Air direction is the authority delegated to subordinate MACCS agencies to regulate employment of aircraft and surface-to-air weapons units to balance their availability and priority of use. The TACC, TADC, SAAWC, TAOC, EW/C site, DASC, tactical air coordinators (airborne), and assault support coordinators (airborne) exercise air direction. Air direction achieves a balance between the MAGTF's finite aviation assets; e.g., aircraft, surface-to-air weapons units, and control agencies, and the ACE's accomplishment of its mission. Ineffective air direction results in poorly used resources and excessive response times. A large volume of information and an extensive communications network is required for the ACE and MACCS to provide effective air direction. The communications network must incorporate information from the ACE and the MAGTF. Air direction tasks include—

- Developing ATOs.
- Fulfilling ATO requirements; i.e., tasking aircraft to perform specific missions.
- Diverting aircraft from its original mission.
- Processing air support requests.
- Collecting information on mission status.
- Moving ground-based air defense fire units to new firing positions.
- Adjusting mission assignments for aircraft/surface-to air weapons units due to changes in the air or ground situation.

Emission Control

Emission control (EMCON) regulates the use of electromagnetic, acoustic, and other emitters to optimize command and control capabilities. EMCON achieves this regulation by minimizing the detection of AAW assets by enemy sensors and reducing mutual interference among friendly command and control systems. EMCON also aids in executing a military deception plan.

Weapons Control and Coordination

Although the following forms of control and operations exist for AAW operations, planners and operators should strive to achieve decentralized control of AAW assets in most situations to allow the maximum flexibility to attack or counter threat aircraft and missile targets.

Centralized Control

Centralized control occurs when the controlling agency directs target engagements. It minimizes the likelihood of engaging friendly aircraft while

permitting engagements of hostile aircraft but only if specific orders are issued to initiate the engagement. An example of centralized control is a controlling agency that requires a firing unit to request permission to engage a target. However, even under centralized control, the right of self-defense is never denied.

Decentralized Control

Decentralized control occurs when controlling agencies monitor unit actions and only make direct target assignments to units when necessary for proper fire distribution, to prevent engagement of friendly aircraft, or to prevent simultaneous engagements of hostile aircraft. Decentralized control is the normal wartime mode of control for air defense. It increases the chance of engaging a hostile aircraft in a high-density environment because the firing unit can engage targets without requesting permission from the controlling agency. Silence is consent.

Autonomous Operation

An autonomous operation is a mode of operation assumed by a surface-to-air missile unit after it has lost all communication with its controlling agency. The surface-to-air missile unit commander assumes full responsibility for control of weapons and engagement of hostile targets within the established ROE. Operation orders must define specific actions and procedures for autonomous operations.

RELATIONSHIP BETWEEN AIRSPACE CONTROL AND AIR DEFENSE

The objective of airspace control is to maximize the effectiveness of combat operations without adding undue restrictions and with minimal adverse impact on the capabilities of any [component]. (JP 3-52) This relationship stresses close coordination must exist between airspace control, air traffic control, and area air defense units to *reduce the risk of fratricide and balance those risks with the requirements for an effective air defense.*

The balance required between restrictions on airspace control and flexibility provided to air defense operations is determined by the ACE commander and between the airspace control authority and area air defense commander at the joint level. These commanders and their staffs design or provide input to the design of the airspace control plan and area air defense plan. The airspace control plan specifies airspace control procedures used in the joint force's area of responsibility or operations area. The area air defense plan specifies joint force procedures for integrating weapons and other air defense actions that occur within the joint force's area of responsibility or joint operations area.

When drafting the area air defense plan, detailed engagement procedures that are integrated with airspace control measures are essential to provide maximum flexibility and responsiveness to all airspace users equally. Air defense interface is critical to effective combat zone airspace control. (JP 3-52) Geographic arrangement of air defense weapons within the battlespace and procedures for identification and engagement impact on all joint aviation operations and must be integrated into the airspace control plan. See JP 3-52, MCWP 3-25, and chapters 6 and 7 of this MCWP.

MARINE AIR COMMAND AND CONTROL SYSTEM

The MAGTF commander normally delegates the authority for aviation operations to the ACE commander. The ACE commander exercises his/her authority through the MACCS. The MACCS provides the ACE commander with the means for effective command, coordination, and control of all MAGTF aviation operations and the effective functioning of the MAGTF's IADS. Appendix A shows various communications data link architecture that enables this process. These relationships are shown in figure 4-2, page 4-8.

The MACCS task-organizes its resources based on the mission, enemy, terrain and weather, troops and support available-time available (METT-T). Although all MAGTF elements provide personnel and control agencies that comprise the MACCS, the ACE provides the majority of functionality. See MCWP 3-25.3, *Marine Air Command and Control System Handbook.*

Tactical Air Command Center

The TACC is the senior MACCS agency and the focal point for command and control of MAGTF aviation. It is the ACE commander's operational command post. To avoid confusion with its Navy counterpart, the Navy tactical air control center, the TACC is often referred to as the Marine TACC.

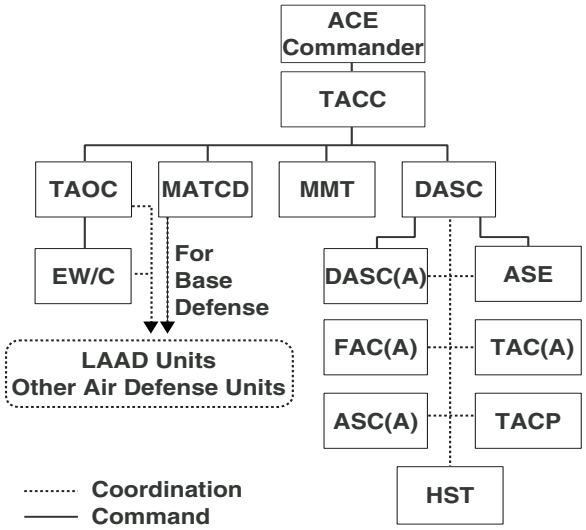

Figure 4-2. Marine Air Command and Control System.

The TACC consists of three mutually supporting, cross-functional operational organizations supported by a centralized intelligence organization. The TACC does not provide facilities for all ACE staff functions. It provides a facility for the ACE commander and staff to plan and execute MAGTF aviation and aviation support operations. TACC organizations are—

- Future plans.
- Future operations (future operations).
- Current operations (current operations).
- Air combat intelligence (ACI).

Future plans conducts aviation and aviation support planning for the next MEF mission change. Future operations develops future ATOs and prepares operation orders or fragmentary orders for the next ACE mission change. Current operations executes the daily ATO and assesses its effectiveness. ACI is embedded within the TACC. Timely and tailored and fused intelligence is integral to the functioning of future plans, future operations, and current operations. ACI is the focus of all aviation intelligence activities supporting the ACE. It produces and disseminates aviation-specific all-source intelligence, including assessments of adversary capabilities and vulnerabilities, target analysis, battle damage assessment (BDA), and the current status and priority of assigned targets to assist in execution day changes. See MCWP 3-25.4, *Marine Tactical Air Command Center Handbook*, and chapter 5 of this MCWP.

Tactical Air Direction Center

A TADC can be established by the commander, landing force (CLF) during amphibious operations. It coordinates between MACCS agencies ashore and the commander, ATF's (CATF's) Navy tactical air control center afloat. Once the CLF is ashore and ready to assume control of aviation operations and airspace management functions, the CATF transfers control of all aviation operations within the AOA to the CLF. The CLF's Marine TADC then becomes the Marine TACC ashore, and the Navy's tactical air control center reverts to a Navy TADC. The Marine TADC normally mirrors the Marine TACC in organization, facilities, and capabilities.

The essential difference between the Marine TACC and TADC is the amount of responsible airspace and the scope of assigned tasks. A TADC is typically assigned specific aviation operations tasks in the landward sector of the AOA. A TADC may be delegated the authority to coordinate landward sector air defense operations, OAAW operations or both. See NWP 3-09.11, *Supporting Arms in Amphibious Operations*, and chapter 6 of this MCWP for more information on passage of control ashore.

Sector AAW Coordinator

The SAAWC is the MAGTF commander's air defense battle manager. The ACE commander determines the extent of his/her authority. The SAAWC coordinates and manages all active air defense weapons (aircraft and surface-to-air weapons) within his/her assigned sector. In amphibious operations, the Marine SAAWC may also be known as the landing force SAAWC.

The SAAWC does not exercise real time control of aviation operations. His/Her responsibilities focus on coordinating and planning air defense and some OAAW operations. Within these guidelines, the SAAWC and his/her staff typically provide the interface between TAOC controllers and the ACE commander's battlestaff.

Normally, the Marine SAAWC's operations facility collocates or integrates with the TAOC to provide the SAAWC and his/her battlestaff with a greater capability to coordinate with the TAOC. Representatives from various units of the Marine air control group and the ACE battlestaff also staff the Marine SAAWC operations facility. See MCWP 3-25.6, *Sector Antiair Warfare Coordinator Handbook*.

SAAWC functions in AAW operations typically include—

- Managing air defense resources, including aircraft and surface-to-air weapons within his/her assigned sector.
- Managing airborne tankers.
- Recommending air defense control measures to the TACC, airspace control authority, and regional/area air defense commander, as appropriate.
- Recommending employment of AAW resources to support future operations.
- Recommending air defense warning and weapons release conditions to the TACC and/or area air defense commander.
- Recommending air defense priorities to the MAGTF commander via the ACE commander.
- Launching alert aircraft or diverting airborne aircraft to attack time critical targets, when authorized.
- Functioning as a sector or regional air defense commander for theater air defense operations, when directed.

Tactical Air Operations Center

The TAOC is subordinate to the TACC. It is the primary AAW agency within its assigned sector. The TAOC, along with the SAAWC and his/her staff, may perform alternate TACC functions (current operations section only) for limited periods.

The TAOC provides positive airspace control, management, and surveillance for its assigned airspace. Personnel detect, identify, and control the intercept of hostile aircraft and missiles by aircraft and surface-to-air weapons. They also provide en route air traffic control and navigational assistance for friendly aircraft. The TAOC has three types of organic surveillance radars: the AN/TPS-59, the AN/TPS-63, and the AN/MPQ-62.

The AN/TPS-59 radar provides long-range air surveillance for the TAOC. It operates in the following modes.

Theater Ballistic Missile Mode

The radar can detect and track the launch of theater ballistic missiles out to 400 nautical miles and at altitudes over 500,000 feet without external cueing. The AN/TPS-59 also provides data on launch and impact circular probability ellipses, projected missile trajectory, and missile time to impact.

Air Breathing Target Mode

The AN/TPS-59 can track traditional air breathing targets out to 300 nautical miles and up to 100,000 feet.

Combined Mode

The combined mode tracks air breathing and theater ballistic missile targets; the former at distances to 300 nautical miles and altitudes to 80,000 feet for air breathing targets.

The AN/TPS-63 radar provides mid-range (up to 160 nautical miles) two-dimensional radar coverage. It is usually used as an early warning or gap filler radar.

The AN/MPQ-62 continuous wave acquisition radar (CWAR) provides close-in, low-altitude, two-dimensional radar coverage. The CWAR is typically used with ground-based data link (GBDL) to provide early cueing to LAAD.

The TAOC shares the air picture built by its organic radars with data link-equipped aircraft, missile units, MACCS, and joint air defense agencies and facilities. See appendix A for further information on digital data links. For units not capable of receiving information via data link, the TAOC provides voice reports (manual cross-tell) for early warning and situational awareness.

The TAOC detects, identifies, and controls intercepts for air defense operations within its assigned sector. It provides close, broadcast, tactical or data link control to DCA missions and assigns targets to surface-to-air weapons units. For OAAW missions, the TAOC can provide control for sweeps and escort missions and routing or coordination for SEAD or surface strikes. With information from the AN/TPS-59 radar, the TAOC can provide organically-derived location data for the guidance of aircraft conducting theater ballistic missile attack operations. See MCWP 3-25.7, *Tactical Air Operations Center Handbook*.

Marine Air Traffic Control Detachment

The MATCD is the principal MACCS organization responsible for terminal air traffic control. It uses its organic radars to provide airspace control, management, and surveillance within its designated air defense sector. The MATCD contributes to the MAGTF's IADS by exchanging air traffic control

information with command and control units by digital data link and voice reports (manual cross-tell). The MATCD is normally responsible for activating a designated BDZ and providing early warning and cueing to surface-to-air weapons units within the BDZ. See MCWP 3-25.8, *Marine Air Traffic Control Detachment Handbook*.

Low Altitude Air Defense Battalion

The LAAD battalion consists of a headquarters and service battery and two LAAD firing batteries. The LAAD battalion uses the Stinger missile to provide close-in, low-altitude air defense of forward combat areas, installations, and vital areas. It also provides surface-to-air weapons support for units engaged in special operations and independent operations. The LAAD battalion typically establishes a combat operations center collocated with the SAAWC's operations facility.

The AN/UPS-3 tactical defense alert radar is organic to the LAAD battalion. It has a short-range (10 nautical miles), low-altitude (under 10,000 feet), early warning, alerting, and cueing capability. The firing section employs the AN/UPS-3.

LAAD units are usually assigned in general support of the MAGTF or in direct support of a specific unit. Depending on its size, a LAAD unit can provide both general and direct support close-in air defense by task-organizing its assets. In general support, LAAD units typically receive tasking from the MAGTF commander via the ACE commander and are positioned to provide close-in, point defense of MAGTF vital areas and or designated maneuver elements. In direct support, LAAD units provide defense of those resources designated by the supported unit commander. See MCWP 3-25.10, *Low Altitude Air Defense Handbook*, and MCWP 3-25.11, *Low Altitude Air Defense Battalion Gunner's Handbook* (under development).

Direct Air Support Center

The DASC is subordinate to the Marine TACC. It directs aviation operations that directly support ground forces. It may be ground-based (DASC) or airborne (DASC[A]). The DASC coordinates the execution of preplanned air support; responds to requests for immediate air support; and controls and directs close air support, assault support, and certain air reconnaissance missions. It provides up-to-date information on friendly assets and the scheme of maneuver as well as OAAW coordination, routing, and targeting. The DASC normally collocates with the senior FSCC within the GCE to coordinate direct air support missions with other supporting arms. The DASC does not have organic sensors to track aircraft; it uses procedural control. The DASC can provide ground-based air defense units and surface-to-air weapons systems with the location of friendly aircraft. It can also coordinate with forward air controllers and the fire support coordination center for SEAD missions. The DASC may be the designated control agency for OAAW missions, including time critical target missions, conducted in or near the proximity of friendly troops. See MCWP 3-25.5, *Direct Air Support Center Handbook*.

Marine Wing Communications Squadron

The Marine wing communications squadron (MWCS) provides communications support and coordination for the ACE and the MACCS. It also provides interagency communications to establish and maintain an integrated MACCS, thus linking elements of the MAGTF's IADS.

Air Coordinators and Air Controllers

Ground-based and airborne coordinators and controllers; e.g., forward air controllers; forward air controllers (airborne); tactical air coordinators; and strike control and reconnaissance missions can contribute significantly to the overall AAW effort. They help control OAAW strikes and defensive counterair missions; conduct visual surveillance, and provide intelligence input. See MCWP 3-25.3 for more information.

CAPABILITIES

Command and control is a force multiplier. However, in AAW, it carries specific capabilities and limitations.

The command and control agencies that perform AAW functions are not limited in performing single tasks. The TAOC, DASC, and others perform air control and air direction functions that impact on all functions of Marine aviation.

Air command and control capabilities can be easily task-organized to perform very specific missions or to cover a broad range of requirements, including

providing joint force enabling functions for area air defense coordination. The ability to scale-up or scale-down capabilities provides a flexible option to the joint force commander for the capability he/she needs to add to his/her area of responsibility.

The principal command and control agencies that perform control and direction of AAW operations have organic, redundant communication means, including voice and data communications using various carriers.

The TACC and TAOC can interface and share air defense information with joint and multinational partners via digital data links and voice communications.

Redundant capabilities in the air command and control system allow continuous operations to support AAW and other aviation operations.

The ACE has a robust communications capability but limited organic satellite communications equipment. It is often necessary to facilitate communications and liaison with joint force air command and control agencies and commands. This limitation can be minimized by proper prioritization of the MAGTF's limited satellite communications resources.

The MACCS's ground-based radars are susceptible to line of sight acquisition caused by terrain features and curvature of the Earth. Optimizing radar siting for covering the designated surveillance area and augmenting radar coverage with gap filler/early warning radars and airborne radars can minimize this limitation.

Passing AAW-related information and receiving radar data depends highly on the electromagnetic spectrum. AAW command and control systems are susceptible to electronic attack (jamming) and electronic warfare support (deception, intrusion, and interference) operations. Effective training in recognizing and acting on electronic warfare actions, along with proper employment of active and passive measures; i.e., electronic protection, deception, and operations security can minimize or negate enemy electronic warfare affects.

CHAPTER 5. PLANNING

Planning is the art and science of envisioning a desired future and laying out effective ways of bringing it about. (MCDP 5, *Planning*) It is a process that requires a number of ongoing, iterative, interdependent activities. The ongoing planning process requires plans to build on itself.

The MAGTF conducts planning to orient itself on future objectives. Planning forces MAGTF personnel to project their thoughts forward in time, focus on the enemy, anticipate actions and reactions, and assess risk. Proper planning can help seize the initiative, assist in time-sensitive decisionmaking, simplify complex situations, and generate tempo.

The commander's intent and planning guidance are essential to the creation of plans. The commander's personal, active involvement in each step of the planning process ensures clear understanding of his/her vision and desired end state while ensuring the plan built supports the MAGTF's single battle concept. AAW planning supports—

- Deep operations to shape the battlespace and achieve battlespace dominance.
- Close operations to engage in decisive combat.
- Rear operations to provide force sustainment.

Effective conduct of antiair warfare operations requires integrated planning at all levels and with each MAGTF element. The MAGTF commander relies on the expertise and advice of element commanders and their staffs to help determine the MAGTF's AAW concept of operation. ACE, GCE, and CSSE commanders; their staffs; and their subordinate elements must understand the MAGTF commander's guidance and intent. To achieve unity of effort, the MAGTF commander must clearly outline AAW planning responsibilities. However, all commanders are responsible for the planning and execution of passive air defense measures. See MCDP 5 and MCWP 5-1, *Marine Corps Planning Process*.

DELIBERATE PLANNING

AAW operations must be carefully and deliberately planned to achieve the desired degree of air superiority and force protection required by the MAGTF. The three planning frameworks in figure 5-1 are used to conduct timely and thorough deliberate planning.

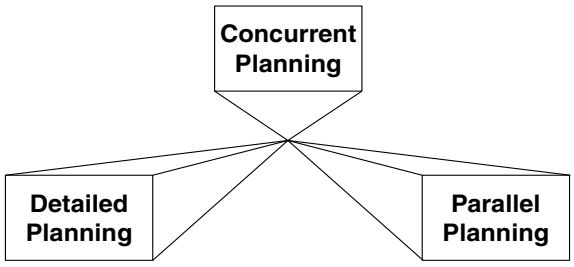

Figure 5-1. Deliberate Planning.

Concurrent Planning

Concurrent planning is planning accomplished simultaneously by two or more echelons of the same command or by corresponding echelons of different commands. Subordinate commanders can start concurrent planning based on information announced before written planning documents are issued. Planning memorandums, warning orders, and outline plans are other ways to disseminate fragmentary planning information. This dissemination allows subordinate commanders to start concurrent planning.

Concurrent planning can avoid the long, detailed planning process that can occur if essential information is stalled in lower command echelons. To control concurrent planning, subordinate commanders must have a clear understanding of the commander's intent (at least two echelons above the subordinate commander).

Parallel Planning

Parallel planning results from close and continuous coordination between corresponding units. AAW's coordination requirements, interrelationship of assigned tasks, and complex support requirements make parallel planning essential. Basic AAW decisions are determined based on a common understanding of objectives and procedures obtained from the free exchange of information among units. Mission-type orders, clear commander's intent, and continuous liaison provide an atmosphere conducive to parallel planning.

Detailed Planning

Detailed planning is required at all levels, although its extent is situation-dependent. It should promote flexibility. Planners should foresee likely possibilities and develop plans that respond to changing conditions.

PLANNING FACTORS

The MAGTF commander should consider many factors when developing planning guidance. These factors reflect METT-T and the commander's intent based on the MAGTF's concept of AAW operations, and provide a framework. Factors that should be addressed are—

- The quantity and capability of enemy offensive and defensive air weapons, including theater missiles (both ballistic missiles and cruise missiles) and electronic warfare assets, the latter with particular regard to electronic attack and electronic protection capabilities.
- The terrain within the AOA.
- The anticipated duration of operations.
- The ATF's AAW plan for ship-based radar surveillance and weapons projections ashore.
- The air defense sectors, subsectors, and procedures established by the ATF commander, naval expeditionary force (NEF) commander or the joint force commander based on air defense responsibilities.
- Integrating MAGTF AAW assets with naval, joint or coalition forces.
- The characteristics of, definition of, and procedures for the destruction, vital, and surveillance areas.
- Availability, capability, and integration of MAGTF AAW assets.
- The plans to land MAGTF antiair warfare units in relation to their proposed locations.
- The time and conditions for phasing control ashore.
- Centralized command and decentralized control. Integrating AAW warfare operations with supporting arms fires.
- Weapons employment and ROE.
- Aerial refuelers.
- The means and procedures to warn all ATF and LF (or MAGTF) units of the impending air attack.
- The land-based air defense system's ability to support forces afloat.
- The requirements for air, naval, and artillery fire control for SEAD.
- All-weather operations.
- Airspace control.

PLANNING RESPONSIBILITIES

The Marine Corps planning process is driven by top-down guidance, the single battle concept, and integrated planning. Applying these tenets to the six warfighting functions, the commander and his/her staff strive to achieve unity of effort and effective integration of combat power.

Higher Headquarters

Initially, AAW planning, including coordinating all air defense weapon systems and electronic attack, is the responsibility of higher headquarters. Depending on the type of operation and command relationships, higher headquarters can be the joint force or appropriate naval commander.

Higher headquarters concentrates on the general conditions required for AAW planning. General conditions are based on the level of command and vary accordingly; e.g., if the joint force commander's main focus is on the campaign, subordinate commanders focus principally on the conduct of operations that support the campaign. In battles and engagements, commanders plan AAW operations against enemy capabilities that will shape the battlespace, achieve battlespace dominance, and influence future operations. Responsibilities may include—

- Establishing and disseminating appropriate ROE.
- Coordinating plans for early warning and air surveillance.
- Determining AAW priorities.
- Establishing appropriate AAW sectors.
- Establishing AAW restricted areas.

The MAGTF Commander

The MAGTF commander directs MAGTF operations in support of the joint force commander's campaign, directs the planning of AAW operations to shape the battlespace and achieve battlespace dominance, tasks his/her staff to plan AAW operations to support MAGTF operations,

and tasks subordinate commanders to conduct AAW planning in support of deep, close, and rear operations. Both the MAGTF staff and subordinate commanders and their staffs conduct AAW planning based on the MAGTF commander's mission, commander's intent, main effort, air defense priorities, and other guidance. MAGTF AAW operational planning isolates, shapes, and prepares the battlespace for future operations and provides for the force protection and air superiority required to conduct deep, close, and rear operations. Responsibilities include—

- Coordinating MAGTF intelligence planning.
- Translating information requirements into collection tasks for agencies both within and external to the MAGTF.
- Providing initial and periodic assessments of enemy air defense capabilities.
- Identifying MAGTF or LF requirements and capabilities needed to conduct AAW.
- Informing higher headquarters; i.e., the joint force commander, NEF commander, and CATF of MAGTF AAW requirements and capabilities.
- Establishing AAW priorities among the ACE, GCE, and CSSE including identifying vital, destruction, and surveillance areas.
- Issuing offensive AAW and air defense objectives in the initial MAGTF planning guidance.
- Ensuring AAW is available and allocated sufficiently in quantity and type to establish an effective, land-based, AAW system ashore.
- Acting on requests for organic and nonorganic support that include—
  - Organic electronic warfare support.
  - Signals, human, and imagery intelligence support from national- and theater-level intelligence collection assets.
  - Supporting arms support.
  - Organic communications support that connects national- and theater-level intelligence collection assets and the MAGTF.
  - Intelligence.
  - Employment and integration of other Service, theater, and/or national assets to support or augment early warning, surveillance, and control of AAW operations.
- Addressing early movement of AAW units ashore during the assault in the landing plan.
- Establishing land-based early warning and target acquisition means ashore.
- Establishing the necessary AAW control agencies ashore.

The Aviation Combat Element Commander

The ACE commander conducts AAW operations in support of the MAGTF. The ACE commander directs his/her staff and subordinate commanders and their staffs to plan AAW to support the MAGTF's deep, close, and rear operations. Appendices B and C are detailed checklists to ensure every significant planning consideration is covered. AAW planning is based on the MAGTF's mission, commander's intent, designation of the main effort, air defense priorities, and other guidance. The MAGTF commander may designate the ACE as the main effort to conduct AAW operations (especially during the initial stages of a conflict) or to conduct other shaping efforts where AAW efforts could play a large role.

The Ground Combat Element Commander

The GCE commander uses combined arms to conduct ground operations that support the MAGTF commander's plan. GCE operations include deep, close, and rear operations. AAW provides force protection and air superiority for the GCE to conduct ground operations. The GCE commander and his/her staff must provide input during the planning of AAW operations.

The MAGTF's size and the level of threat imposed by enemy air and air defense assets determine the GCE commander's involvement. The GCE commander's needs can encompass air defense and OAAW areas of concern. Responsibilities include—

- Developing intelligence requirements for AAW operations and submitting them to the MAGTF G-2.
- Recommending to the MAGTF commander and coordinating with the ACE commander on—
  - Developing OAAW and air defense objectives.
  - Developing OAAW target priorities and procedures.
  - Developing air defense priorities with respect to the GCE.
  - Identifying vital, destruction, and surveillance areas.
  - Developing the preliminary AAW plan.
  - Determining the GCE's AAW requirements during planning and execution.

  - Developing procedures to monitor AAW operations.
  - Developing procedures to process and disseminate air defense targets of opportunity and air assets information.
- Helping the ACE commander develop procedures to rapidly attack/engage enemy air and air defense targets of opportunity discovered by the GCE.
- Providing periodic evaluation of the impact of enemy air and air defense capabilities on GCE objectives.

The Combat Service Support Element Commander

The CSSE commander conducts operations that provide essential logistics functions, activities, and tasks that support and permit force sustainment of the MAGTF. Force sustainment supports deep, close, and rear operations. AAW operations provide force protection and air superiority for the CSSE to conduct logistics operations. The CSSE commander and his/her staff must provide input to AAW planning. The MAGTF's size and the level of threat imposed by enemy air defense and OAAW assets determine the CSSE commander's involvement. Responsibilities include—

- Developing intelligence requirements for antiair warfare operations and submitting them to the MAGTF G-2.
- Recommending to the MAGTF commander and coordinating with the ACE commander on—
  - Developing OAW and air defense objectives.
  - Developing offensive antiair warfare target priorities and procedures.
  - Developing of air defense priorities with respect to the CSSE.
  - Identifying vital, destruction, and surveillance areas.
  - Developing the preliminary antiair warfare plan (includes air defense and OAAW).
  - Determining the CSSE's antiair warfare requirements during planning and execution.
  - Developing procedures to monitor AAW operations.
  - Developing procedures to process and disseminate air defense targets of opportunity and air assets information.
- Helping the ACE commander develop procedures to rapidly attack/engage enemy air and air defense targets of opportunity discovered by the CSSE.
- Providing periodic evaluation of the impact of enemy air and air defense capabilities on CSSE objectives.

THE ACE BATTLESTAFF

The TACC is where the ACE commander and staff plan and execute AAW operations. The ACE battlestaff consists of three mutually supporting cross-function operational work sections supported by a centralized intelligence center called air combat intelligence (ACI).

The ACE G-3 is the direct representative of the ACE commander in the TACC. The ACE G-3 is responsible for the overall functioning of future plans, future operations, and current operations. The ACE G-2 has staff cognizance over all ACE intelligence activities, including ACI and the intelligence watch sections in future and current operations.

Future Plans

Future plans is responsible to the ACE G-3 for aviation planning in support of the next MAGTF mission change. Future plans—

- Maintains liaison with MAGTF future plans.
- Conducts deliberate planning for MAGTF operation plans and follow-on missions associated with the current operation.
- Develops aviation courses of action for each follow-on MAGTF mission under development.
- Develops aviation estimates of supportability for each follow-on MAGTF mission under development.
- Develops and refines operation plans and orders associated with each follow-on MAGTF mission.
- Provides detailed deployment, employment, mobilization, and sustainment plans for follow-on MAGTF missions.
- Prepares course of action brief and/or supportability decision briefs.
- Helps future operations after the ACE support plan transitions to the operational planning team for operation order/frag order detailed preparation.

Future Operations

Future operations plans for those activities directed against an enemy when detailed planning must be accomplished and aviation resources allocated. Future operations builds the next air tasking order (ATO) using preplanned requests and planning and coordination information from the ACE headquarters staff, MAGTF headquarters, and the joint force commander's staff. Future operations coordinates with current operations to determine any requirements to continue or extend the efforts of the current battle. Future operations—

- Maintains liaison with MAGTF future operations, force fires, and the joint air operations center combat plans division.
- Plans and produces the next ATO using approved planning guidance.
- Develops ACE operation orders/frag orders based on support plans prepared by future plans.
- Administers the ACE targeting board.
- Formulates current plans outside the ATO cycle but within the current operation order/frag order.
- Plans and coordinates changes to the airspace control order and air defense plan.
- Develops ACE's air apportionment recommendation.
- Directs, coordinates, and supervises the development and forwarding of the ACE commander's critical information requirements.
- Provides the ACE operational planning team's nucleus.
- Coordinates with current operations and development of ATO.

Current Operations

Current operations coordinates and executes those activities directed against an enemy when planning has been completed and resources committed. This period is normally 24 hours. It includes all on-going operations conducted by the ACE in support of the MAGTF, such as current aviation operations in support of deep, close, and rear operations. Current operations personnel execute the current ATO. Its crewmembers interface directly with subordinate MACCS agencies such as the TAOC, DASC, and MATCDs to ensure ACE capabilities are managed and employed in accordance with the ACE commander's intent. Current operations crewmembers coordinate with and receive information from TACC future operations to assist in directing and controlling current operations. Current operations—

- Maintains liaison with MAGTF current operations and the joint air operations center combat operations division.
- Manages the execution of the ACE operations order/frag order.
- Manages the execution of the current ATO.
- Assesses and adjusts current ACE operations based on changes in MAGTF guidance or the status of friendly and enemy force situation.
- Analyzes and interprets battlespace events as they relate to MAGTF aviation operations.

Air Combat Intelligence

ACI provides timely, tailored, and fused intelligence to future plans, future operations, and current operations. It is the focus of all aviation intelligence activities supporting the ACE. It produces and disseminates aviation-specific all-source intelligence, including assessments of enemy capabilities and vulnerabilities, target analysis, battle damage assessment, and the current status and priority of assigned targets.

ACI is responsible to the ACE G-2 for producing and disseminating aviation-tailored all-source intelligence required for decisionmaking during the planning and execution of MAGTF aviation operations. ACI extends and complements, but does not duplicate, the efforts of the MAGTF G-2 all-source fusion center. See MCWP 3-25.4. Some specific ACI tasks are:

- Maintain liaison with the MAGTF G-2 operations section, the joint air operations center intelligence division, and other designated intelligence activities.
- Prepare ACE intelligence estimates and intelligence summaries.
- Direct, coordinate, and supervise the development and forwarding of ACE priority intelligence requirements and other intelligence requirements.
- Prepare and implement the ACE organic intelligence collection plan, including planning and coordinating unmanned aerial vehicle (UAV) operations.
- Direct, coordinate, and supervise the production and dissemination of all-source intelligence to the ACE commander, staff, and subordinate units.

- Direct, coordinate, and determine ACE requirements for maps, charts, graphic aids, and imagery products, and supervises distribution.
- Coordinate intelligence support for ACE survival, evasion, resistance, and escape requirements, and arrange for and coordinate dissemination of weather data for the ACE.

THE AIR TASKING ORDER

The ATO is generated by the ACE commander in MAGTF operations and the JFACC in joint operations. The ATO tasks and disseminates targets and specific missions of projected sorties, capabilities, and forces to components, subordinate units, and command and control agencies. It normally provides general and specific instructions; e.g., call signs, targets, and controlling agencies.

The ATO may include the airspace control order or issued separately. It also includes special instructions (SPINS). SPINS provide amplifying notes, important details, and changes. The ATO, airspace control order, and SPINS provide operational and tactical direction at appropriate levels of detail. The level of detail should be explicit when forces operate from different bases and multi-component and/or composite missions are tasked. Less detail is required when missions are tasked to a single component or base. See JP 3-52. Each ATO covers a 24-hour period. See figure 5-2. There are usually four ATOs at any given time. They include the ATO—

- Undergoing assessment (yesterday's plan).
- In execution (today's plan).
- In production (tomorrow's plan).
- In planning (the following day's plan).

Because input to the joint ATO must be provided 3 to 4 days in advance, the ATO can represent only a starting point for daily flight operations. It is impractical to predict every need in advance. The MAGTF commander must have the flexibility to launch or divert any aircraft to complete the mission, even if this requires short-notice deviations from the ATO.

The air tasking cycle is the key aviation planning tool regardless of the size or type of operation. It provides planners with a process that most efficiently and effectively supports MAGTF operations with available aviation assets. This cycle produces the MAGTF ATO and/or air plan. The six-phase joint ATO cycle is described in JP 3-56.1, *Command and Control for Joint Air Operations*. The MAGTF six-phase air tasking cycle is discussed in MCWP 3-2, *Aviation Operations*. The revised MAGTF six-phase air tasking cycle retains the necessary steps of the previous four-phase cycle but is more compatible with the joint ATO cycle. This progression is essential for Marine aviation to function in the joint arena, particularly if the ACE commander is dual-hatted as the JFACC. The six phases of the MAGTF ATO cycle are command aviation guidance, target development, allocation and allotment, tasking, force execution, and combat assessment.

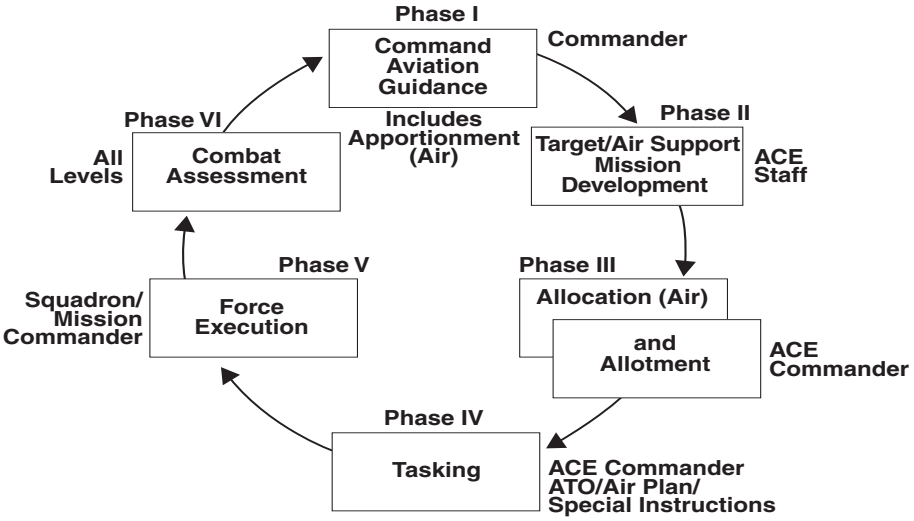

Figure 5-2. MAGTF Six-Phase Air Tasking Cycle.

CHAPTER 6. OPERATIONS

An operation is a military action or the carrying out of a strategic, tactical, service, training or administrative military mission; the process of carrying on combat, including movement, supply, attack, defense and maneuvers needed to gain the objectives of any battle or campaign. (JP 1-02). In support of U.S. military operations, Marine forces are organized and equipped specifically to meet the requirements of expeditionary operations. (MCDP 3, *Expeditionary Operations*). Expeditionary operations are military operations conducted by an armed force to accomplish a specific objective in a foreign country. Expeditionary operations involve projecting a force into a crisis or conflict by establishing forward bases (land- or sea-based) from where military operational power can be brought to bear on the tactical situation. Expeditionary operations are temporary in nature. They are conducted with the intent of withdrawing from the foreign country after the specific task or mission has been accomplished.

MAGTF ANTIAIR EMPLOYMENT

The MAGTF is the Marine Corps' primary tactical organization for conducting missions across the spectrum of military operations. Each MAGTF has a command, ground combat, aviation combat, and combat service support element. Each element contributes directly or indirectly to the MAGTF's AAW operations. Regardless of the MAGTF's task organization, each MAGTF element commander is responsible for conducting passive air defense operations.

The Marine Expeditionary Force

The Marine expeditionary force (MEF) is the principal Marine Corps warfighting organization. It is usually employed in support of larger crises or contingencies. It is capable of missions across the range of military operations, particularly amphibious assault and sustained operations ashore in any environment.

The MEF's AAW resources enable it to perform all missions as described in chapters 2 and 3, and fully integrate into the aviation operations and air defense architecture of a joint or multinational force using the command and control structure described in chapter 4. The MEF's AAW resources normally include—

- A Marine aircraft wing with squadrons of fixed- and rotary-wing aircraft that conduct all AAW missions.
- Short-range surface-to-air missile systems for air defense against aircraft.
- A MACCS that can execute centralized command and decentralized control of AAW operations (including air command, direction, surveillance, and control) and integrating MAGTF AAW operations with those of the joint or multinational force.

The MEF is an enabler for certain joint force functional requirements. In AAW operations, capabilities include performing as the joint force air component commander and hosting his/her associated command post, i.e., the joint air operations center; and coordinating joint force air defense operations as the area air defense commander (AADC) or as a regional or sector air defense commander (SADC) under the AADC.

The Marine Expeditionary Brigade

The Marine expeditionary brigade (MEB) is the mid-sized MAGTF normally employed to conduct operations that bridge the gap between our principal warfighter (the MEF), and the MEU. The MEB is normally a self-contained operating force capable of missions that require sustained operations for up to 30 days. The MEB is capable of conducting independent amphibious assault operations, maritime prepositioning force (MPF) operations or operate/serve as the advanced echelon of a MEF.

MEB AAW resources can be task-organized to perform many of the missions as described in chapters 2 and 3, and integrated (to a lesser degree than a MEF) into the aviation operations and air defense architecture of a joint or multinational force. This is accomplished by using task-organized portions of the command and control structure described in chapter 4. MEB AAW resources normally include—

- A composite Marine aircraft group (MAG) task-organized with fixed- and rotary-wing aircraft to conduct OAAW and air defense missions.
- A short range surface-to-air missile detachment for air defense against aircraft.
- A MACCS capable of executing centralized command and decentralized control of AAW operations critical to the MAGTF. This MEB C2 system may be task-organized to perform functions

as the JFACC and AADC if required to integrate with a joint or multinational force.

The Marine Expeditionary Unit (Special Operations Capable)

The Marine expeditionary unit (special operations capable) (MEU[SOC]) is the standard forward-deployed Marine expeditionary organization. It is normally used as a self-contained operating force capable of missions of limited scope and duration, and may act as a forward-deployed extension of the MEF. AAW capabilities typically include—

- A composite squadron of fixed- and rotary-wing aircraft that conduct limited OAAW and air defense operations.
- A reinforced short-range surface-to-air missile section.

Because of its limited size and scope of its operations, the MEU(SOC) relies on the NEF to fill most of its AAW requirements. The NEF typically provides for air defense of the MEU(SOC) and its accompanying amphibious ready group and OAAW resources from naval surface fire support and carrier-based aircraft. The NEF provides the majority of command and control to the MEU(SOC).

The MEU(SOC) contributes to NEF AAW efforts with its infantry, artillery, aircraft, and surface-to-air missiles. Its aircraft and Marine-portable surface-to-air missiles can augment the amphibious ready group's air defense efforts during emergency defense.

The Special Purpose MAGTF

The special purpose MAGTF (SPMAGTF) conducts a specific mission that is limited in scope, focus, and often in duration. The SPMAGTF may be a force of any size, but is normally small. SPMAGTF AAW capabilities are specifically tied to its task organization.

AIR DEFENSE PRIORITIES

Once air defense priorities are assigned to MAGTF assets, the assets are defended in order of priority by the supporting air defense units.

In determining his/her air defense priorities, the MAGTF commander evaluates his/her assets and determines the relative importance of each asset to the MAGTF's ability to accomplish its mission. The supporting air defense unit commander balances his/her force availability against the MAGTF commander's list of critical assets. Beginning with the most important asset, the air defense unit commander determines, based on his/her experience, the assets his/her forces can defend. Then the air defense unit commander recommends to the MAGTF commander, via the ACE commander, that these assets receive air defense priority. The following factors determine the relative importance of an asset and its need for air defense.

Criticality

Criticality is the degree to which the asset is essential to mission accomplishment. If prioritizing, assets are categorized as those that—

- Prevent mission accomplishment if damaged.
- Interfere with the immediate accomplishment of the mission if damaged.
- Interfere with the eventual accomplishment of the mission if damaged.
- Slightly restrict the mission accomplishment if damaged.

Vulnerability

Vulnerability is the susceptibility of a nation or military force to any action that reduces or eliminates its will or desire to fight. Vulnerability also includes the susceptibility of a system; e.g., a command and control system or an IADS to actions that degrade its effectiveness. Useful factors to determine an asset's vulnerability include—

- The mission.
- Hardness (resistance to destruction or degradation).
- Mobility (if it can disperse or displace to another position while protected by other air defense weapons).
- Passive air defense protection ability.

Recuperability

Recuperability reflects the degree an asset can recover from inflicted damage. Recuperability is expressed in terms of time, equipment, manpower, and ability to perform its mission.

Threat Characteristics

Threat characteristics determine which weapon provides the most economical active air defense of a MAGTF asset. Threat characteristics include targeting information provided by intelligence estimates, past enemy attack methods, enemy location and strength, type of enemy aircraft and ordnance, and enemy doctrine.

Once the MAGTF commander has established his/her air defense priorities, air defense employment principles and guidelines provide the basis for employment of air defense weapons in the MAGTF's IADS.

AIR DEFENSE EMPLOYMENT PRINCIPLES

Air defense employment principles provide an IADS that prevents enemy air attacks from interfering with the MAGTF's mission.

Mobility

Mobility is crucial to air defense. The MAGTF's air defense systems must be highly mobile and rapidly deployable to provide continuous protection for maneuver elements and provide self-defense.

Weapons Mass

Weapons mass allocates sufficient air defense resources to defend priority MAGTF assets or areas adequately. Weapons mass is achieved by concentrating ground-based and airborne air defense assets on and around a vital area to defend it from enemy air attack. The ability to mass weapons depends on effective command and control.

Weapons Mix

Weapons mix blends aircraft, SAWs, and small arms to achieve a balanced, complementary air defense system that complicates the enemy's ability to attack the MAGTF. Weapons mix offsets the limitations of one air defense system with the capabilities of another, strengthens the MAGTF's IADS, and degrades the enemy's ability to respond.

Integration

Integration is the close coordination of effort and unity of action that results from the efficient blending of individual air defense systems. It conserves fires and eliminates unnecessary multiple engagements of the same target by different assets. If the MAGTF IADS is to support the battle for air superiority, it must be integrated into MAGTF operations. Command and control provides the means to coordinate and control the MAGTF IADS.

AIR DEFENSE EMPLOYMENT GUIDELINES

Air defense employment guidelines aid commanders in tailoring the air defense of a specific MAGTF. The size, shape, and inherent air defense assets of the MAGTF determine the guidelines for employment.

Balanced Fires

Balanced fires result from positioning air defense assets so they can provide equally defensive fires from all directions. Balanced fires take on added importance when faced with a 360 degree threat from enemy air attack.

Weighted Coverage

Weighted coverage results from concentrating air defense weapons toward known enemy locations, unprotected unit boundaries or likely enemy attack corridors or routes.

Mutual Support

Mutual support results from positioning individual assets so they deliver fires into dead zones that surround adjacent assets. Mutual support enhances defensive survivability. The required maximum distance between air defense units and assets to achieve mutual support varies depending on the type of air defense weapon and the speed and altitude of the threat.

Early Engagement

Early engagement is the engagement of aircraft before their release of ordnance at the maximum range of surveillance and weapons systems. Air defense assets should be positioned far enough from the defended

asset or area to allow engagement of enemy aircraft before they deliver their ordnance. The distance between the defended area and the defending assets will vary. The enemy threat, ordnance, delivery methods, and the type of MAGTF air defense assets determine the distance between the defended area and the defending assets.

Overlapping Fires

Overlapping fires occur when individual air defense units' engagement zones overlap. Overlapping fires reduce the possibility of enemy aircraft slipping through the MAGTF's air defense without being engaged by at least one air defense unit.

Defense-in-Depth

Defense-in-depth results from positioning air defense assets so enemy aircraft meet an increasing volume of fire as they approach a defended asset or area. The MAGTF IADS maximizes the effects of defense-in-depth by integrating and coordinating all air defense weapons.

SELECTING AND POSITIONING AIR DEFENSE WEAPONS

Force protection considerations are critical during MAGTF operations. The MAGTF's mission, task organization, concept of operations, and the anticipated threat are the principal factors that determine the weapons to protect the MAGTF from aircraft and missile attacks. Other factors to consider to determine the number and disposition of ground-based and airborne air defense weapons systems include—

- Availability of fighters and fire units.
- Terrain (topography and accessibility).
- Type of defense.
- Coverage by other air defenses.
- Nature of the enemy threat (ground-based and airborne).
- Coverage and limitations of ground-based radars and adjacent fighters and fire units.
- Minimum safe intercept point for each type of threat.
- Enemy weapons delivery technique.
- Attack altitude and speed.
- Available ordnance.
- Likely avenues of approach.
- Anticipated rates of attack.
- Time lapse between target detection and interception.
- Communications requirements.
- Airspace, air defense, and fire support coordinating measures.

EMPLOYMENT OF GROUND-BASED AIR DEFENSE WEAPONS

Surface-to-air weapons provide the ground-based air defense of the MAGTF's IADS. Positioning ground-based air defense weapons is affected by the type of defense desired and specific system site considerations.

Point defenses are usually located in the MAGTF's rear area to achieve balanced fires, early engagement, destruction-in-depth, and mutual support. Normally, point defenses do not have enough assets to provide weighted coverage in more than one direction and still protect the defended asset from attack from an unexpected direction.

Air defenses are usually located in a forward zone to achieve destruction in-depth, mutual support, early engagement, and weighted coverage. Normally, area defenses do not attempt to achieve balanced fires. Area defenses are designed to prevent penetration from the rear, and they usually provide defense in-depth along expected avenues of approach. If a limited number of air defense systems are available, area defenses may be forced to forego early engagement along more than one threat axis to achieve continuous coverage over a broad territory.

Stinger elements must consider friendly positions and ensure that requirements in their sites do not exceed the bounds of the supported unit's security area. To avoid revealing friendly force locations to the enemy, supported units may restrict areas where Stinger weapons can be fired. Each Stinger unit commander, down to and including team leaders, must coordinate with supported or adjacent friendly forces' firing site requirements and support the friendly scheme of maneuver. See MCWP 3-25.10 for details on Stinger sites.

Considerations for the location of Marine-portable Stingers include—

- Enemy air threat, including air delivery methods and tactics.
- Mission and disposition of the defended unit(s)/ installation(s).
- Commander's guidance concerning elements or installations to be defended and their order of priority.
- Capabilities of other MACCS agencies to provide integrated air defense and early warning.
- Stinger weapon system capabilities and limitations.
- Availability of firing and alternative firing positions.
- Location and coverage of other air defense means.
- Clarity of fields of fire.
- Disposition/control procedures while embarked.

EMPLOYMENT OF AIRBORNE AIR DEFENSE WEAPONS

Aircraft manning combat air patrols (CAPs) are the airborne air defense weapons of the MAGTF's IADS. In the MAGTF's IADS, CAP is the maneuver element. CAP employment, positioning, and tactics must be considered to optimize CAP effectiveness in the MAGTF's IADS. Fighter/radar CAP capabilities are flexible and blend with the principles of destruction-in-depth and mutual support. Destruction in-depth normally places the fighters forward of ground-based air defense weapons in the MAGTF integrated air defense system as the first line of defense. Weapon engagement zones are placed in line with the threat axis to allow CAPs to continuously engage threat aircraft during their ingress and egress.

Placement of CAPs should facilitate engagement of enemy aircraft as far from the vital area or defended asset as practical. This may or may not correspond to the maximum surveillance range of the TAOC's radars because of terrain masking and airspace limitations. CAP engagements should occur before the enemy reaches its weapons release point. This requires some form of extended range combat air patrols and expanded air intercept zones, which extend well forward of the forward line of own troops.

Altitude

An altitude should be high enough to provide low-altitude surveillance coverage denied to TAOC radars.

Search Patterns

Search patterns should be tailored to anticipate threat tactics and TAOC surveillance gaps.

Speed

CAP aircraft speed should be based on threat and time on station requirements.

Formation

Synchronized, single, night, and all-weather CAPs require special consideration. Refer to appropriate Naval air training and operating procedures standardization (NATOPS) manuals for more details.

Commit Criteria

Commit criteria should be established within the confines of mission requirements and ROE.

Rules of Engagement

ROE should be established during the planning process and continuously evaluated to provide fighters with the opportunity to use offensive tactics.

Intercept Tactics

Aggressive tactics should be used to destroy enemy aircraft, break up strike packages, and negate the effects of enemy fighters.

Manning and Relieving

Defense conditions and available assets determine the CAP manning plan. Procedures should be established for sufficient IADS coverage.

Situational Awareness

Communications flow between IADS control agencies and weapon platforms should be determined and transmitted to all potential users to facilitate situational awareness.

WEAPON ENGAGEMENT ZONE

Establishing weapon engagement zones is imperative to protect MAGTF vital areas. The MAGTF

commander uses the weapon engagement zone concept to define zones of responsibility to a weapons system; e.g., aircraft or surface-to-air weapons. Weapon engagement zones enhance weapons systems capabilities and offensive tactics (fire and maneuver) by fighters. If possible, the MAGTF commander should select recognizable terrain features to define a weapons engagement zone. A weapon engagement zone should offer—

- Well-defined responsibilities for all weapons.
- Concentration of firepower.
- The ability to use offensive tactics for radar fighters.
- Ease of command and control
- Less restrictive weapons engagement conditions.

Each weapon system; e.g., Stinger or F/A-18 has specific requirements for optimum location and employment. The ACE commander must determine the number and location of air defense assets for effective air defense of MAGTF air defense sectors based on input from the TACC, SAAWC/TAOC, and GCE and CSSE commanders. Number, location, and composition of aircraft for CAP stations to defend against the enemy threat in fighter engagement zones must be determined. The ACE commander, with input from the SAAWC, determines the number of aircraft on station, ground or airborne alert and the aircraft's secondary air defense mission. The ACE commander also determines the number, location, and composition of surface-to-air weapons needed in the missile engagement zone to defend against the enemy threat.

Weapon engagement zone activation and deactivation procedures must be clearly outlined for adequate air defense coverage of the MAGTF's air defense sectors. Normally, the SAAWC or TAOC is tasked with activation/deactivation responsibility. Activation occurs as surface-to-air weapons or aircraft become operational and assume responsibility for air defense of a particular weapon engagement zone; i.e., fighter or missile engagement zone. A weapon engagement zone is deactivated if a surface-to-air weapons unit is degraded, destroyed or inoperable because of maintenance or if aircraft cannot provide coverage in a fighter engagement zone. When part of or an entire weapon engagement zone is deactivated, another weapon engagement zone is normally activated to provide air defense coverage in that area.

Minimal, dedicated, full-time aircraft may be required on station in the weapon engagement zone if timely intelligence and early warning threat surveillance within the weapons engagement zone is present. Ground or strip-alert aircraft may be used to meet the air defense requirement within the weapon engagement zones. Dedicated on station aircraft may be required to ensure the integrity of the MAGTF IADS if timely intelligence and surveillance are unavailable.

WEAPONS MANAGEMENT

Weapons management is integrating and coordinating assets allocated for AAW missions and specifically operation of the MAGTF's IADS. Weapons management responsibilities start with the ACE commander and extend to the individual aircrew/missile unit; i.e., TAOC, SAAWC or weapon platforms.

Air Defense Warning Conditions

Air defense warning conditions indicate a degree of air raid probability. They are passed by the senior air control agency to all MAGTF elements. Warning conditions may differ between areas of the battlespace due to the tactical situation and localized enemy air threat. The three air defense warning conditions are—

- Red - attack by hostile aircraft is imminent or in progress.
- Yellow - attack by hostile aircraft is probable.
- White - attack by hostile aircraft is improbable.

Rules of Engagement

ROE are directives issued by competent military authority which delineate the circumstances and limitations under which United States forces will initiate and/or continue combat engagement with other forces encountered. (JP 1-02) As this relates to the ACE, ROE identify the exact conditions under which aircraft and missile batteries may engage a target (airborne or on the ground). Equipment, discipline, and principles for the employment of MAGTF aviation under the different ROE do not change. What is mitigated is the degree of force applied. ROE always allow the right of self-defense.

Identification Criteria

Identification criteria are closely related to ROE. While identification criteria describe the conditions to declare unknown personnel or equipment as either

friendly or hostile, ROE cannot be applied until identification occurs. Generally, it is more difficult to distinguish hostiles from friendlies (or unknowns) in MOOTW than in combat. This difficulty results in more restrictive ROE. There is an inverse relationship between the ease of identification and the restrictiveness of ROE.

Weapons Control Status

Weapons control statuses define the restrictions on firing air defense weapons for a particular area and time period. Weapons control statuses may vary to apply only to specific aircraft, weapons systems or targets, e.g., assigning a status of weapons free against all targets with ballistic trajectories and weapons tight against all air breathing targets for all ground-based air defense units. Weapons control statuses follow:

- Weapons free - fire at any target that is not positively identified as friendly.
- Weapons tight - fire only at targets positively identified as hostile in accordance with prevailing target identification criteria.
- Weapons hold - do not fire except in self-defense or in response to a formal fire control order.

Tactical Air Command Center

The ACE commander and battlestaff provide overall coordination and management of the weapons platforms allocated for the air defense mission. The ACE commander coordinates weapons management within the TACC via watchstanders from future operations and current operations. The TACC initiates coordination with a Marine aircraft group, Marine air control group, forward operating bases, and the joint force.

Ordnance availability; fuel availability or consumption; time on station of committed aircraft; and aircraft launch, recovery, and turnaround priority are time-sensitive issues requiring coordination and management among the members of current operations. Through its management of the current ATO, current operations also has the authority to cancel, divert or change missions to meet the needs of the current situation.

Current operations maintains situational awareness on each offensive AAW and air defense sortie. Members of the current operations section achieve situational awareness in part by establishing close and continuous communications with each Marine aircraft group and forward operating base's air boss. The air boss is the individual at the MAGTF controlled forward operating base responsible to the TACC for decentralized coordination and execution of the air defense fragmentary order. The air boss coordinates with and briefs each air defense aircrew before they launch and debriefs them upon recovery. The air boss prioritizes ordnance loading and fueling of air defense aircraft. Based on the forward operating base's base defense zone procedures, the air boss establishes launch/recovery priorities with the MATCD or Marine air traffic control mobile team. The air boss concept may or may not occur at a joint task force/host country-controlled air facility.

In addition to coordination with the Marine aircraft groups and the air boss, current operations also builds situational awareness through coordination with the SAAWC, TAOC, MATCDs, and joint force air defense agencies. Situational awareness is enhanced through activation and maintenance of digital data links with naval, joint, and multinational air command and control agencies. Members of current operations normally perform the data link interface coordination duties for the MACCS.

Based on recommendations from subordinate MACCS units and the situational awareness gained from the previously described sources, the TACC may direct that aircraft be diverted from their scheduled missions to meet immediate needs for higher priority threats; i.e., time-sensitive targets. The TACC directs establishing air defense warning conditions for the MAGTF and weapons release conditions for aircraft operating within the MAGTF's assigned air defense sector as shown in tables 6-1 and 6-2, page 6-8.

Future operations conducts detailed planning and coordination to build the next ATO. Future operations conducts direct coordination with the ACE commander and ACE operations officer to determine the allocation of ACE resources needed for future AAW operations. Future operations also coordinates with naval and joint force aviation to determine needed up-front sorties for air defense, air reconnaissance, and air interdiction missions.

Current and future operations maintain close and continuous liaison with the joint force's J-3, JFACC, and AADC as needed. This ensures that the TACC and the SAAWC receive the status of joint force sorties available to support the MAGTF's current and future operations.

Table 6-1. Weapons Release Conditions.

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

Table 6-2. Air Defense Warning Conditions.

Red	Attack by hostile aircraft is imminent or in progress.
Yellow	Attack by hostile aircraft is probable.
White	Attack by hostile aircraft is improbable.

Sector Antiair Warfare Coordinator

The SAAWC and his/her staff interface with the TAOC controllers and the ACE commander's battlestaff. The SAAWC is the ACE commander's air defense battle manager. The SAAWC coordinates and manages all active air defense weapons (aircraft and surface-to-air weapons) within his/her assigned sector, and functions to the extent of the authority delegated to him/her by the ACE commander. The TACC plans, allocates, and provides assets to the SAAWC to manage and commit to current AAW operations. In turn, the SAAWC provides recommendations for detailed planning of future operations to future operations. When delegated the authority by the ACE commander, the SAAWC can divert aircraft to attack offensive antiair warfare time critical targets and to respond to immediate air defense requirements. When authorized by the ACE commander, the SAAWC can establish air defense warning conditions within his/her designated sector.

Tactical Air Operations Center

The TAOC performs real-time control of fighter aircraft and surface-to-air weapons. By using system state, fuel state, and weapons state, the TAOC controls missile units and aircraft committed to a weapon engagement zone. The TAOC provides the TACC and SAAWC with the current status of committed/on-station assets. The TAOC also establishes follow-on/replacement weapons platform requirements.

Weapons Platforms

Personnel manning weapons platforms (aircraft and Stinger teams) are responsible for conserving and managing fuel and ordnance to increase a platform's performance. Weapons platform operators provide their equipment/system state, fuel state, and weapons state to the TAOC's weapons section. If the TAOC becomes a casualty and no alternative ground agency can perform integrated weapons management, senior platform personnel may manage similar assets within a WEZ.

Basic considerations to determine threat levels, positioning weapons, and exercising command and control are essential to understanding AAW operations. The rest of this chapter covers the types of operations normally conducted by MAGTF's and how AAW contributes to the MAGTF commander's single battle concept.

AMPHIBIOUS OPERATIONS

Amphibious operations are attacks launched from the sea by naval and landing forces, embarked in ships or craft involving a landing on a hostile or potentially hostile shore. (JP 1-02) Amphibious operations are designed and conducted to prosecute further combat operations; obtain a site for an advanced naval, land or air base; deny use of an area or facilities to the enemy; or to fix enemy forces and attention, providing opportunities for other combat operations. JP 3-02, *Joint Doctrine for Amphibious Operations*, provides the overarching doctrine for conducting amphibious operations. Assaults, raids, demonstrations, and withdrawals are types of amphibious operations. Other operations may be conducted by amphibious forces, e.g., NEOs and humanitarian assistance.

Forces assigned to conduct an amphibious operation task-organize as an amphibious force. The amphibious force is normally part of a larger NEF. The amphibious force is composed of Navy and Marine Corps forces.

Force protection for the amphibious force during movement to the operational area is a high priority. AAW operations conducted by naval forces provide

the required force protection and achieve air superiority for the landing force to project combat power ashore. The Navy is responsible for AAW during movement of the landing force to the operational area. Landing force aviation and Navy aircraft operating from supporting aircraft carriers and air defense-capable ships provide air defense weapons platforms and capabilities. Landing force assets aboard amphibious ships support the Navy's point defense for the ships; e.g, AV-8s, air-to-air capable helicopters, and Stinger teams.

Since Navy and Marine Corps units have organic aviation, they work in concert to support the amphibious force. Landing force assets can enhance or augment Navy antiair warfare assets, but potential loss or expenditure of finite landing force resources may affect the MAGTF's ability to accomplish objectives ashore.

Although the amphibious assault is the principal type of amphibious operation, anitair warfare actions will normally follow a similar pattern despite the type of operation. AAW operations that support amphibious operations are grouped into pre-D-day, D-day, and post-D-day (if the MAGTF is established ashore) operations. AAW assets require careful planning. Training and rehearsals can ensure that personnel and equipment meet combat readiness requirements.

Pre-D-Day Operations

Depending on the threat, pre-D-day AAW operations may include neutralizing or destroying enemy air defense, aircraft, airfields, supporting infrastructure (including command and control), and theater missile capabilities. Pre-D-day offensive antiair warfare operations achieve the air superiority for the MAGTF to conduct operations. They shape the battlespace for the main assault and create opportunities for the MAGTF commander to exploit during the main assault. The Navy normally controls the airspace and may be tasked as an area air defense commander for a specific region or sector during pre-D-Day amphibious operations. The MAGTF commander provides anitair warfare support to the Navy commander during this period. Landing force assets may be tasked to provide emergency defense of the amphibious ships.

D-Day Operations

AAW operations on D-day and beyond are geared toward maintenance of air defense and air superiority for the MAGTF's operations ashore, whether an assault, raid or NEO. The critical part of this phase is the actual landing of the MAGTF ashore. Antiair warfare operations initiated during pre-D-day should continue as preparation of the landing area continues. Aviation, naval surface fire support, sea-based surface-to-air weapons systems, and infantry weapons provide most of the antiair warfare fires until artillery and ground-based air defense assets have landed and are operational ashore.

The Navy normally retains controls of the airspace and air defense operations and the Navy tactical air control center. Navy, Marine Corps and joint antiair warfare assets are integrated to maintain air superiority.

Air defense capabilities are normally established and built up ashore. Capabilities include ground-based surface-to-air weapons, aircraft, surveillance assets, and command and control agencies. After landing force (MAGTF) assets and units are established ashore, transfer of specified operations may pass from the Navy to the MAGTF. If the MACCS is established ashore, the MAGTF may assume control of the airspace and air defense for its area of operations.

Initial Air Defense Capability Ashore

Initially, aircraft operating from supporting aircraft carriers or forward operating bases provide airborne air defense ashore. Stinger teams operating in direct support of the ground combat element are the first ground air defense capability established ashore. Stinger teams supporting the assault unit may initially collocate and coordinate their activities with forward air controllers to deconflict supporting friendly aircraft from enemy aircraft. Deconfliction and coordination of air defense aircraft (operating feet-dry) and direct support Stinger assets occur between air warfare commander and the Stinger unit commander. Established return-to-force procedures and ROE must be briefed in detail and understood by all air defenders and fixed-wing and rotary-wing aircrews. See figure 6-1, page 6-10.

The Stinger team's section leader, located in the assault unit's fire support coordination center, supervises and controls the Stinger teams. The senior Stinger commander ashore establishes communications with the Stinger sections ashore and with the Navy tactical air control center. The unit commander afloat provides hostile early warning alerts to Stinger sections and team commanders ashore. The senior Stinger commander ashore provides threat, engagement, and status information to the unit commander afloat.

Air Defense Buildup Ashore

As the landing force's follow-on GCE and CSSE resources phase ashore, additional air defense assets also phase ashore as soon as possible. The GCE's follow-on infantry, artillery, and armor units may be accompanied by additional Stinger assets assigned in either general or direct support and light armored vehicle (air defense) variants to provide air defense for screening forces. The CSSE may also have Stinger assets assigned in direct support. General support Stinger assets establish a comprehensive low-altitude air defense of the force beachhead and integrate with the assault force's direct support Stinger assets. The platoon commanders of Stinger assets in general support coordinate their activities with the Stinger commander located with the TACC afloat. The senior direct support Stinger commander may integrate his/her forces with the DASC after it phases ashore and becomes operational. This integration provides comprehensive and timely deconfliction and coordination of friendly aircraft and enemy aircraft.

During the buildup of MAGTF air defense ashore, Marine wing communication squadron detachments, Marine wing support squadrons, and Marine air traffic control detachments establish forward operating bases ashore. Forward operating bases allow MAGTF aircraft (including antiair warfare-capable platforms) to establish forward bases ashore. As forward operating bases are established ashore and LF aircraft begin using the forward operating bases, ground-based air defense assets must provide air defense. Once the forward operating base is operational and MAGTF air defense assets are available, a forward operating base defense zone must be established and coordinated with the air warfare commander. See figure 6-2.

The early introduction of Stinger sections and an early warning and control site from the TAOC ashore extends shipboard weapons employment, radar surveillance, identification, and coordination/control capabilities. The Stinger section, if provided with an acquisition radar, and the early warning and control elements provide initial engagement, early warning, cueing, and surveillance capabilities against the enemy aircraft and missile threat. The TAOC's early warning and control site also initiates data link connectivity with ATF and other air defense units.

Data between the early warning and control site's radars and Navy capable platforms is also exchanged through the cooperative engagement capability (CEC). Over the CEC link, radar data is shared between sensors. This shared data provides a composited, nearly continuous track on all aircraft and theater missiles detected by sensors. CEC significantly increases the engagement envelope of ground- and surface-based air

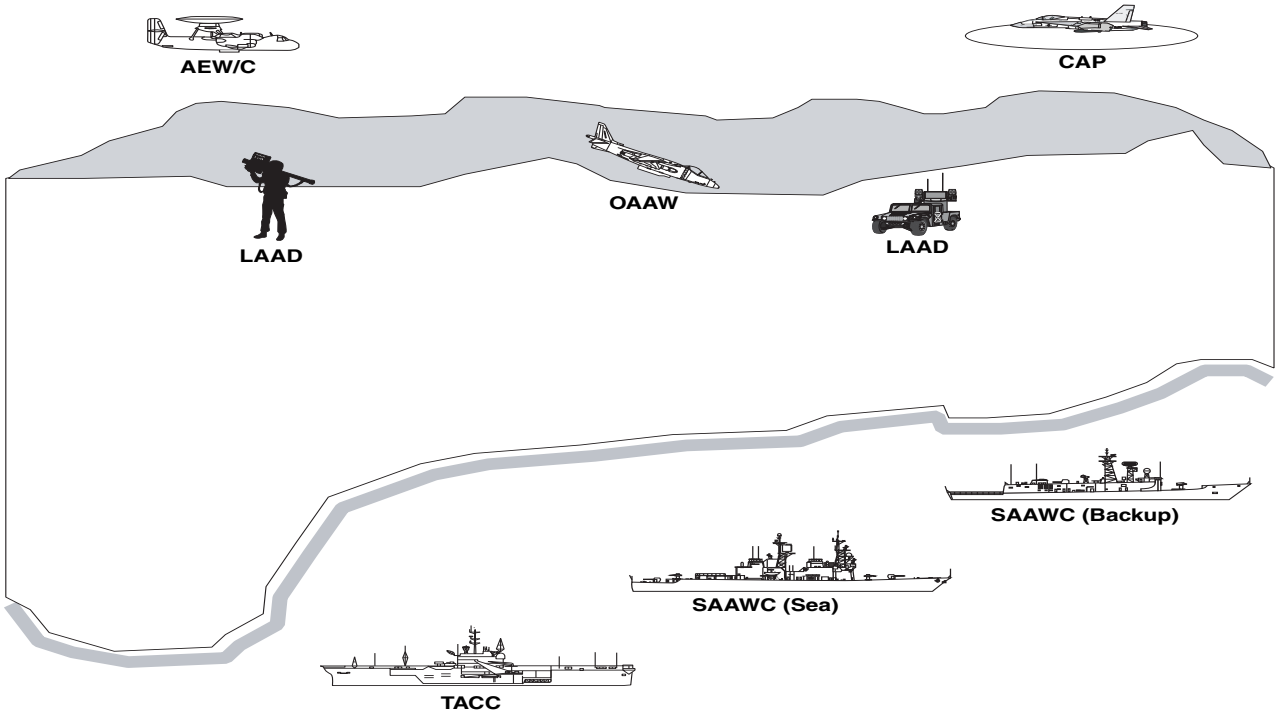

Figure 6-1. Notional Initial Air Defense Capability Ashore Laydown.

defense weapons by providing the weapon systems with fire quality control data from nonorganic surveillance sources. This data provides weapon systems with the potential to engage and fire on targets outside the radar horizon of their own sources.

With the introduction of the early warning and control site ashore, general support Stinger platoon commanders/section leaders may collocate at command and control nodes to facilitate exchange of surveillance/identification information with the early warning and control site, landward SAAWC, and the TACC afloat.

The ACE commander, normally through the Marine SAAWC/TAOC, activates missile engagement zones as operationally required. Control agencies must coordinate flight paths to prevent landing force aircraft from penetrating a missile engagement zone unless absolutely necessary. Typically, activating a missile engagement zone changes RTF and ROE procedures in the initial assault phase. All control agencies, controllers, and aircrews must adhere to the new procedures.

As additional general support Stinger assets move ashore, remaining TAOC equipment and personnel phase ashore. Liaison is established with the landward SAAWC to coordinate MAGTF AAW operations. Once the TAOC and Stinger assets are operational, they establish and maintain the required voice and digital information links with the landward SAAWC.

Post D-Day Operations

Depending on the type of operation, the MAGTF commander establishes air control facilities ashore as required by transferring control ashore. These facilities provide increased surveillance, quicker response to air defense threats and offensive antiair warfare targeting, and extend the ATF's weapons control capabilities. Initially, air control agencies ashore operate as an adjunct to agencies afloat. Air control agencies ashore assist as needed and monitor air control aspects (including communications circuits) directly related to their tasking. As the MACCS becomes functional and able to assume

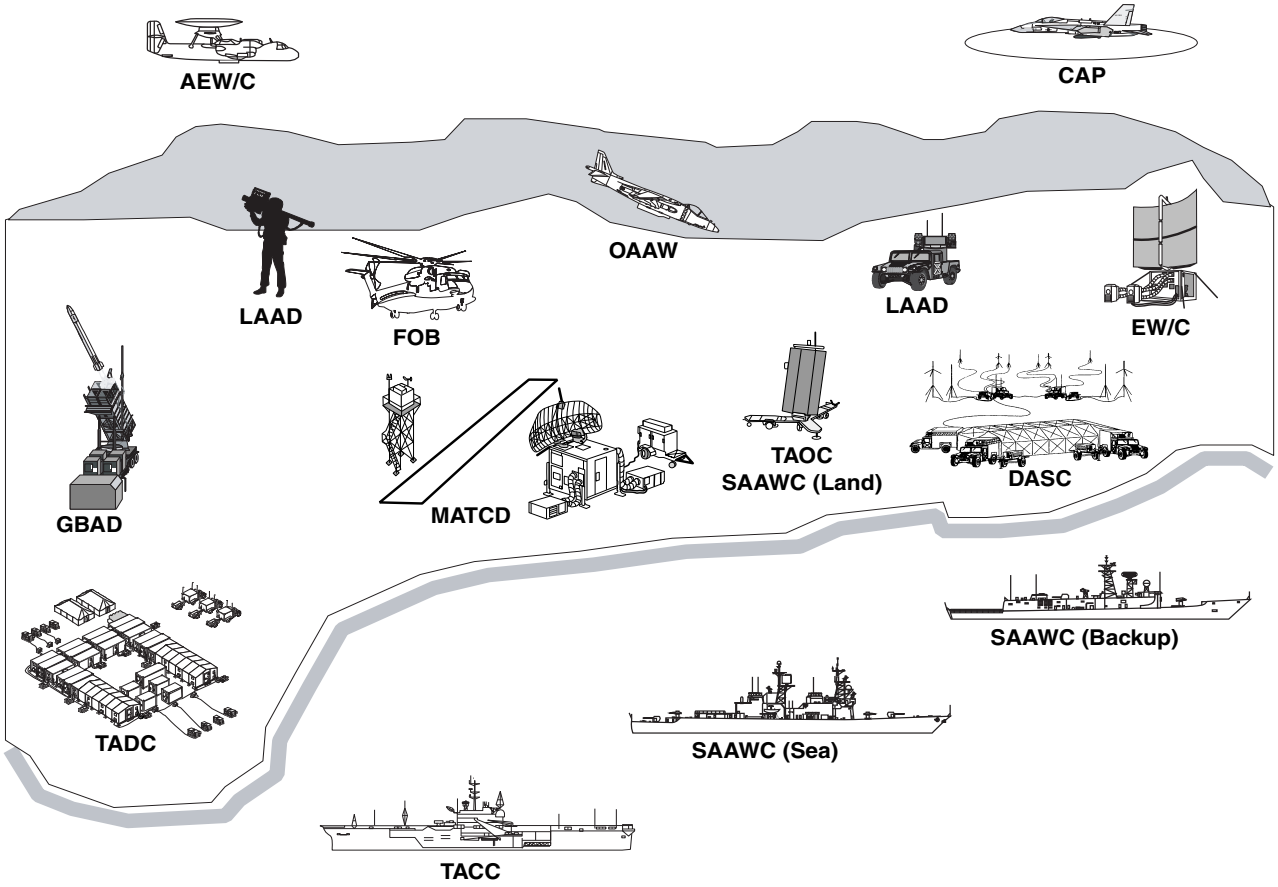

Figure 6-2. Notional Air Defense Buildup Ashore.

greater airspace control responsibilities, the Navy may incrementally pass control of some parts of the operation to the MAGTF. The decision to phase ashore all or parts of airspace and air defense control is based on the mission, the type of operation being conducted, the ability to establish agencies ashore, the tactical situation, and the MAGTF commander's recommendation to phase functions ashore. During the phasing of airspace and air defense control ashore, Navy control units afloat monitor the progress of assumption of air control responsibilities ashore, and can act in a backup or alternate role if required. See figure 6-3.

Once the DASC is ashore and operational, control of offensive air support and assault support aircraft phases ashore. As part of its offensive air support control responsibilities, the DASC may also process immediate requests for attacks against time critical targets and SEAD missions in support of OAAW operations.

With the introduction of ground-based air defense assets and the early warning and control site ashore, air intercept zones and fighter engagement zones are also established for aircraft and missile intercept zones; missile engagement zones are established for surface-to-air missile units. As the MAGTF's IADS of interlocking engagement zones is established, a change of RTF and ROE procedures may occur. Once the TAOC is ashore and operational, control of air defense of the landward sector (including theater missile defense) phases ashore to the landing force SAAWC.

Before transferring control of air operations to the MACCS units ashore, the MACCS must establish an integrated and comprehensive surveillance plan for the MAGTF. Surveillance resources are employed ashore based on their capability and coverage. The Marine control group commander, staff, and subordinate unit commanders must thoroughly analyze the surveillance requirements of the MAGTF's sector of responsibility. They must address terrain and its masking effects, threat axis of attack, and available surveillance resources. They must also identify the—

- Location of the TAOC and its radars, the early warning and control site, and gap-filler radars.
- Ability of Marine air traffic control radars at forward operating bases to augment the surveillance system and base defense zone concept.
- Location of Stinger units in general and direct support.
- Orientation of aircraft weapon engagement zones. Resources used in weapon engagement zones should provide specific airborne surveillance or weapon capabilities in a sector that other surveillance sources cannot see.

Marine air control group planners must also identify to the ACE commander any other specific requirements of aircraft surveillance capabilities; e.g., airborne early warning and control and surface-to-air weapons.

A complete and effective surveillance system is required for effective integrated air defense. Once the system is established, the TAOC's surveillance section coordinates surveillance information. The surveillance section coordinates input from the TAOC's sensors and all other surveillance sources. The surveillance section identifies detected air tracks and uses organic and remote sensor data and data link information to build a complete and comprehensive air picture. This air picture is used by the ACE commander and the IADS to gain situational awareness of ongoing aviation operations.

The SAAWC, collocated with or in the TAOC, may assume some current operations functions of the MATCD as TADC equipment and personnel phase ashore. Once phased ashore, the SAAWC manages the MAGTF's AAW assets and coordinates landward air defense, AAW and other air operations as required with the Navy TACC.

The SAAWC is the MAGTF commander's air defense battle manager. He/She commits AAW resources to missions tasked by the MAGTF or ACE commander. The Navy's air warfare commander must coordinate with the MAGTF or ACE commander to request support. Only the MAGTF or ACE commander has the authority to commit MAGTF aviation resources.

As the MATCD becomes operational, it establishes the required communications with the DASC, TAOC, forward-based landing force aviation units, and the Navy tactical air control center. The MAGTF commander can request that control of the airspace be transferred ashore. If approved, the MATCD then becomes the TACC, and the Navy tactical air control center becomes a TADC. Only one TACC is active in an operational area at one time.

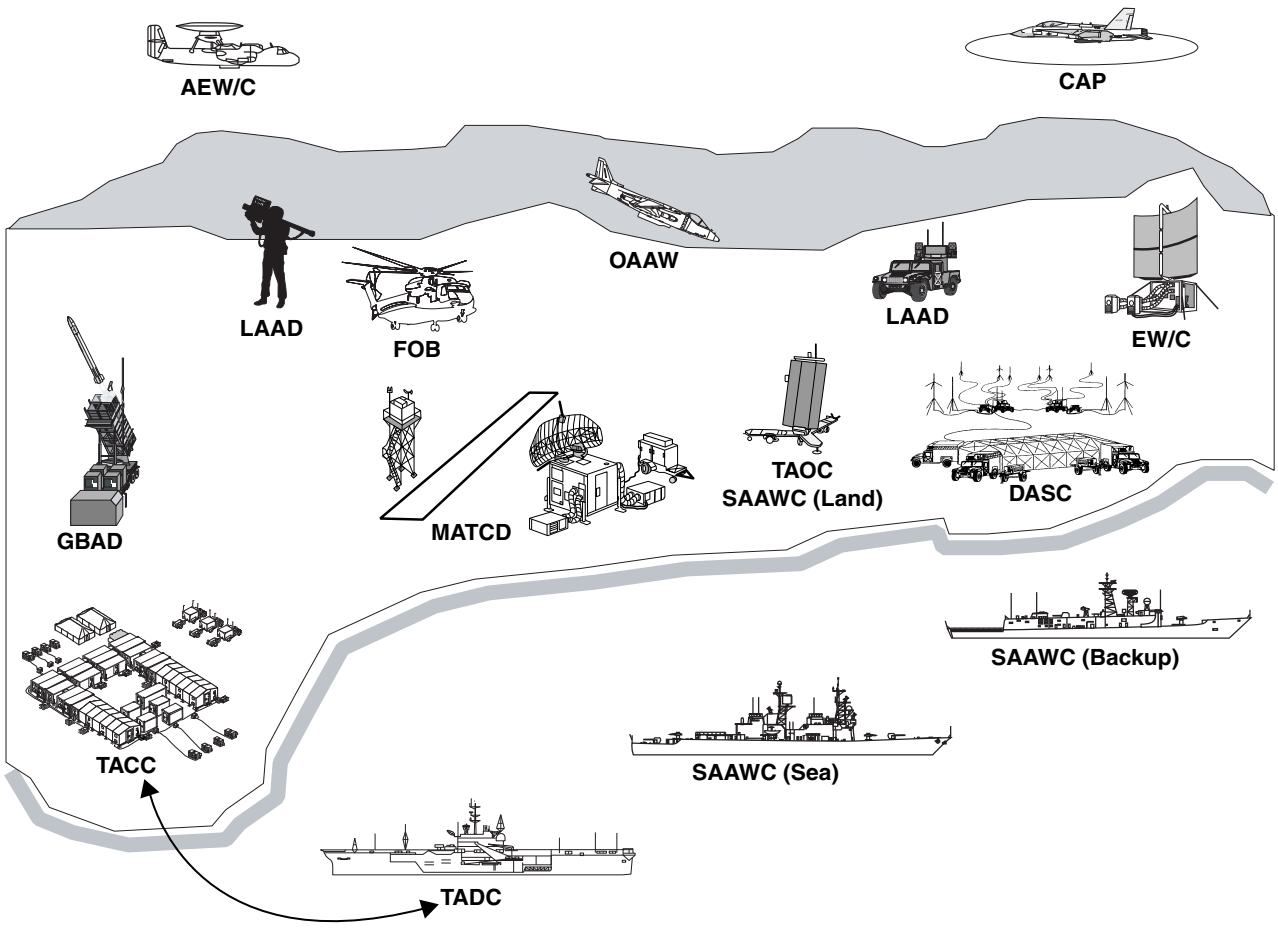

Figure 6-3. Transfer of Control Ashore.

MILITARY OPERATIONS OTHER THAN WAR

Military operations other than war (MOOTW) are operations that encompass the use of military capabilities across the range of military operations short of war. These military actions can be applied to complement any combination of the other instruments of national power and occur before, during, and after war. (JP 1-02)

MOOTW and conventional warfare share similarities. Both involve demonstrations of political resolve and, when necessary, the use of force to complete a mission. Both are inherently conducted in support of national objectives. War is conducted to achieve national objectives through large-scale, sustained combat; MOOTW are conducted to deter war and promote peace.

AAW operations are conducted in MOOTW as well as in war. The MAGTF uses the same resources in both situations. Although tactics may be the same, ROE will be the principal guideline for the degree that AAW is employed in MOOTW.

JP 3-07, *Joint Doctrine for Military Operations Other Than War*, describes many types of MOOTW; the types having AAW roles follow.

Counterdrug Operations

Air defense surveillance radars track aircraft or air defense aircraft intercept and identify aircraft suspected of transporting drugs.

Enforcing Exclusion Zones

Air defense aircraft and radars can enforce no-fly zones.

Ensuring Freedom of Navigation and Overflight

AAW aircraft provide escort or enforce freedom of navigation activities in international airspace as recognized by the International Civil Aviation Organization.

Noncombatant Evacuation Operations

AAW resources provide air defense for security of landing zones and MAGTF assets.

Peace Operations

Peace operations encompass both peacekeeping operations and peace enforcement operations. AAW operations enforce peace treaties, cease fires or further enable the forcible execution of peace operations.

Protection of Shipping

AAW aircraft can provide CAP or escort for U.S. ships operating in international waters.

Strikes and Raids

AAW operations can damage, seize or destroy an objective for political purposes. AAW assets provide escorts for these strikes and raids, conduct SEAD or attack weapons of mass destruction facilities.

Show of Force Operations

Aircraft demonstrate U.S. resolve through high visibility operations to diffuse potentially hostile situations.

OPERATIONAL MANEUVER FROM THE SEA

Operational maneuver from the sea (OMFTS) is the Marine Corps' operational concept for the 21st century. OMFTS is not a tactic but a mindset regarding how MAGTFs will fight tomorrow's wars. OMFTS focuses on using sea, land, and air as maneuver space and maneuver and tempo to exploit enemy weaknesses and attack their center(s) of gravity. Under OMFTS, Marine forces will conduct amphibious operations and sustained operations ashore to support national policy. However, the methodology used in conducting OMFTS will differ significantly from our amphibious doctrine of today.

To transition from today's tactics to tomorrow's, methods and technologies needed to make operational maneuver from the sea a reality need to be investigated. The outcome of this investigation will hopefully enable the development of the tactics, techniques, and procedures needed to fight tomorrow's wars.

CHAPTER 7. JOINT AIR DEFENSE OPERATIONS

Joint air defense operations protect the joint force as a whole or as components from attack by hostile aircraft and missiles. The range of weapons systems, the ability to cross boundaries between component areas of operation, and the speed associated with air and missile attacks make joint air defense a responsibility of all components of the joint force. The intent of joint air defense operations is to successfully negate attacks by enemy aircraft and missiles by providing a seamless, fully integrated air defense system. METT-T is used to determine the extent to which air defense integration is accomplished, the employment of air defense systems, and the area of air defense coverage afforded by joint force resources.

THE JOINT FORCE COMMANDER

The joint force commander (JFC) is ultimately responsible for air defense of the joint forces. Normally, the JFC has two options for delegating authority for the coordination of joint air defense operations: to his/her staff or to a functional component commander.

The JFC's staff is normally used to coordinate joint air defense operations when a conflict or situation is of limited duration, scope or complexity. When the JFC's staff is used to coordinate joint air defense operations, he/she may elect to centralize planning and coordinating functions within the staff while retaining the ability to directly task joint force air defense capabilities and forces. The JFC's staff functions to the extent of the authority given by the JFC.

The JFC's choice to use his/her staff for coordinating joint air defense operations is influenced by his/her span of control, the duration and scope of operations, and the degree of centralized planning and control needed to conduct effective air defense operations. The complexity of the operations is the primary consideration for the JFC in determining if his/her staff has the ability to coordinate joint force air defense operations. When the complexity of coordinating joint air defense operations exceeds the scope and capabilities of the JFC's staff, the JFC will designate a functional component commander to coordinate joint air defense operations. A functional component commander promotes unity of effort and increases the JFC's span of control through delegation of authority. The functional component commander normally designated is the area air defense commander (AADC).

THE AREA AIR DEFENSE COMMANDER

The area air defense commander is normally the component commander with the preponderance of air defense capability and the command, control, and communications capability to plan and execute integrated air defense operations. (JP 1-02) The AADC is an individual; i.e., position, not an air command and control agency. The JFC defines the support relationship between the AADC and supporting commanders. All components will provide representatives to the AADC's headquarters to provide specific weapon systems expertise as well as broader mission expertise. The AADC normally exercises operational control over forces assigned or attached to him/her and tactical control over other military forces and capabilities made available for tasking. Responsibilities between joint air defense and joint airspace control are inherently interrelated. The JFC normally designates the same individual as AADC and airspace control authority. AADC responsibilities include—

- Assessing the enemy order of battle and situation.
- Developing and executing the joint air defense plan (a detailed plan to disseminate timely air and missile warning and cueing information to components, forces, allies and coalition partners, and civil authorities), as appropriate.
- Developing and implementing identification and engagement procedures and ROE that are appropriate to the aircraft and missile threat.
- Coordinating air defense operations with other component commanders.
- Ensuring timely and accurate track reporting among participating units to provide a consistent common operating picture.
- Establishing air defense regions or sectors to enhance decentralized control of joint air defense operations.
- Establishing air defense warning conditions and weapons release conditions for the joint operations area.
- Publishing technical and tactical operational data messages or operational task link messages for coordination of air defense and data link operations.

- Performing the duties of the airspace control authority when directed by the JFC.

Relationships with other component commanders and the AADC are established by the JFC. The JFC normally establishes AADC command relationships as shown in figure 7-1.

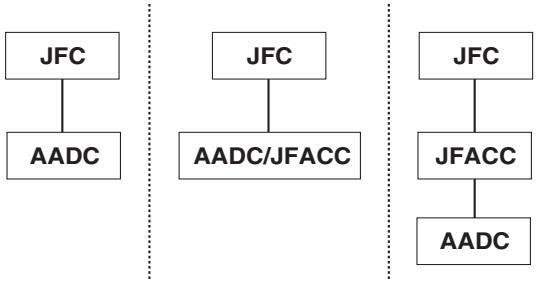

Figure 7-1. Options for AADC Designation.

The AADC as a Separate Functional Commander

The JFC may designate the AADC as an individual who has no other functional commander responsibilities. The AADC reports directly to the JFC relative to joint air defense matters. The AADC would also coordinate with other Service and functional commanders, including the JFACC, on area air defense. This arrangement is most beneficial when it is anticipated that functional responsibilities will pass from one component to another, such as the passing of AADC functions from afloat to ashore.

The AADC as a Combined Functional Component Commander

The JFC may designate one individual as the AADC and another functional component commander; e.g., the AADC as the JFACC. This individual performs the duties as the AADC and the JFACC, although the responsibilities of each functional area are separate but interrelated. The individual commander may use one or two staffs to fulfill dual responsibilities. This arrangement is most beneficial when high tempo, high intensity air and air defense operations facilitate unity of effort and enhance coordination between joint air and air defense operations.

THE AIR DEFENSE PLAN

The AADC, with the support and coordination of the Service and functional commanders, develops, integrates, and distributes a JFC-approved joint air defense plan. It integrates the active air defense capabilities of the joint force's components to provide a responsive air defense system that will achieve both operational and tactical objectives. The air defense plan reflects the priorities established by the JFC. Because air defense, airspace control, and management functions are inherently interrelated areas, the air defense plan and the airspace control plan should be developed in tandem to avoid conflicts. Some items addressed are—

- Sensor employment.
- Identification procedures.
- Engagement procedures.
- Airspace control measures pertaining to air defense.
- Weapons control procedures.
- Weapons system employment.
- Tactical interface design; i.e., TADIL.
- Dissemination of early warning.

THE REGIONAL AND SECTOR AIR DEFENSE COMMANDERS

To enhance his/her ability, the AADC, in coordination with other component commanders, may recommend establishing air defense regions to the JFC. Air defense regions may be further subdivided into air defense sectors. The number of air defense regions and sectors will vary depending on geographical, political, and operational factors; e.g., friendly forces, geography, threat, and concept of operations. A regional air defense commander (RADC) is designated to coordinate air defense activities within each region. A sector air defense commander (SADC) is designated for each air defense sector. Responsibilities of both commanders may include, but are not limited to—

- Coordinating air defense actions between regions and sectors.
- Evaluating the results of engagements within their region or sector.
- Forwarding observations and results of engagements within their region or sector to the AADC.
- Requesting from the AADC or directing, when authorized, changes to the air defense alert and weapons release conditions commensurate to the threat.
- Requesting additional air defense assets from the AADC when necessary.

The AADC provides RADCs with—

- Guidance and direction for air defense warning conditions and weapons release conditions.
- Changes to ROE.
- Allocation of additional air defense resources as necessary or as available.
- Requests for additional airborne air defense assets from the JFACC.

NOTIONAL JOINT AIR DEFENSE OPERATIONS

The area, regional, and sector air defense commanders can coordinate active air defense operations at the lowest level. This concept of centralized command—exercised through the AADC—and decentralized execution—exercised through RADCs and SADCs—promotes coordinated operations and economy of force while allowing decisionmaking at the lowest level. Reaction time to the threat is enhanced and the likelihood of fratricide is reduced. See figure 7-2.

Based on the JFC's air defense priorities, the AADC builds an air defense plan designed to optimize the joint force's air defense capabilities against enemy air attack. When employing his/her available air defense resources, the AADC considers factors such as mutual support and destruction-in-depth to maximize engagement opportunities and protection of forces.

The AADC's air defense resources include air command and control agencies, surface-to-air weapon

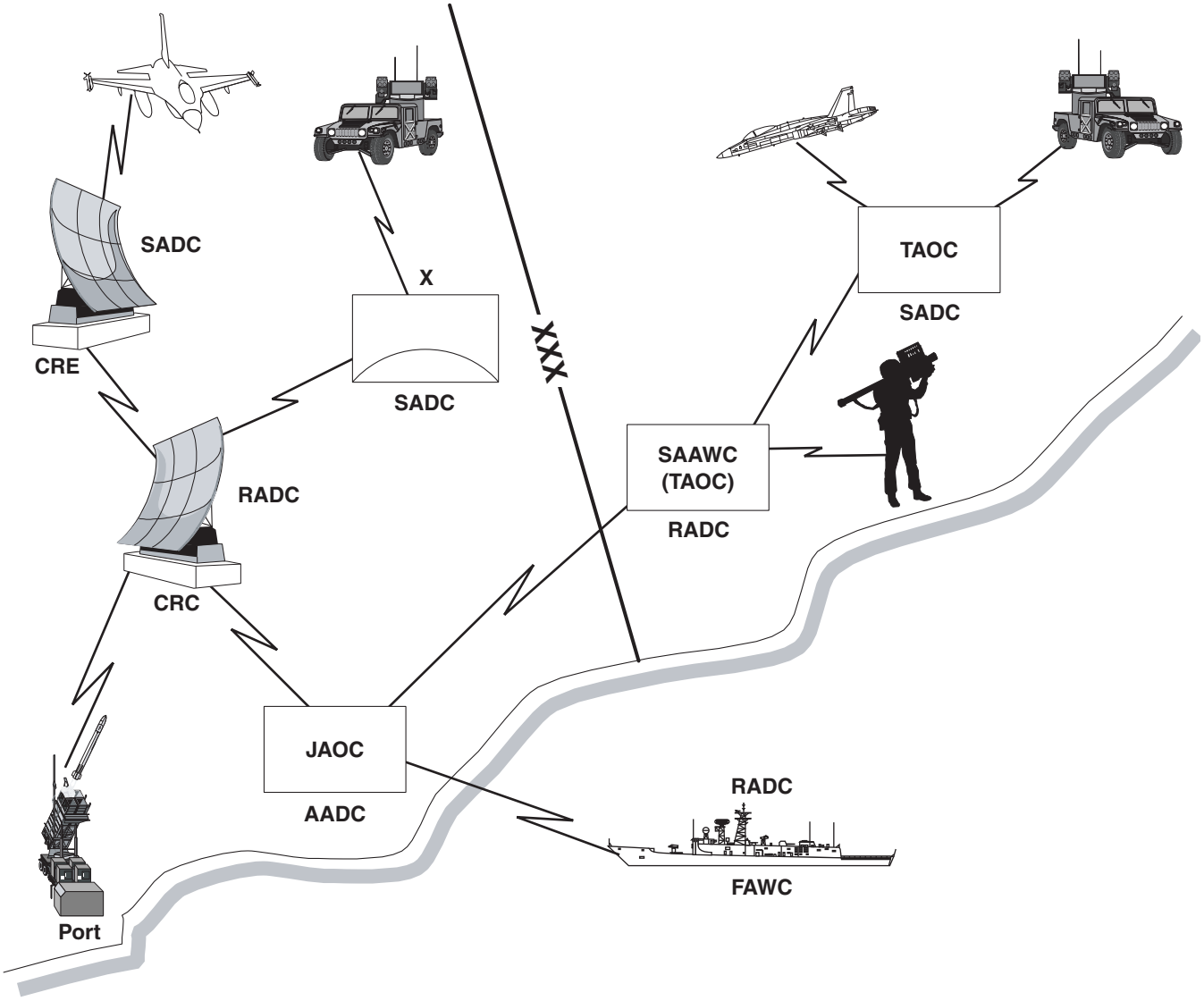

Figure 7-2. Notional Joint Air Defense Organization.

systems, and air defense aircraft. The AADC reviews air command and control agencies' locations to ensure overlapping air surveillance coverage of the joint operations area, thus enhancing mutual support and increasing opportunities for detecting threat aircraft and missiles. The AADC determines the positioning of those surface-to-air missile systems specifically designated for joint theater air and missile defense. The employment plan for components' surface-to-air missile systems is normally factored into the overall joint air defense plan to determine gaps in air defense coverage and to identify shortages in resources.

The JFACC allocates a percentage of aircraft to perform air defense missions based on the JFC's apportionment decision. The AADC typically allocates air defense missions to each RADC to perform air defense activities within each region. RADCs, in turn, distribute air defense aircraft to subordinate SADCs, depending on the anticipated need for air defense aircraft within their sectors. SADCs further distribute air defense aircraft to control agencies within their sector. It is the responsibility of controlling agencies to execute the air defense mission through the coordination, control, and integration of aircraft and surface-to-air weapon systems under their direction.

THE MAGTF AND JOINT AIR DEFENSE OPERATIONS

The MACCS is the principal conduit, which the MAGTF integrates with the joint air defense network. The senior agency of the MACCS, the tactical air command center (TACC), plans and coordinates MAGTF air defense operations with the AADC. The SAAWC assists in the near-term coordination and management of MAGTF-organic and joint force air defense resources allotted to the MAGTF by coordinating with the area, regional or sector air defense commander, as appropriate. The TAOC is the MAGTF's principal air defense agency responsible for the real-time execution of air defense operations. The TAOC, through the SAAWC, coordinates its activities with adjacent sector and regional air defense control agencies.

Currently, three Services have the command and control capabilities to perform area, regional or SADC functions: the United States Air Force, United States Navy, and United States Marine Corps. Capabilities are based on each Service's organic ability to communicate, surveil, coordinate, and command and control all facets of joint air defense. The Navy provides a sea-based command and control capability that is best suited for maritime operations, but can also provide joint air defense coordination functions in the littorals. The Air Force's capabilities are land-based, focused on high-tempo, extended duration air defense operations in support of a major theater campaign. The MAGTF can perform joint air defense coordination functions in both littoral operations and sustained operations ashore. The MAGTF's expeditionary nature and orientation on the littorals are defining factors that planners must comprehend when assigning these functions to the MAGTF.

The MAGTF's ability to perform AADC functions is best described as an enabling or pass-through capability. The MAGTF is well-suited to function as AADC in littoral operations for limited time. Examples of the MAGTF performing AADC functions include—

- The planned passage or transition of AADC functions from a sea-based facility to a shore-based facility (or vice versa)—similar to phasing control ashore—with the intent of the MAGTF passing those functions to another Service at a later time.
- Or, if an unplanned transition, where the AADC is unexpectedly unable to perform its functions because of a catastrophic action that significantly curtails the ability of the primary AADC to perform its functions.

If designated as the AADC, the commander, Marine Corps forces may delegate the authority for air defense coordination to the MAGTF commander, who may delegate that authority to the ACE commander.

The ACE commander, acting as the agent for the AADC, uses a joint staff whose composition is representative of the joint force to plan, manage, and coordinate joint air defense operations. The TACC may host the AADC's staff, providing the necessary voice and data communications resources and planning tools to coordinate joint air defense operations. The TACC's battlestaff is responsible for the coordination and execution of MAGTF aviation operations and should not be considered a part of the AADC's joint staff. However, it is likely that TACC crewmembers will be used to augment and provide subject matter expertise to the AADC's staff.

The MAGTF's ACE does not have the resources to perform area air defense functions for extended durations or in support of large scale theater

operations without significant communications and personnel support. The requirement for the TACC to remain expeditionary should be considered when determining the scope and duration for MAGTF designation as the AADC.

Like the AADC, regional and sector air defense commanders are managers of air defense assets. The MAGTF possesses a robust capability to function as regional and sector air defense commanders in both amphibious operations and sustained operations ashore, with regional and sector air defense coordination activities falling well within the scope and capabilities of the MAGTF's existing air defense architecture.

The SAAWC, as the MAGTF's air defense battle manager, is the most likely candidate to perform RADC or SADC functions. Like the AADC, regional and sector air defense commander positions are joint force billets. Joint staffs separate from the MAGTF air defense staff should coordinate region and sector air defense operations. If designated as the MAGTF's agent to perform regional or sector air defense commander functions, the SAAWC should ensure that liaisons from affected joint and multinational forces be included in his/her staff to facilitate planning and coordination of air defense operations.

As a RADC, the MAGTF's agent coordinates air defense operations directly with the AADC. As a SADC, the MAGTF's agent coordinates sector air defense with the RADC. Assuming these joint force responsibilities creates a requirement for dual reporting of air defense activities, one through joint reporting channels, and the other through the MAGTF's.

APPENDIX A. TACTICAL DIGITAL INFORMATION LINKS

A tactical digital information link (TADIL) is a Joint Staff-approved, standardized communications link that transmits digital information. Current practice is to characterize a TADIL by its standardized message formats and transmission characteristics. TADILs interface two or more command and control or weapons systems via a single or multiple network architecture and multiple communication media for exchange of tactical information. (JP 1-02)

In AAW operations, TADILs share air track information to build a comprehensive picture of the current air situation in a near real time basis. TADILs used by the MACCS in air defense operations follow.

TADIL-A

TADIL-A is also known as Link 11. It is a secure, half-duplex (poll-response) netted digital data link that uses parallel transmission frame characteristics and standard message formats. TADIL-A uses a rollcall mode under the control of a net control station (a machine function). The net control station synchronizes the track reporting of link participating units. Information is transmitted at either 1,364 or 2,250 bits per second (bps) over a high frequency (HF) or ultra-high frequency (UHF) carrier. TADIL-A is normally used to exchange data between airborne, sea-based, and ground-based air defense units.

TADIL-B

TADIL-B is also known as Link 11B. It is a secure, full-duplex, point-to-point digital data link conducted between two reporting units. Data is simultaneously received between reporting units. Operations are normally conducted over multichannel radio, satellite communication, telephone lines or cables. Information is transmitted at 2,400, 1,200 or 600 bps. TADIL-B is generally limited to providing connectivity between ground-based units.

TADIL-C

TADIL-C is also known as Link 4A. It is an unsecure, time-division digital data link conducted between an air defense controlling unit; e.g., TAOC or airborne warning and control system (AWACS) and appropriately equipped aircraft. Information exchange at 5,000 bps can occur in one of three modes: full two-way (ground to air to ground), one way air to ground, or one way ground to air.

TADIL-J

TADIL-J is also known as Link 16. It is a secure, high-speed digital data link. It uses the joint tactical information distribution system transmission (JTIDS) characteristics and protocols, conventions, and fixed-length message formats defined by the JTIDS technical interface design plan. TADIL-J is intended to replace or augment many existing TADILs as the joint standard for data link information exchange. Information is passed at one of three data rates: 26.88, 53.76 or 107.52 kilobits per second. TADIL-J devices will be located in ground, airborne, and sea-based air defense platforms and selected fighter aircraft.

NATO LINK 1

NATO Link 1 is a point-to-point digital data link that supports NATO air defense ground environment operations. It functions similarly to TADIL-B, but track number assignments differ and Link 1 is unencrypted.

ARMY TACTICAL DATA LINK-1

Army tactical data link-1 (ATDL-1) is a secure, full-duplex, point-to-point digital data link that interconnects tactical air control systems and Army or Marine tactical air defense oriented systems. It transmits at the rate of 1,200 bps.

GROUND-BASED DATA LINK

Ground-based data link (GBDL) is a simplex or half-duplex digital data link used by air defense units. It enhances the combat effectiveness of remotely emplaced LAAD gunners by providing them with a low-to-medium altitude air picture and weapons cueing from sensors feeding targeting information to the MACCS.

MAGTF TADIL CAPABILITIES

Table A-1 shows TADIL capabilities of various MAGTF agencies and weapons platforms.

Figures A-1 and A-2 show interfaces and connectivity options for MACCS to interface with joint and multinational forces.

Table A-1. MAGTF TADIL Capabilities.

	TACC	TAOC	EW/C	MATCD	LAAD	F/A-18
TADIL-A						
TADIL-B						
TADIL-C						
TADIL-J						
LINK 1						
ATDL-1						
GBDL						

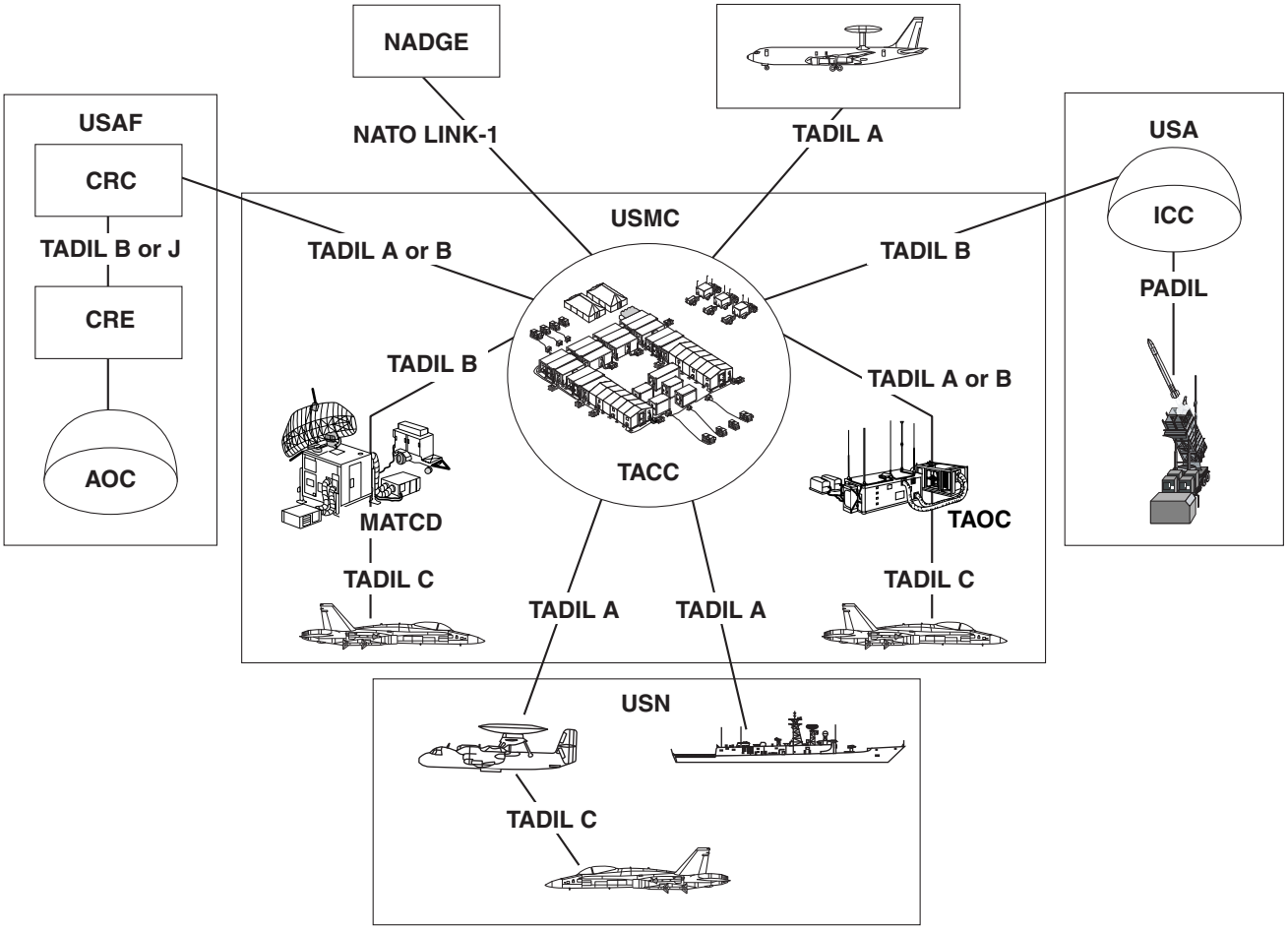

Figure A-1. Data Link Interfaces (TACC-Emphasis).

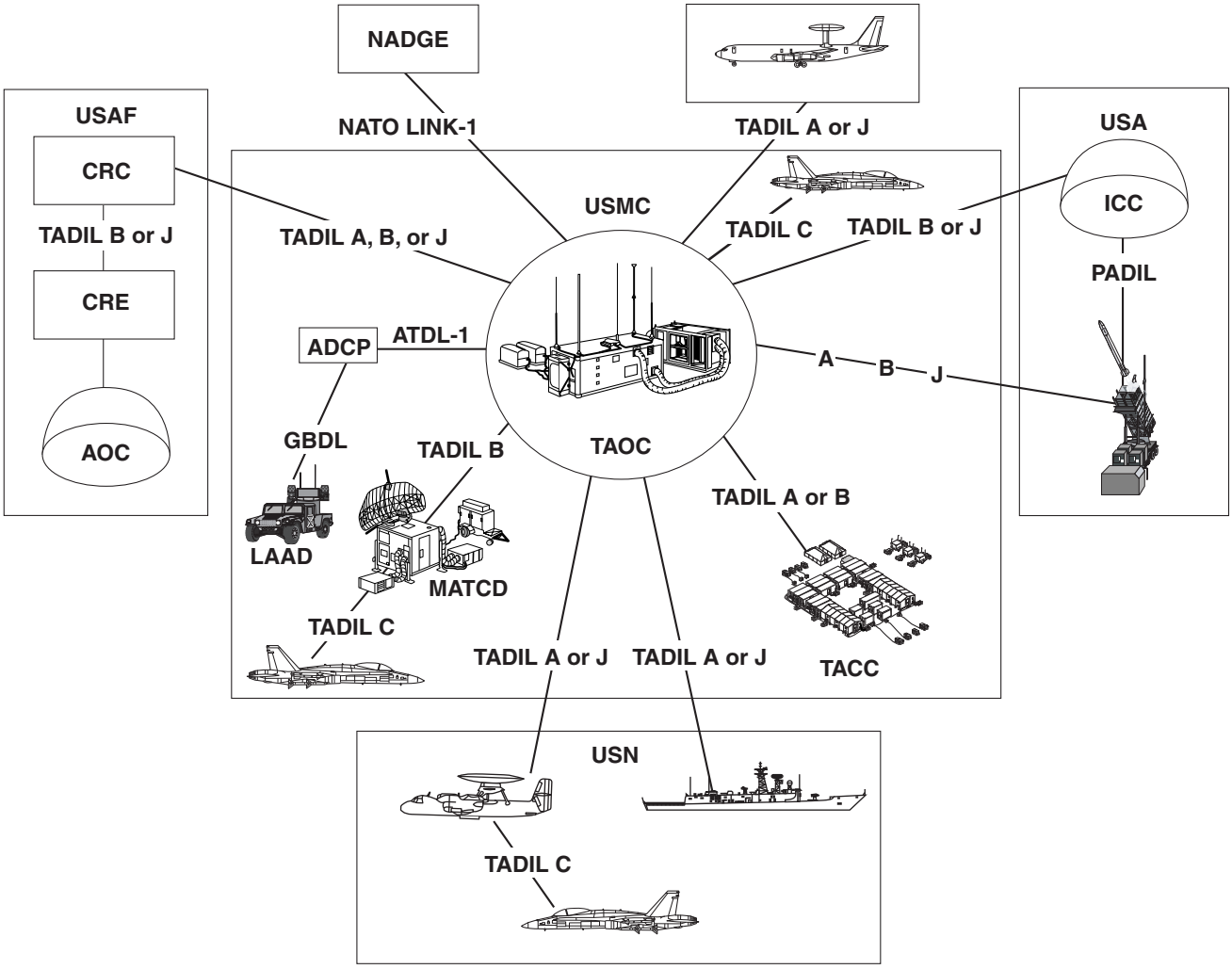

Figure A-2. Data Link Interfaces (TAOC-Emphasis).

APPENDIX B. AIR DEFENSE PLANNING CHECKLIST

This checklist helps form information requirements, plan an overall air defense strategy, and apply tactics and techniques for air defense operations above the MEU level.

GENERAL MISSION OVERVIEW

- Air defense strategy.
- Mission statement.
- Tasking and general requirements.

THREAT ANALYSIS

Air Order of Battle

- Aircraft numbers, types, and locations.
- Aircraft range and time on station.
- Air-to-ground weapons (standoff capability).
- Air-to-air weapons (defensive electronic attack capabilities).
- Night and all-weather capabilities.
- Navigation systems.
- Targeting information required.
- Tactics (ROE, identification criteria, RTF ingress/egress routes, formations, escort tactics, and attack profiles).
- Self-protection capabilities.
- Maximum sortie rates.
- Electronic attack/IR countermeasures capability.
- Training and readiness.
- Sustainability/logistics support.

Ground Order of Battle

- SAM systems, locations, and numbers.
- Antiaircraft artillery systems, locations, and numbers.
- SAM/antiaircraft artillery engagement envelopes and tactics.
- Theater missile systems, locations, and numbers.
- Theater missile engagement envelopes and tactics.
- Training and readiness.
- Sustainability/logistic support.
- Enemy troop concentrations (e.g., FEBA area).
- Organic air defense capability.
- Surface-to-surface threats.

Electronic Order of Battle

- Electronic attack/electronic protection capabilities.
- Radio electronic combat assets/locations.
- Defensive electronic attack capabilities.
- Electronic attack/electronic protection tactics.
- C2 nets (filter centers, links, and control points).
- Early warning and acquisition systems numbers, types, locations, coverage, and detection range.

Enemy Command and Control

- SAM/antiaircraft artillery control (location).
- Ground-controlled intercept facilities (location).
- SAM/CAP/strike coordination.
- Theater missile control (location).
- RTF procedures.
- ROE.
- Training and readiness.
- Identification criteria.

Enemy Logistics Support

- Airfields (location).
- Support facilities (maintenance depots; ammunition dumps; petroleum, oils, and lubricants).
- Means of supply.
- Lines of communications.

INTELLIGENCE

- Intelligence collection assets tasked.
- Intelligence disseminated to air defense planners/controllers.

AMPHIBIOUS OBJECTIVE AREA/AREA OF OPERATION DESCRIPTION

- Sector of responsibility.
- Vital/destruction/surveillance areas.
- Zone defense grid.

AIR DEFENSE OPERATIONS

Methods Available

- Electronic warfare.
- Communications jamming.
- Radar jamming.
- Deceptive jamming.
- Deception.
- Aircraft/ordnance.
- Decoys.
- Chaff.
- Stinger (MANPADS/Avenger).
- Radar SAM.
- MACCS.

Considerations

- Missile intercept/engagement zones.
- SHORAD engagement zones.
- Air intercept zones/fighter engagement zones.
- Visual CAP locations.
- Radar CAP locations.
- Stinger locations.
- Tankers.
- Airborne early warning and control aircraft.
- Aircraft/ordnance availability.
- Surveillance capability.
- Defense conditions.
- Weapons control statuses.
- Radar control procedures.
- Threat axis.
- AAW fragmentary orders and call signs.
- Additional missions.

Surveillance Coordination

- Digital information link configuration.
- Non real-time track reporting (visual).
- Evaluation criteria.
- Surveillance sectors.

ROE

- Standing.
- Supplemental.

Specific Control Procedures

- RTF ingress/egress routes and procedures.
- Lame duck procedures.
- IFF/selective identification feature.
- Radar fighters.
- Visual CAP.
- Stinger.
- Lost communications procedures.

Identification Authority

Identification Criteria

- Not identified as friendly/visually identified as hostile.
- Flight characteristics/flight profiles.
- Pop-up.
- Electronic attack detected.
- Attacking friendly assets.
- Mode I, II, III, and IV.

Weapons Control and Management

- Radar-equipped CAP.
- Visual CAP.
- Stinger.
- Radar SAM.
- Casualty procedures.

Aerial Refueling Plan

- Track location.
- Assets.
- Mission priorities.

What-ifs for Major Weapons System Deficiencies

Mission and Tasking Reviewed

APPENDIX C. OAAW PLANNING CHECKLIST

This checklist helps form information requirements, plan an overall OAAW strategy, and apply tactics and techniques for OAAW operations above the MEU level.

GENERAL MISSION OVERVIEW

- OAAW strategy.
- Mission statement.
- Tasking and general requirements.

THREAT ANALYSIS

Air Order of Battle

- Aircraft numbers, types, and locations.
- Air-to-air weapons (defensive electronic attack capabilities).
- Night and all-weather capability.
- RTF ingress/egress routes and formations.
- Training and readiness.
- Sustainability/logistics support.

Ground and Missile Order of Battle

- SAM systems, locations, and numbers.
- Antiaircraft artillery systems, locations, and numbers.
- SAM/antiaircraft artillery engagement envelopes and tactics.
- Theater missile systems, locations, and numbers.
- Theater missile engagement envelopes and tactics.
- Training and readiness.
- Sustainability/logistics support.
- Enemy troop concentrations (e.g., FEBA).
- Organic air defense capability.
- Surface-to-surface threats.

Electronic Order of Battle

- Electronic attack/electronic protection capabilities.
- Radio electronic combat assets/locations.
- Defensive electronic attack capabilities.
- Electronic attack/electronic protection tactics.
- C2 nets (filter centers, command and control links, and control points).
- Early warning and acquisition systems numbers, types, locations, coverage, and detection range.

Enemy Command and Control

- SAM/antiaircraft artillery control (location).
- Location of ground-controlled intercept facilities.
- SAM/CAP coordination.
- Theater missile control (location).
- RTF procedures.
- ROE.
- Training and readiness.
- Identification criteria.
- IADS capabilities, procedures, and effectiveness.

Enemy Logistics Support

- Airfields (location).
- Support facilities (maintenance depots; ammunition dumps; and petroleum, oils, and lubricants).
- Means of supply.
- Lines of communications.

INTELLIGENCE/TARGETING

- Collection assets tasked.
- Targets prioritized.
- Weapon assets allocated (weaponeering).
- Assessment plan developed (planning, execution, post-strike phase).
- Intelligence disseminated to mission commanders/ planners.

- Intelligence preparation of the battlespace prepared for potential theater missile transporter-erector launcher hide sites.

OAAW STRIKE PLANNING

Preemptive Measures

- Tasking based on intelligence.
- Integration of/coordination with the targeting sequence.
- Integration with SEAD and local air superiority measures.
- Assignment of mission commanders.
- Allocation of weapon assets (weaponeering).
- Initiation of planning.
- Scheduling and coordinating with other Marine aviation functions; e.g., offensive air support, assault support, and electronic warfare.
- Mission planning feedback.
- Execution.
- Assessment of effectiveness.

SEAD Measures

- Coordination with GCE.
- Tasking based on intelligence.
- Integration with preemptive and local air superiority.
- Assignment of mission commanders.
- Allocation of weapon assets (weaponeering).
- Scheduling and coordinating with other Marine aviation functions; e.g., offensive air support, assault support, and electronic warfare.
- Mission planning feedback.
- Execution.
- Assessment of effectiveness.

Local Air Superiority Measures

- Tasking based on intelligence.
- Integration with preemptive and SEAD measures.
- Assignment of mission commanders.
- Allocation of weapon assets (weaponeering).
- Initiation of planning.
- Scheduling and coordinating with other Marine aviation functions; e.g., offensive air support, assault support, and electronic warfare.
- Mission planning feedback.
- Execution.
- Assessment of effectiveness.

OAAW OPERATIONS

Methods Available

- Ground/naval fires.
- Electronic warfare.
- Communications jamming.
- Radar jamming.
- Deceptive jamming.
- Deception.
- Aircraft/ordnance.
- Decoys.
- MACCS.
- Chaff corridors.
- Antiradiation missile support:
  - Self-launched.
  - Standoff planned.
  - Standoff targets of opportunity.
  - Close-in planned.
  - Close-in targets of opportunity.
- Direct attack:
  - Bombs/rockets.
  - Cluster bombs.
  - Precision-guided weapons.
- Avoidance.
- Night attack.

Self-Defense Measures

For friendly aircraft, adherence to:

- Safe passage corridors.
- Altitude and speed criteria.

Preconditions for Air Attack

- Target geographically located via electronic, visual or photographic reconnaissance or by probing defenses:
  - Emitters turn on to electronically locate.
  - Sites shoot to visually locate reconnaissance.

- Targeted for antiradiation missile (enemy emitter up) accomplished by—
  - Simulated attacks.
  - Real attacks.
- Jamming assets:
  - Support OAAW strikes for the preemptive plan.
  - Operate randomly for no specific air mission, but operate concurrently with ground fires to effect deception.
  - Support deceptive air strikes.
  - Support CAS strikes.
  - Electronically locate threats.

Deception Assets

- Tactical air launched decoys (TALD).
- UAVs.
- Other aircraft. These aircraft can be directed by the DASC to contact the OAAW manager. Their missions should be anticipated and supported by electronic warfare. Deception aircraft fly at medium altitude to the edges of enemy envelopes. Aircrews are given the prebriefs required to fly these profiles (intelligence and procedures). Deception aircraft can be fragged for a deception mission as a follow-on to CAS or any other mission if assets permit.

Purposes of Deception Assets

- Cause the enemy to expend missiles and emit.
- Locate enemy sites.
- Deception for other strikes.

AIRCREW TACTICS—LOCATION

Visual Methods (Organic)

- The aircrew observes the system or launches made by the system.
- Ground troops observe the system and provide location information.

Electronic means

- EA-6Bs indicate the presence of a system within a certain radius.
- Aircraft radar homing and warning gear indicates the presence of radar systems.

AIRCREW TACTICS—ATTACK TACTICS AND TECHNIQUES

- Direct attacks flown without support.
- Low-altitude attacks use terrain to conceal/mask attack.
- Medium-altitude attacks use precision-guided weapons (laser/TV).
- Target marking (as in CAS missions), if possible.
- Direct attacks flown with antiradiation missile support. Antiradiation missile can be directed against covering or targeted system.
- Self-antiradiation missile support provided by the attacking aircraft. Critical timing is easily coordinated using this method.

Standoff Antiradiation Missile Support

- Scheduled:
  - Critical timing is required between aircraft.
  - The system must emit or missiles may be wasted.
- On-call:
  - Enemy system must shoot.
  - Package normally consists of four aircraft: one EA-6B acting as manager, one antiradiation missile/rocket standoff attack aircraft (ironhand), and two iron bombers.
- Immediate:
  - Short time of flight required if shot is to cover aircraft in the system's envelope.
  - If OAAW operations support CAS, place antiradiation missile on station to react to threats, backed up by iron bombers if possible.

APPENDIX D. GLOSSARY

SECTION I ACRONYMS

AADC . . . . . area air defense commander
AAW . . . . . antiair warfare
ACA . . . . . airspace control authority
ACA . . . . . airspace coordination area
ACE . . . . . aviation combat element
ACM . . . . . airspace control measure
ACO . . . . . airspace control order
AIZ . . . . . air intercept zone
AOA . . . . . amphibious objective area
ATDL . . . . . Army tactical data link
ATO . . . . . air tasking order

BDZ . . . . . base defense zone

CAP . . . . . combat air patrol
C2 . . . . . command and control
CATF . . . . . commander, amphibious task force
CEC . . . . . cooperative engagement capability
CLF . . . . . commander, landing force
CSSE . . . . . combat service support element

DASC . . . . . direct air support center
DASC(A) . . . . . direct air support center (airborne)
DCA . . . . . defensive counterair

EMCON . . . . . emission control
EW/C . . . . . early warning and control

FAD . . . . . fighter air direction
FEBA . . . . . forward edge of the battle area
FEZ . . . . . fighter engagement zone
FFA . . . . . free-fire area
FSCL . . . . . fire support coordination line
FSCM . . . . . fire support coordinating measure

GBDL . . . . . ground based data link
GCE . . . . . ground combat element

HIDACZ . . . . . high-density airspace control zone

IADS . . . . . integrated air defense system
ICU . . . . . interface coordination unit
IFF . . . . . identification, friend or foe
IR . . . . . infrared

JFACC . . . . . joint force air component commander
JEZ . . . . . joint engagement zone

LAAD . . . . . low-altitude air defense

MACCS . . . . . Marine air command and control system
MAGTF . . . . . Marine air-ground task force
MATCD . . . . . Marine air traffic control detachment
MEB . . . . . Marine expeditionary brigade
MEF . . . . . Marine expeditionary force
METT-T . . . . . mission, enemy, terrain and weather, troops and support available - time
MEU . . . . . Marine expeditionary unit
MEU(SOC) . . . . . Marine expeditionary unit (special operations capable)
MEZ . . . . . missile engagement zone
MIZ . . . . . missile intercept zone
MOOTW . . . . . military operations other than war
MRR . . . . . minimum-risk route
MWCS . . . . . Marine wing communications squadron

NCTR . . . . . non cooperative target recognition
NFA . . . . . no-fire area

OAAW . . . . . offensive antiair warfare
OMFTS . . . . . operational maneuver from the sea

PIRAZ . . . . . positive identification and radar advisory zone

RADC . . . . . regional air defense commander
RADCON . . . . . radar control
RFA . . . . . restrictive fire area
RFL . . . . . restrictive fire line
ROA . . . . . restricted operations area
ROE . . . . . rules of engagement
ROZ . . . . . restricted operations zone
RTF . . . . . return to force

SAAFR . . . . . standard use Army aircraft flight route
SAAWC . . . . . sector antiair warfare coordinator
SADC . . . . . sector air defense commander
SAM . . . . . surface-to-air missile
SEAD . . . . . suppression of enemy air defenses
SOA . . . . . state of alert
SPINS . . . . . special instructions
SPMAGTF . . . . . special purpose Marine air-ground task force

TACC . . . . . tactical air command center
TADC . . . . . tactical air direction center
TADIL . . . . . tactical digital information link
TAOC . . . . . tactical air operations center

WEZ . . . . . weapon engagement zone

SECTION II. DEFINITIONS

active air defense – Direct defensive action taken to destroy, nullify or reduce the effectiveness of hostile air and missile threats against friendly forces and assets. It includes the use of aircraft, air defense weapons, electronic warfare, and other available weapons. (JP 1-02)

air control – The authority to effect the maneuver of aircraft. The elements of air control are: air control agency, air controller, airspace control, operational control, positive control, procedural control, radar control, and terminal control. (MCRP 5-12C)

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 direction – The guidance and supervision which a commander employs to focus his resources on mission accomplishment. Air direction occurs as a sequence of the following activities:

1. apportionment (Air) – The determination and assignment of the total expected air effort by percentage and/or by priority that should be devoted to the various air operations and/or geographic areas for a given period of time.

2. allocation (Air) – The translation of the air apportionment decision into total numbers of sorties by aircraft type available for each operation or task.

3. tasking – The process of translating the allocation into orders and passing these orders to the units involved. Each order normally contains sufficient detailed instructions to enable the executing agency to accomplish the mission successfully.

4. fragmentary order – An abbreviated form of an operation order, usually issued on a day-to-day basis, that eliminates the need for restating information contained in a basic operation order. It may be issued in sections. (Extract from MCRP 5-12C, under "Marine air command and control system".)

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)

airspace control authority – The commander designated to assume overall responsibility for the operation of the airspace control system in the airspace control area. Also called ACA. (JP 1-02)

antiair warfare – A U.S. Navy/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)

area air defense commander – Within a unified command, subordinate unified command, or joint task force, the commander will assign overall responsibility for air defense to a single commander. Normally, this will be the component commander with the preponderance of air defense capability and the command, control, and communications capability to plan and execute integrated air defense operations. Representation from the other components involved will be provided, as appropriate, to the area air defense commander's headquarters Also called AADC. (JP 1-02)

combat air patrol – An aircraft patrol provided over an objective area, over the force protected, over the critical area of a combat zone, or over an air defense area, for the purpose of intercepting and destroying hostile aircraft before they reach their target. (JP 1-02)

command – The authority that a commander in the military service lawfully exercises over subordinates by virtue of rank and assignment. (JP 1-02)

command and control – The means by which a commander recognizes what needs to be done and sees to it that appropriate actions are taken (MCDP 6, *Command and Control*)

commander, amphibious task force – The US Navy officer designated in the initiating directive as commander of the amphibious task force. Also called CATF. (JP 1-02)

commander, landing force – The officer designated in the initiating directive for an amphibious operation to command the landing force. Also called CLF. (JP 1-02)
Control - (Needs the definition)

control – The physical or psychological pressures exerted with the intent to assure that an agent or group will respond as directed. (JP 1-02)

counterair – A US Air Force term for air operations conducted to attain and maintain a desired degree of air superiority by the destruction or neutralization of enemy forces. Both air offensive and air defensive actions are involved. The former range throughout enemy territory and are generally conducted at the initiative of the friendly forces. The latter are conducted near or over friendly territory and are generally reactive to the initiative of the enemy air forces. (JP 1-02)

destruction area – An area in which it is planned to destroy or defeat the enemy airborne threat. The area may be further subdivided into air intercept, missile (long-, medium-, and short-range), or antiaircraft gun zones. (JP 1-02)

electronic attack – Actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception, and employment of weapons that use either electromagnetic or directed energy as their primary destructive mechanism (lasers, radio frequency weapons, particle beams). (JP 1-02)

fighter engagement zone – In air defense, that airspace of defined dimensions within which the responsibility for engagement of air threats normally rests with fighter aircraft. Also called FEZ. (JP 1-02, under "weapon engagement zone")

joint engagement zone – In air defense, that airspace of defined dimensions within which multiple air defense systems (surface-to-air missiles and aircraft) are simultaneously employed to engage air threats. Also called JEZ. (JP 1-02, under "weapon engagement zone")

joint force air component commander – The joint force air component commander derives authority from the joint force commander who has the authority to exercise operational control, assign missions, direct coordination among subordinate commanders, redirect and organize forces to ensure unity of effort in the accomplishment of the overall mission. The joint force commander will normally designate a joint force air component commander. The joint force air component commander's responsibilities will be assigned by the joint force commander (normally these would include, but not be limited to, planning, coordination, allocation, and tasking based on the joint force commander's apportionment decision). Using the joint force commander's guidance and authority, and in coordination with other Service component commanders and other assigned or supporting commanders, the joint force air component commander will recommend to the joint force commander apportionment of air sorties to various missions or geographic areas. Also called JFACC. (JP 1-02)

joint theater missile defense – The integration of joint force capabilities to destroy enemy theater missiles in flight or prior to launch or to otherwise disrupt the enemy's theater missile operations through an appropriate mix of mutually supportive passive missile defense; active missile defense; attack operations; and supporting command, control, communications, computers, and intelligence measures. Enemy theater missiles are those that are aimed at targets outside the continental United States. Also called JTMD. (JP 1-02)

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. (JP 1-02)

missile engagement zone – The airspace of defined dimensions within which the responsibility for engagement normally rests with missiles. Also called MEZ. MEZs may be designated within the missile intercept zone. (MCWP 3-25)

offensive antiair warfare – Those operations conducted against enemy air assets and air defense systems before they can be launched or assume an attacking role. Offensive antiair warfare operations in or near the objective area consist mainly of air attacks to destroy or neutralize hostile aircraft, airfields, radars, air defense systems, and supporting areas. Also called OAAW.

passive air defense – All measures, other than active air defense, taken to minimize the effectiveness of hostile air and missile threats against friendly forces and assets. These measures include camouflage, concealment, deception, reconstitution, redundancy, detection and warning systems, and the use of protective construction. (JP 1-02)

planning – The art and science of envisioning a desired future and laying out effective ways of bringing it about. (MCDP 5)

point defense – The defense or protection of special vital elements and installations; e.g., command and control facilities and air bases. (JP 1-02)

sector antiair warfare coordinator – An individual designated by the aviation combat element commander to function as his air defense battle manager. He functions to the extent of authority delegated to him by the aviation combat element commander. The

sector antiair warfare coordinator is responsible for coordination and management of all active air defense weapons (aircraft and surface-to-air weapons) within his assigned sector. Also called SAAWC. (MCRP 5-12C)

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 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)

theater missile – A missile, which may be a ballistic missile, a cruise missile, or an air-to-surface missile (not including short-range, non-nuclear, direct fire missiles, bombs or rockets such as Maverick or wire-guided missiles), whose target is within a given theater of operation. (JP 1-02).

vital area - A designated area or installation to be defended by air defense units. (JP 1-02)

weapon engagement zone – In air defense, airspace of defined dimensions within which the responsibility for engagement of air threats normally rests with a particular weapon system. Also called WEZ. (JP 1-02)

weapons of mass destruction – In arms control usage, weapons that are capable of a high order of destruction and/or of being used in such a manner as to destroy large numbers of people. Can be nuclear, chemical, biological, and radiological weapons, but excludes the means of transporting or propelling the weapon where such means is a separable and divisible part of the weapon. Also called WMD. (JP 1-02)

APPENDIX E. REFERENCES AND RELATED PUBLICATIONS

Joint Publications (JPs)

0-2	Unified Action Armed Forces
1-02	Department of Defense Dictionary of Military and Associated Terms
3-0	Doctrine for Joint Operations
3-01	Joint Doctrine for Countering Air and Missile Threats
3-01.4	Joint Tactics, Techniques, and Procedures for Joint Suppression of Enemy Air Defenses
3-01.5	Doctrine for Joint Theater Missile Defense
3-02	Joint Doctrine for Amphibious Operations
3-07	Joint Doctrine for Military Operations Other Than War
3-52	Joint Doctrine for Joint Airspace Control in the Combat Zone
3-56.1	Command and Control for Joint Air Operations

Marine Corps Doctrinal Publications (MCDPs)

1	Warfighting
2	Intelligence
3	Expeditionary Operations
4	Logistics
5	Planning
6	Command and Control

Marine Corps Warfighting Publications (MCWPs)

3-2	Aviation Operations (under development)
3-16	Tactics, Techniques, and Procedures for Fire Support Coordination (under development)
3-22.2	Suppression of Enemy Air Defenses
3-25	Control of Aircraft and Missiles
3-25.1	Integrated Combat Airspace Command and Control (ICAC2) Manual
3-25.2	Multi-Service Procedures for Theater Air-Ground Systems (TAGS)
3-25.3	Marine Air Command and Control System Handbook
3-25.4	Marine Tactical Air Command Center Handbook
3-25.5	Direct Air Support Center Handbook
3-25.6	Sector Antiair Warfare Coordinator Handbook
3-25.7	Tactical Air Operations Center Handbook
3-25.8	Marine Air Traffic Control Detachment Handbook
3-25.9	Low Altitude Air Defense Handbook
3-25.11	LAAD Gunnder's Handbook (under development)
5-1	Marine Corps Planning Process
5-1.1	Aviation Planning

Naval Warfighting Publication (NWP)

3-09.11/ MCWP 3-11.1	Supporting Arms in Amphibious Operations

Miscellaneous

Joint Vision 2010
...From the Sea
Forward...From the Sea
Marine Corps Concept Paper, *Operational Maneuver From the Sea*
Marine Corps Concept Paper, *Ship to Objective Maneuve*r

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