

Draft

MCWP 3-25.7

Tactical Air Operations Center Handbook



US Marine Corps

Draft

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FOREWORD

The Marine air command and control system (MACCS) provides the aviation combat element commander with the means to exercise control of those organic and nonorganic aviation assets to support Marine air-ground task force (MAGTF) operations. Marine Corps Warfighting Publication (MCWP) 3-25, *Control of Aircraft and Missiles*, addresses basic planning considerations for MACCS operations, employment, and interoperability among MACCS and joint Service agencies.

MCWP 3-25.7, *Tactical Air Operations Center Handbook*, complements and expands MCWP 3-25 by focusing on tactical air operations center (TAOC) operations and the role it plays in integrated MAGTF, joint, and multinational operations. Designated for MAGTF, naval expeditionary force, and joint force commanders and staffs, MCWP 3-25.7 highlights TAOC—

- Organization.
- Equipment.
- Planning.
- Operations.

MCWP 3-25.7 provides the requisite information needed by commanders and staffs to understand and evaluate the operational principles and capabilities of various TAOC employment options.

Applicable Operation Iraqi Freedom lessons learned have been analyzed, validated, and incorporated into this publication.

MCWP 3-25.7 supersedes MCWP 3-25.7, *Tactical Air Operations Center Handbook*, 13 September 1996.

Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

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CHAPTER 1

FUNDAMENTALS

The tactical air operations center (TAOC) is the Marine air command and control system's (MACCS's) principal airspace control and management agency. The Marine air control group's (MACG's) Marine air control squadron (MACS) provides personnel and equipment. Through radar inputs from its organic sensors and data link information from other military radar units (MRUs), the TAOC provides real-time surveillance of assigned airspace in addition to air direction, positive aircraft control, and navigational assistance to friendly aircraft.

Function

The TAOC provides air surveillance and control of aircraft and surface-to-air weapons (SAWs) for anti-air warfare (AAW) in support of the Marine air-ground task force (MAGTF). Its primary function—to conduct and coordinate AAW—is accomplished through the direction, coordination, and employment of various air defense weapons systems that include interceptor aircraft and ground-based air defense (GBAD) weapons.

Tasks

- Provides airspace control, management, and surveillance for its designated sector or area of interest.

- Provides navigational assistance, including itinerant air traffic control (ATC), to friendly and neutral aircraft.
- Detects, identifies, and controls the intercept of hostile aircraft and missiles.
- Deploys early warning/control (EW/C) sites to enhance the TAOC's radar coverage.
- Establishes and mans a sector air defense facility (SADF) as the location from where the MAGTF's designated sector air defense commander (SADC) will conduct air defense battle management.
- Recommends employment of assigned weapons and surveillance assets.
- Recommends air defense sectors, subsectors, and weapon engagement zones (WEZs) for itself and component elements.
- Deploys sensors and communications systems to provide air surveillance.
- Detects, identifies, and classifies all aircraft and missiles within its assigned sector.
- Displays and disseminates appropriate air/ground information to designated adjacent, higher, and subordinate agencies, such as the Marine tactical air command center (Marine TACC), another TAOC, the direct air support center (DASC), Marine air traffic control detachments (MATCDs), GBAD units, and aircraft.
- Selects and assigns appropriate weapons to engage and destroy the enemy air threat.
- Controls fires of subordinate air defense elements.
- Functions as an alternate TACC (Alt TACC) for limited periods of time when required or directed. During the initial phase of amphibious operations, the Marine TACC may stand up as a tactical air direction center (TADC) subordinate to the Navy tactical air control center (Navy TACC). If required or directed, the TAOC would function as the alternate TADC.
- Interfaces with adjacent and higher air defense agencies.

- Manages air defense resources.
- Coordinates and executes emission control (EMCON) conditions in its assigned sector.

TAOC Crew Organization

The TAOC crew is the heart of its air defense operations. TAOC crews are task-organized to meet specific missions. See figure 1-1.

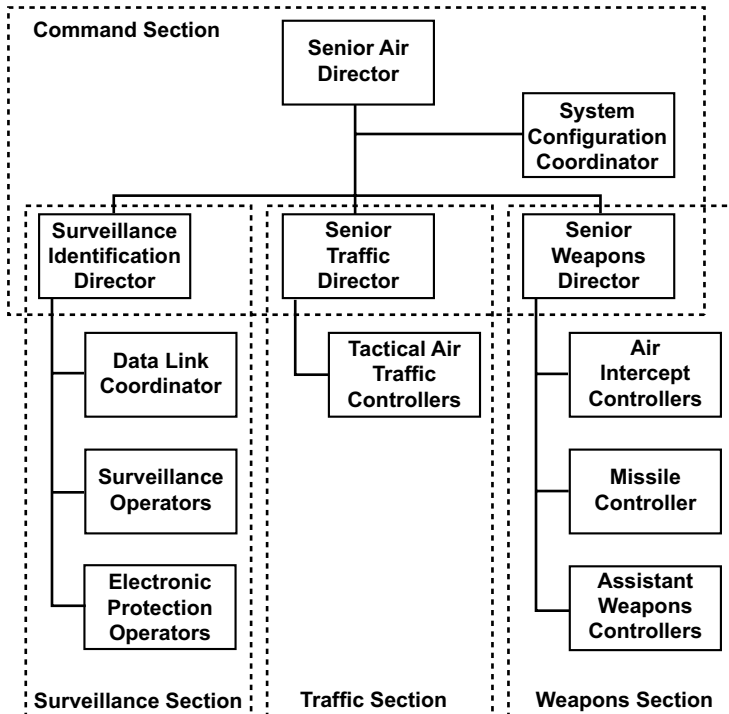


Figure 1-1. Notional TAOC Crew Organization.

Command Section

The command section supervises the surveillance, traffic, and weapons sections.

Senior Air Director

- Responsible for the TAOC's detailed operations.
- Ensures that proper coordination occurs among the various TAOC sections.
- Directs ongoing maintenance through the system configuration coordinator.
- Assigns casualty roles to crewmembers.

Surveillance Identification Director

- Detects, identifies, and classifies all radar inputs within the TAOC's assigned sector and coordinates electronic protection (EP) within the sector.
- Supervises the exchange and correlation of aircraft position and identification (ID) information with other control agencies.
- Coordinates all TAOC tactical data link (TDL) operations.

Senior Traffic Director

- Coordinates and routes all air operations in the TAOC's assigned sector.
- Controls aircraft not engaged in air defense and conducts aircraft handovers with other agencies as required.

Senior Weapons Director

- Employs air defense weapons.
- Evaluates the enemy air threat.

- In accordance with the aviation combat element (ACE) commander's AAW plan and rules of engagement (ROE), assigns weapons to negate the threat. As the senior weapons director (SWD) directly supervises engagements, the SWD coordinates threat engagements between and across multiple WEZs; i.e., assignments, disengagements, and reengagements.

System Configuration Coordinator

- Responsible for equipment readiness and ongoing maintenance.
- Conducts manual reconfiguration of computer and communications equipment to optimize TAOC operations or to respond to equipment failures.

Surveillance Section

- Detects, identifies, and classifies all targets within the TAOC's assigned sector.
- Headed by the surveillance identification director (SID).
- Correlates air tracks reported from all sources and manages the air picture developed within the TAOC and transmitted via data links or voice cross tell nets.
- Employs EP and supervises EMCON conditions set by the TACC.
- Consists of the data link coordinator and surveillance operators (SOs). The data link coordinator manages data link configuration by initiating directed changes to degraded links with subordinate agencies and recommending changes to degraded links to adjacent and senior agencies. The SO monitors radar inputs, initiates or monitors the acquisition of air tracks, performs preliminary ID, and updates track data as required.

Traffic Section

- Supervised by the senior traffic director (STD).
- Provides airspace management for—
 - ◆ Enroute, itinerant, and orbiting aircraft such as Airborne Warning and Control System (AWACS) aircraft.
 - ◆ Airborne command posts.
 - ◆ Transiting or orbiting close air support (CAS)/deep air support aircraft.
 - ◆ Aerial refueling (AR) missions.
- Consists of one or more tactical air traffic controllers (TATCs).
 - ◆ The TATC is responsible for detailed airspace management within the TAOC's assigned sector for all missions not controlled by the weapons section. Cognizance begins when aircraft enter the TATC's assigned area or are handed over to the TAOC by another agency and continues until the aircraft exit the assigned area or are handed off to another en route or terminal control agency.
 - ◆ In addition to providing navigational assistance, the TATC transmits friendly and threat situational awareness information to aircraft entering or transiting through the assigned sector.
 - ◆ The TATC also initiates Link-4A/Link-16 with all appropriately equipped aircraft and maintains track symbology on all aircraft under TATC control.

Weapons Section

- Under the supervision of the SWD; makes weapons assignments in accordance with the ROE and the AAW plan.
- Provides for control of all aircraft on AAW missions and management of SAWs in the TAOC's assigned sector.
- Consists of one or more air intercept controllers (AICs), a missile controller (MC), and one or more assistant weapons controllers (AWCs).

- The AIC—
 - ◆ Controls AAW missions from the point the aircraft is handed off from the traffic section until that mission is returned to the traffic section.
 - ◆ Intercepts hostile airborne targets assigned by the SWD.
 - ◆ Controls combat air patrol (CAP) aircraft and augments surveillance efforts in his assigned zone with CAP aircraft radar.
- The MC controls applicable SAW engagements within the TAOC's sector.
- The AWC—
- Assists the AIC and MC by entering data on aircraft tracks, monitoring tracks and radio nets, and maintaining aircraft missile control logs.
- Operates Link-4A/Link-16 with appropriately equipped aircraft as directed by the AIC. During hostile target intercepts, the AWC provides the AIC/MC information about the heading, altitude, and speed of the hostile target.

EW/C Crew Configuration

The EW/C crew is task-organized as directed by the TAOC. The EW/C crew will normally be capable of limited air surveillance and weapons control.

Briefings

See appendix A for the operations brief format. See appendix B for the TAOC crew brief format. TAOC crew briefs are adapted to missions and are normally conducted before crewmembers assume duty.

CHAPTER 2

SYSTEM DESCRIPTION

The TAOC consists of operator shelters, air surveillance radars, communications equipment, and a mobile electric power (MEP) generator. This equipment allows air defense control officers, tactical air defense controllers, and air control electronics operators to maintain air situational awareness and to effectively control, coordinate, and manage air defense employment within the TAOC's assigned sector.

Tactical Air Operations Modules

The hub of the TAOC is the AN/TYQ-23(V)4 tactical air operations module (TAOM). See figure 2-1, page 2-2. Each TAOC has four TAOMs. A subset of the TAOC is the EW/C site. It will have one or two TAOMs. The TAOM is a mobile, modular, automated command and control (C2) shelter designed to conduct AAW control, tactical ATC, and surveillance and ID functions for the MAGTF. The TAOC's modular concept allows TAOMs to operate in stand-alone configuration or to be combined with other TAOMs to increase system capability and redundancy.

Each TAOM contains the mission-essential equipment; i.e., computers, operator positions, and digital and voice communications to provide limited C2 functions. TAOMs can be dispersed up to 500 meters apart from one another and functionally connected over fiber optic cables. Fiber optic cables allow dispersing TAOC radars up to 2 kilometers from a TAOM. Radars can also be remoted up to 40 kilometers from the TAOC and interfaced to the

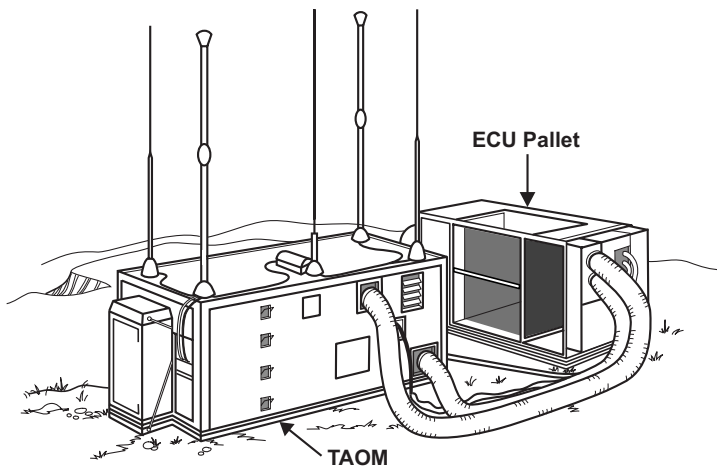


Figure 2-1. TAOM with ECU Pallet.

TAOM over remote radar data links. The TAOC's modular concept allows the build-up or scale-down of system capacity without disrupting C2 operations. It also allows echeloning C2 air defense C2 as the battle progresses. TAOM shelter and environmental control unit (ECU) pallet data are shown in tables 2-1 and 2-2.

Table 2-1. TAOM Shelter Specifications.

Length	20 feet
Width	8 feet
Height	8 feet
Square	160 square feet
Cube	1,280 cubic feet
Weight	16,500 pounds (approximately)
Power requirements	120/208 volts, 60 hertz, 23 kilowatts, 3-phase, 4 wire

Table 2-2. ECU Pallet Specifications.

Length	12 feet
Width	7 feet
Height	8 feet
Square	86 square feet
Cube	688 cubic feet
Weight	6,500 pounds (approximately)
Power requirements	120/208 volts, 60 hertz, 30 kilowatts, 3-phase, 4 wire

Mobility

It is planned that the TAOM will be replaced with the common aviation command and control system (CAC2S) in fiscal year 2008 and the AN/TPS-63B with the G/ATOR [ground/air task oriented radar] in fiscal year 2010. TAOC mobility should vastly improve. The MACS table of equipment provides for organic motor transport capability required to employ the TAOC but assets are limited. Materials handling equipment (MHE) is required for emplacement unless the shelters remain mobile-loaded.

TAOM mobility permits deployment of an air control capability that can manage various air situations. Commercial or military air, land or sea vehicles may transport the TAOM or it may be towed using an M-1022 mobilizer. The TAOM travels with most of its equipment packaged inside the shelter, including antennas and some power cables.

The ECU pallet houses the remainder of the equipment including the B0007 heating and air conditioning units and the fiber optic and power cables.

TAOMs may be mobile-loaded on an MK48/18 Logistics Vehicle System (LVS) with the addition of corner modifications.

Marine Corps Systems Command is conducting tests to determine the maximum height and weight at a maximum speed at which a TAOM may be secured to an MK48/18 LVS using the corner modifications. Corner modifications bolt into existing holes on the corners of the TAOM.

To alleviate TAOC mobility problems, actions are underway to procure the M-1022A1 mobilizer for the MACS. It consists of a pair of dollies bolted to the ends of the TAOM shelter, thus allowing the TAOM to be towed behind a 7-ton truck. Designed to operate on improved surfaces; i.e., paved or gravel roads, the mobilizer incorporates a hydraulic lift system that lifts the TAOM 10-18 inches off the deck. The mobilizer also loads/off-loads TAOMs from aircraft and shipping. Each MACS is scheduled to receive five mobilizers.

The TAOC's mobility is limited by the amount and type of organic transportation assets available to the MACS. Unit planners should specify their desires as to whether the TAOC or TAOC elements will remain mobile-loaded throughout the operation. If it is decided not to mobile-load the TAOC or if assets are not available, sufficient transportation and MHE must be available to rapidly emplace the TAOC.

MHE must be able to access the TAOC's site and lift the TAOM shelter. Transportation assets should be of sufficient dimensions to hold the TAOM shelter. International Organization for Standardization extenders are available from the TAOC should LVS assets be used.

Versions

The AN/TYQ-23 operates in two versions. The United States Marine Corps (USMC) operates Version (4) called the TAOM.

The United States Air Force (USAF) operates Version (3) or the preplanned product improvement called modular control equipment. The acronym TAOM applies to either version of the AN/TYQ-23 as dictated by common usage. The shortened acronym OM [operations module] is also commonly used to refer to a module or shelter in either Service. The two versions respond to the different tactical requirements of the USMC and USAF. These different requirements are satisfied with TAOM hardware, which, for the most part, is the same for both Services. USAF software is the baseline version and mostly common to both systems. Deadlining criteria is covered later in this chapter.

The major differences between the two versions are the display symbols on the operator console units (OCUs) and how the data is processed. The USMC version employs an upgraded TAOM interface group (TIG) at each radar site. The addition of Modern Tracking System software and a high-speed processor into the TAOM interface unit now enable radar track processing to be performed at the TAOM interface unit (local) prior to transmission to the TAOM. The TAOM combines radar data from all local (organic) radars into tracks. Radar video and sweep data are still forwarded via 2-kilometer fiber optic and shared over the existing radar data bus. However, the processed track package is delivered via a 2-kilometer fiber-channel cable that terminates at the radio/local area network demarcation panel where it is routed by the fiber-channel switch to the active radar tracker software segment. The USAF version employs a modular control equipment interface group located at the radar site. This group preprocesses the radar data, generates tracks, and returns the tracks to the TAOM to combine into system tracks.

Theater Missile Defense Modifications

Various modifications have been made to TAOC equipment to upgrade its theater missile defense (TMD) capabilities. Concentrating on the theater missile (TM) threats most likely to influence a MAGTF; i.e., shorter-range theater ballistic missiles (TBMs) and cruise missiles (CMs), TAOC modifications are primarily focused on the TAOM and the AN/TPS-59(V)3.

The TAOM has been modified to receive, process, distribute, and/or forward TBM target data to AAW and GBAD units that can engage and destroy the target and other C2 agencies via digital data communications.

TAOM(V)4 processes Link-16 information, operates in Link-16 voice, and has a laser printer, a fiber-channel switch, local area network ports, and firmware reconfigurable modems in the digital communication unit. OCUs have been upgraded to 26-inch monitors, keyboard, and trackball.

Operator Interface

Each TAOM contains four OCUs. Each OCU is the primary operator-to-TAOM interface. The OCU provides the operator with the means to—

- Display radar surveillance data from up to four sensors.
- Activate and perform digital data link operations with surface, shipborne, and airborne data link platforms.
- Conduct AAW control of interceptor aircraft and GBAD units by voice or data communications.
- Conduct tactical ATC for friendly aircraft.

Voice Communications

Each TAOM contains internal radio equipment to support voice and data communications. In addition to its internally housed ultrahigh frequency (UHF), very high frequency (VHF), and high frequency (HF) radios, the TAOM introduces externally controlled radios and point-to-point circuitry from outside the TAOC to augment its communications requirements. Each TAOM also internally houses the required cryptographic instruments to encrypt its radios. Each TAOM contains secure voice telephone capability and can introduce two-wire analog and four-wire digital telephonic communications devices. The TAOC's voice capabilities depend on the number of TAOMs deployed and the external communications support available. Table 2-3 lists specific TAOM voice communications capabilities.

Data Communications

The TAOC can exchange surveillance data with data link-equipped agencies such as the—

- USAF's control and reporting centers.
- United States (US) Army Patriot systems.
- US Navy airborne tactical data systems and naval tactical data systems units.
- AWACS aircraft.
- GBAD units.
- Appropriately equipped interceptor aircraft over TDLs.
- North Atlantic Treaty Organization (NATO) ground-based agencies over the NATO air defense ground environment data link, known as NATO Link-1. Interface modes and capabilities are in table 2-3, page 2-8.

Table 2-3. TAOM Voice Communications Capabilities.

Item	Quantity
KY-58 (external)	14
ANDVT-KY-75 with RCU	4 (internal/external)
HYX/HYP-57	12
KG-84A	13
KG/KGX-40	1
External radios ¹	10
AN/GRC-171V4 (UHF)	4
Harris HF radio	2/1 ²
KY-68 secure telephone	1
Telephone	4
Direct access trunks	4
¹ Refers to the number of external radios that may be added to the 3 VHF, 4 UHF, and 2 HF radios internal to each TAOM.	
² One HF radio can be removed and replaced with a third computer during single OM EW/C operations. Five computers provide maximum system capability.	

Link-11 is a netted, half-duplex (poll-response), digital data link normally used for connectivity between airborne tactical data system and naval tactical data system platforms. Link-11 requires a net control station (NCS), a machine function designed to synchronize the track reporting of Link-11 participating units (PUs). Link-11 data is encrypted through a KG-40A encryption device. The carrier for Link-11 data is HF and/or UHF communications media.

Link-11B is a point-to-point, full duplex data link conducted between two reporting units (RUs), which include appropriately equipped MRUs and GBAD systems. Link-11B data is simultaneously received and transmitted between RUs. Link-11B operations are normally conducted over multichannel radio satellite communications telephone lines or cables and are generally limited to providing connectivity between ground-based units. A KG-84A/C encryption device encrypts Link-11B.

Link-4A is a data link conducted between the TAOC, F-14, and F/A-18 aircraft. Link-4A data links can be configured for one-way, limited two-way, and full two-way, and are conducted over UHF radio and are unencrypted.

Link-16 is the Department of Defense primary TDL for all Service and defense agency C2, intelligence, and, where practical, weapon system applications.

NATO Link-1 is a point-to-point data link (PPDL) that functions similarly to Links 11, 11B, and 16 except that it is not encrypted and does not transmit digital orders.

The TAOC can conduct a point-to-point Theater Force Management System data link. (Link options are multispeed variant 1 and Automatic Digital Network I and VI.) A given TAOC can only run one of these options at a time.

The number of TAOMs operating as part of the TAOC determines the TAOC's data link capabilities. See table 2-4.

Table 2-4. TAOC Data Link Capabilities.

Number of TAOMs	1	2	3	4
PPDLs (include Link-11B and NATO Link-1)	9	11	13	13
Link-11	1	1	1	1
Link-4A	1 (1 way-60 AC*, 2 way-12 AC)	1 (1 way-60 AC, 2 way-12 AC)	1 (1 way-60 AC, 2 way-12 AC)	1 (1 way-60 AC, 2 way-12 AC)
Link-16	1	1	1	1

*AC = alternating current

Automated Functioning

The TAOM provides certain automated functioning capabilities that significantly enhance the operator's ability to conduct surveillance, traffic, and weapons functioning. Two of the primary automated functions include aircraft ID and weapons control modes.

Automated Aircraft ID Modes

ID of friendly aircraft can be assisted through automatic identification, friend or foe (IFF) correlations. Operators enter friendly Mode I, II, and/or III information into the TAOC database. The database will make a correlation between the air tasking order (ATO)-entered information and the squawks reported by aircraft. If a correlation is made between the Mode I/III tables and/or the Mode II ATO data, the air track will be classified as designated in the ATO file.

Mode IV responses are also used in the ID process through automatically performed Mode IV tests. When the TAOC is operating in the low threat mode, Mode IV interrogations are not performed automatically. In the medium threat mode, a track's recommended identity (based on automatic ID) is compared to its current identity. If a high or low confidence Mode IV response is received after a manual Mode IV interrogation and the track's identity is unknown, assumed friend or assumed enemy, the track's ID will automatically be changed to unknown/assumed friend. When operating in the high threat mode, automatic Mode IV interrogation is performed on all tracks with an ID of unknown/assumed friend. A track with an identity of unknown is automatically updated to a friend when a high confidence Mode IV response is received or unknown/assumed friend when a low confidence response is received.

Additional automated ID capabilities are available through execution of a series of parameters entered into the TAOC's database. The ID/classification subprogram will track recommended classification based on the results of up to ten different tests including aircraft profile, IFF, and proximity to designated vital areas.

Automated Weapons Control Modes

The TAOM's automated weapons control modes can provide significant assistance to the TAOC crew regarding threat ranking and intercept feasibility. The TAOM has three weapons control modes: manual, semiautomatic, and automatic.

In the manual mode, the TAOM does not conduct automatic weapons trials or engagements. The operator conducts trial and weapons assignments.

In the semiautomatic mode, the system acts in an advisory capacity. Tracks are threat-ranked based on their proximity to vital areas, speed/heading, and their assigned identity. All available weapons systems are trialed against hostile or faker tracks, beginning with the highest-ranked threat. The system will display the three shortest time-to-intercept (TTI) solutions based on available GBAD, airborne interceptor or alert interceptor availability. The operator may then choose to accept or reject the recommended action. The TAOC will continue to try all hostile and faker tracks until they are engaged or until no other weapons are available to intercept the threat.

The automatic mode functions similarly to the semiautomatic mode except when the TTIs are compared, the system automatically assigns the weapon with the shortest TTI to engage the target. Multiple weapons will be assigned to raid-sized groups. Two weapons will be engaged against raid sizes of few; four weapons will be assigned against raid sizes of many. When the raid size is

designated as few or many, GBAD assets may be the preferred weapon based on TTI and hot missile inventories. Dissimilar weapons will not be simultaneously engaged against the same target, thus reducing the chance of fratricide.

Countermeasures

The TAOC has several automatic capabilities designed to enhance its survivability against electronic and direct attack. Capabilities include automatic activation of an EMCON plan and ID and threat ranking of antiradiation missiles (ARMs). EMCON capabilities allow the TAOC operator to enter protective measures into the TAOM database should an ARM threat be detected. When a track is identified as a probable ARM threat, the TAOM will automatically initiate the predetermined EP measures plan entered into the database. This plan may include radar blinking and blanking and activation of ARM decoys. The system's database also provides operators with the opportunity to designate operational parameters to assist in identifying possible ARMs. These tests are based on speed and time-to-go thresholds and the missile's heading angle (the angle between the missile's heading and a line from the missile's heading to a TAOC radar). Tracks meeting the designated criteria are classified as ARMs.

Air Defense Communications Platform

The AN/MSQ-124 air defense communications platform (ADCP) provides a single shelter to receive and transmit tactical data within the MACCS. The ADCP has a Joint Tactical Information Distribution System (JTIDS) terminal and interfaces with a Link-16 network. The Link-16-equipped ADCP receives tactical data and transmits it to short-range air defense units via the ground-based data link (GBDL). The ADCP also provides immediate translation of TBM data from the AN/TPS-59(V)3 radar via

a PPDL. The ADCP consists of radio and computer equipment housed in a lightweight multipurpose shelter mounted on an M1097 HMMWV [high mobility multipurpose wheeled vehicle]. The ADCP-Enhancement Package is a specially modified version that provides the interface to the Complementary Low Altitude Weapons System air defense missile launcher.

Radars

The TAOC's organic radars provide the air picture to efficiently control and manage air defense within its assigned sector. The TAOM can accept data from four radars and process data from as many as three radars at a time. However, each TAOC has a mix of two AN/TPS-59(V)3 and AN/TPS-63B radars.

AN/TPS-59(V)3 Radar Set

See figure 2-2, page 2-14.

- A solid state radar designed to provide long-range air surveillance.
- A three-dimensional (bearing, range, and target altitude), linear-phased array radar that operates in the D band (1215-1400 megahertz).
- Consists of two shelters and an antenna that is transported on three single-axle trailers. Specifications are shown in table 2-5, page 2-15. The radar control shelter has two-position display consoles that provide a plan position indicator display, range height indicator display or both displays simultaneously. The radar's 54 transmitters are arranged in 54 rows and operated independently of each other.
- Should be deadlined if it cannot detect or track air breathing targets (ABTs) or TBMs.

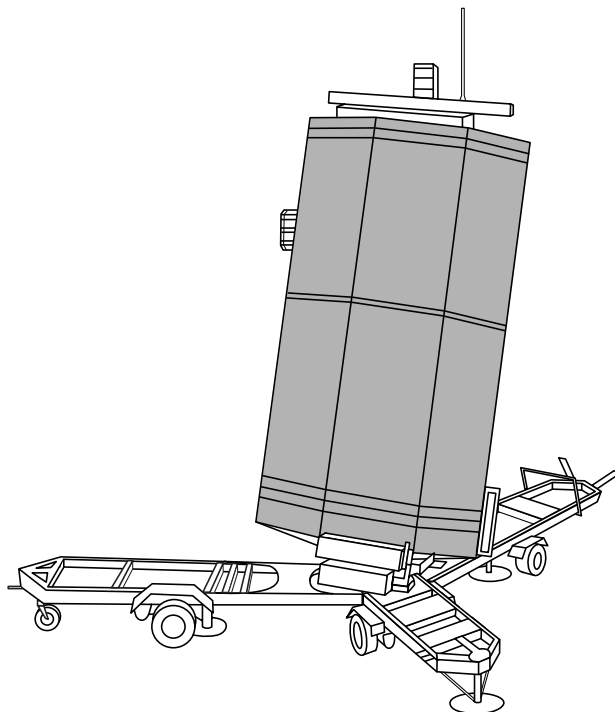


Figure 2-2. AN/TPS-59(V)3 Radar.

- Can also operate in the two-dimensional mode should its general-purpose computer fail.
- Includes four ARM decoy pallets.
- TMD enhancements improve its range and altitude detection capabilities to 400 nautical miles and 500,000 feet respectively against ballistic missile targets.

Table 2-5. AN/TPS-59(V)3 Radar Specifications.

AN/TPS-59(V)3 Radar	Length (in feet)	Width (in feet)	Height (in feet)	Square Feet	Cubic Feet	Weight in pounds (approximate)
2 radar control shelters (electronics/ transport shelter)	12	8	8	89	629	6,000
2 antenna trailer "B-Upper/ B-Lower"	22.5	8	8	180	1,395	9,000
1 antenna trailer "A"	18	8	7	147	978	9,000
System power requirements: 120 volts, 400 hertz, 50 kilowatts, 3-phase						

- Has been modified to provide increased ability to detect, track, and process TBM targets and distribute those targets to the ADCP and TAOM.
- Connected to a TAOM via a fiber optic cable for passing ABT information and TBM track information. For each TBM track, there are three TBM messages passed via Link-16:
 - ◆ The ballistic missile message contains vector and other descriptive data and covariance data.
 - ◆ The reference point message contains launch point and impact point data.
 - ◆ The data update request message contains multiple missile update capability and data selection capability.

AN/TPS-63B Radar Set

- Transportable, lightweight, and designed to provide short- to medium-range, two-dimensional (bearing and range) air surveillance information to the TAOC. See figure 2-3, page 2-16.

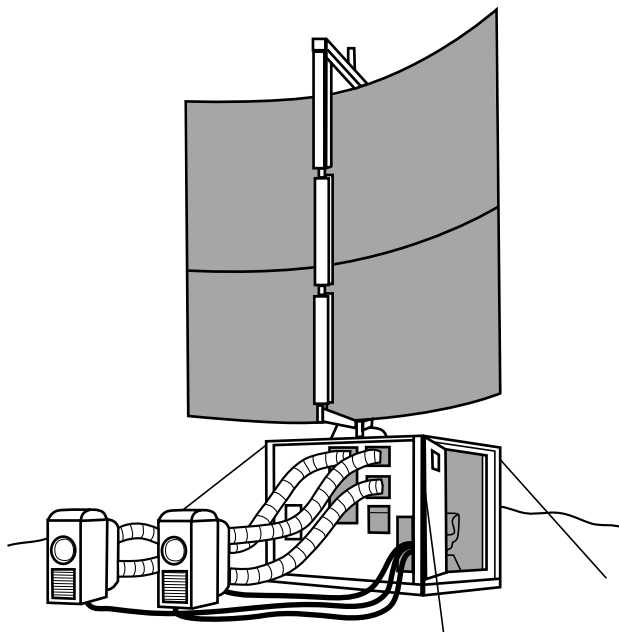


Figure 2-3. AN/TPS-63B Radar.

- A D band emitter (1250-1350 megahertz) and has a selectable search range of 80, 120 or 160 nautical miles up to 40,000 feet in altitude.
- Because of its single shelter design, the AN/TPS-63B is the TAOC's primary assault radar.
- Contains a single display console and can be employed in a stand-alone mode to provide early warning information.
- Should be deadlined if it cannot perform its basic mission to detect and track ABTs.

Table 2-6. AN/TPS-63B Shelter Specifications.

Length	10 feet
Width	8 feet
Height	8 feet
Square	80 square feet
Cube	640 cubic feet
Weight	7,800 pounds (approximately)
Power requirements	120/208 volts, 60 hertz, 30 kilowatts, 3-phase

Radar Height Finding Geometry

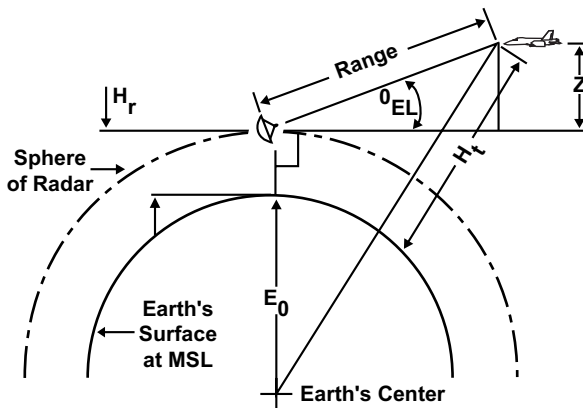
This formula determines altitude and range limitations of a radar system tracking a target in relation to the Earth's curvature. See figure 2-4, page 2-18.

Communications

The MACS table of equipment provides UHF, VHF, and HF communications capabilities in addition to those located internally to the TAOM. The TAOC is also supported through the MACS's wire, telephone, and switchboard assets.

MEP

The MACS provides its own 60 and 400 hertz MEP.



$$(E_0 + H_t)^2 = (E_0 + H_r)^2 + R^2 - 2(E_0 + H_r)R \cos(\theta_{EL} + 90^\circ)$$

E_0 = the earth's radius

H_t = the height of the target above mean sea level (MSL)

H_r = the elevation of the radar above MSL

R = the range (slant range) from radar to target

θ_{EL} = the radar's elevation angle (degrees)

Figure 2-4. Radar Height Finding Geometry.

System Redundancy

The TAOC can automatically reconfigure its system operations should one of the TAOMs become inoperative. This redundancy is accomplished through designation of primary and secondary main computer systems, redundant data and voice control buses, and passive electro-optical relays located at the radar ports.

Echelon Capability

The TAOC can move to alternate locations with uninterrupted operations. During such movements, the TAOC usually delegates increased responsibilities to its EW/C site to maintain agency connectivity and continue to provide medium-range surveillance and limited control of aircraft and missiles.

Electronic Signature

The TAOC has a large electronic signature generated by its air surveillance radars and voice and data communications equipment. Effective planning and employment of EMCON measures are paramount to maximizing survivability.

Low Altitude Air Surveillance

Because the TAOC employs ground-based radar systems, its radar coverage is susceptible to line of sight limitations. This occurs from curvature of the Earth and terrain features within the radar's search range and can preclude effective low-altitude coverage. Use of high ground for radar emplacement, airborne sensors, dispersion of sensors, incorporation of other radar units' air picture, and visual observation can minimize TAOC terrain-masking affects.

Theater Battle Management Core System

The theater battle management core system is a USAF-developed system designed to provide the automated tools to manage

tactical air operations, execute area air defense and airspace management in the area of operations (AO), and coordinate operations with other Military Service components. Specifically, its software provides the automated capability to generate, disseminate, and execute the ATO. The TAOC's terminal will be located in the SADF.

Composite Tracking Network

The AN/TPS-59(V)3 will be upgraded to incorporate the Composite Tracking Network. This network is similar to the Navy's cooperative engagement capability. It is designed to fuse data from multiple sensors to provide near-continual tracking and fire quality control data to air C2 and GBAD units. This capability will significantly enhance USMC capabilities to track ABT and TBM targets and engage them at maximum range.

Deadlining Criteria

AN/TYQ-23(V)4 TAOM

The TAOM will be deadlined if it cannot perform either of its two basic functions:

- Receive, process, correlate, display, and forward sensor and/or data link track information.
- Transmit, receive, and process voice communications information.

Failure of any component or secondary repairable in any redundant system that degrades the operational capability of a particular equipment group or unit by 50 percent or more is justification to deadline the TAOM. Equipment groups that fall into this category are—

- OCUs.
- Computer units (CUs).
- CU bus interface controllers.
- Communications interface unit (CIU).
- Digital data bus.
- Voice communications bus.
- Radar data bus.

A failure of any component or secondary repairable in any non-redundant system that renders a particular equipment group or unit completely inoperative is justification to deadline the TAOM. Equipment groups that fall into this category are—

- CIU unit bus interface controller.
- Radar interface unit.
- Power distribution control unit.
- Digital communications unit controller.
- Digital communications unit modem.
- Exchange assembly.

ADCP

The ADCP is deadline if it cannot perform its primary mission of transmitting TBM data over JTIDS and GBDL.

A failure of any component, secondary repairable or software that inhibits the ADCP's ability to transmit data over a JTIDS network or GBDL is justification to deadline the ADCP.

AN/TPS-59(V)3 RADAR

The radar will be deadlined if it cannot perform either of its two basic missions:

- Detect and track ABTs.
- Detect and track TBMs.

Failure of any component, secondary repairable or software that inhibits the radar's ability to do the following is justification to deadline the radar:

- Detect and track ABTs and/or TBMs.
- Detect, receive, process, and display IFF targets.
- Detect, receive, process, display, and accurately classify Mode 4 IFF targets.
- Forward radar, IFF or Mode 4 information via the TIG to the TAOM.
- Forward TBM information (via PPDL) to the ADCP.

The antenna array electronics must be maintained at a high level of performance for the radar to accurately detect and track targets. The level of performance required for TBMs is much greater than for ABTs. The deadline criteria for the array electronics will be based on the minimum required performance level for TBM detection. The radar is deadlined when six or more rows of electronics are down (faulty). A row is down if any of the following components fail:

- Row power supply.
- Row transmitter.
- Row receiver.
- Row feed.

- Any combination that yields a total of *6 rows down*. *Example:* 1 row power supply (rows 3 and 4) + 2 row transmitters (rows 51 and 54) + 2 row receivers (rows 11 and 20) yields a total of 6 rows down. Failed components can be moved so that only two rows are down. The bad transmitters in rows 51 and 54 and the bad receivers in rows 11 and 20 can be moved to rows 3 and 4 with the bad power supply. The radar officer in charge will make every effort to reduce the number of failed rows before deadlining the radar.

AN/TPS-63B RADAR

The radar is deadlined if—

- It cannot perform its basic mission to detect and track ABTs.
- Failure of any component or secondary repairable that inhibits the radar's ability to—
 - ◆ Detect and track ABTs.
 - ◆ Detect, receive, process, and display IFF targets.
 - ◆ Detect, receive, process, display, and accurately classify Mode 4 IFF targets.
- Failure of any component, secondary repairable or software that inhibits the radar's ability to forward radar, IFF, or Mode 4 information via the TIG to the TAOM.

CHAPTER 3

PLANNING

Planning responsibilities for providing air defense within the MAGTF AO and for the TAOC's employment are generally divided among the Marine TACC, the SADC staff, and TAOC crewmembers. Because these functions closely parallel one another, planning efforts are usually combined. Although the planning phases outlined below may occur in sequence, most steps will be conducted concurrently.

Initial Planning

After receiving the initiating directive from the MAGTF commander (in situations involving amphibious operations) or the operation plan's initiating order, the Marine TACC, and SADC and TAOC staffs begin initial planning. Planning—

- Establishes early liaison and initiates coordination efforts with amphibious force (AF) and joint force planners and coordination with adjacent and subordinate units for operational execution.
- Identifies communications requirements to subordinate, adjacent, and higher-level circuits with ACE/MAGTF communications planners. Requirements should include ID of desired connectivity, encryption hardware and software, and authentication materials.
- Coordinates all frequency requirements (voice, data, and radars) for subordinate, adjacent, and higher level circuits with the ACE/MAGTF communications planner.

- Provides input to the initial estimate of landing force (LF) aviation requirements. This initial estimate should include the number and type of aircraft available, control agencies, and logistic support. Some of the air defense allocations can be deduced from the aviation capabilities of the force involved, estimates of enemy air threat, and the general mission of the LF.
- Provides air defense missile and aircraft control specialist input to the aviation estimates of supportability for all assigned operations. Input should summarize significant aviation aspects of the situation as they might influence any course of action (COA) proposals and evaluate and determine how aviation units can best be employed to support the contemplated LF COAs. The ACE commander, his staff, and subordinate elements prepare the estimate. The end product of the aviation estimates of supportability will include recommending a COA to the ACE commander. At a minimum, aviation estimates of supportability will include—
 - ◆ Contemplated COAs that the ACE can best support.
 - ◆ Disadvantages of less desirable COAs.
 - ◆ Significant aviation (to include C2 and communications) limitations and problems of an operational or logistic nature.

Intelligence Planning

TAOC and SADC intelligence planning focuses on ascertaining enemy orders of battle and capabilities. Planning—

- Obtains preliminary aviation intelligence estimates and detailed aviation intelligence estimates.
- Develops priority intelligence requirements in the form of simple, concise requests, and forwards in three parts: positive requests, qualifying questions and statements, and prioritization of submitted requests.

- Determines the TAOC and SADC staffs' requirements for maps, charts, photographs, and other graphic aids.
- Obtains a complete enemy order of battle that includes information on the threat's missiles, aviation assets, electronic warfare (EW), naval, and ground force capabilities.
- Establishes intelligence collection and dissemination procedures to include timeliness, usability of form, pertinence, and security of gathered information.
- Prepares a detailed rear area assessment for the TAOC and any deployed sites within its sectors.

EW Planning

When the enemy has a known EW and electronic intelligence capability, the unit EW officer will assume an active role in EW planning. Planning—

- Requests a detailed assessment of the enemy's electronic order of battle to include communications and radar jamming capabilities and ARM capabilities and profiles.
- Considers the EW threat when determining TAOC radars locations to include employment of ARM decoy equipment.
- Provides input to the MAGTF C2 warfare plan.
- Maximizes employment of secure communications and data links in the control and coordination of weapons platforms.
- Ensures that planners, operators, and users of electronic equipment thoroughly understand the EW threat and the EMCON/EP techniques that counter that threat.

- Submits recommendations for EMCON and radiation control (RADCON) standards within the TAOC's assigned sector. EMCON and RADCON plans should incorporate all ground-based sensors operating within the sector and consider the ARM threat with due regard to maintaining effective sector surveillance. EMCON and RADCON planning includes—
 - ◆ Minimum communications procedures.
 - ◆ Use of brevity codes and authentication devices.
 - ◆ Use and security of communications security materials.
 - ◆ Delegation of EMCON authority.
 - ◆ Signal security.
 - ◆ Beadwindow calls (when it is believed that someone has committed a security breach over the net).
 - ◆ Gingerbread procedures (an intruder on the net).
 - ◆ Employment of directional antennas.
 - ◆ Circuit discipline.
 - ◆ Appropriate radio wattage.
 - ◆ Radar blinking and blanking.
 - ◆ Use of frequency diversity and frequency agile radios.
 - ◆ Physical dispersion and appropriate siting of communications emitters; e.g., radars, radios or navigation aids (NAVAIDs).

TAOC Site Selection

The site selection process begins once the TAOC's sector is addressed. Planners must ensure that adequate space for site establishment, access to the site, and radar coverage of the sector are maximized. Planning—

- Conducts surveys using maps, aerial photos, charts, and other graphic aids to identify candidate sites with established air defense priorities.

- Produces/obtains radar coverage diagrams from computer software aids such as the Falcon View program in the Portable Flight Planning System software, Electromagnetic Compatibility Analysis Center studies or manual computations.
- Determines optimum site locations for communications connectivity with higher, adjacent, and subordinate agencies using applicable computer programs, line of sight diagrams, and HF propagation predictions.
- Establishes a phased plan of equipment arrival at the site to expedite operational capabilities and communications.
- Selects an advanced party to conduct a physical reconnaissance, locate positions for equipment, and stake out specific equipment sites.
- Prepares site diagrams or models that depict equipment locations and are the basis for setup crew briefings.
- Ensures site plans consider maximum dispersal and remoting of equipment to reduce EW/infrared signatures.
- Designates alternate TAOC locations, which may be used if required.
- Plans for additional EW/C sites, which may be used at short notice and with minimal prior preparation to support various tactical situations.
- Submits a list of candidate sites to the ACE commander based on map surveys and other studies. Site considerations for the TAOC or EW/C should encompass all task-organized equipment and personnel in movement and physical requirements. Site characteristics to include are—
 - ◆ Ground that is level within ± 10 degrees.
 - ◆ Spatial requirements; e.g., antennas or radio frequency hazards. *Note: Ensure minimum of 300 feet separation when siting multiple sensors.*
 - ◆ Logistic supportability.
 - ◆ Camouflage and concealment.

- ◆ Traffic and access.
- ◆ Emergency destruction and/or movement.
- ◆ Drainage.
- ◆ Defendable.
- ◆ Radar coverage of the assigned airspace, sector or vital area.

The TAOC plays a crucial role in MAGTF air defense and AAW operations. Proper TAOC siting plays a major role in the TAOC's operational effectiveness.

The initial step in selecting a site for tactical C2 units equipped with TAOMs involves a detailed study of the area where the mission is to be accomplished. This study is needed to determine the most advantageous locations for radar and communications equipment to accomplish the unit's mission. The site must lend itself to rear area security.

Once all of the general site considerations have been examined, specific requirements for particular equipment configuration must be examined.

Minimum Area Requirements

The amount of area required for a TAOC is based on how many TAOMs are to be collocated. The horizontal plane (footprint) of a single TAOM is 8 feet by 20 feet. In addition to the physical dimensions of the shelter, horizontal and vertical accesses must be considered for cable access, ducting, cable runs, etc. A clearance of 4 feet is needed on each side of the shelter, 10 feet on each end. The minimum area for a single shelter is 16 feet by 40 feet.

In addition to the TAOM International Organization for Standardization shelter area, the pallet assembly's area requirements must be considered. The minimum area required to contain a TAOM

with its pallet assembly situated perpendicular to and the TAOM at the end opposite the TAOM's door is 16 feet by 47 feet.

If the TAOM is to be mobile-loaded during operation, additional area must be added to the area calculations to allow for prime mover maneuvering.

Antenna Area Requirements

The TAOM can be employed with ground or roof-mounted antennas. Since roof-mounted antennas do not increase the foot-print, they are not addressed here. As ground-mounted antennas must be placed within a finite distance from their associated TAOM, each antenna's specific area requirements must be closely considered. Specific area requirements for each of the TAOM's antennas in a ground-mounted configuration are—

- HF whip antenna. The space required to install the HF whip antenna with guidelines is 30 feet in diameter. The overall height of the antenna assembly is 27.2 feet.
- UHF antenna. The assembled UHF antenna's height is 22 feet, 6 inches. The recommended minimum installation area for the UHF antenna is 32 feet in diameter.
- VHF antenna. The overall height of the assembled antenna is 21 feet, 10 inches. The recommended minimum installation area for the VHF antenna is 32 feet in diameter.
- HF sloping dipole. The erected antenna assembly is 21 feet tall and occupies an area 260 feet in diameter.

Radar Area Requirements

Care must be taken when emplacing radars to ensure no physical masking degrades radar coverage. Specific space requirements for

the AN/TPS-63B are 30 by 30 feet to set-up. The AN/TPS-59(V)3 requires 100 by 200 feet to set-up.

Equipment Separation Requirements

Distance Between TAOMs and Ground-Mounted Antennas

Three factors determine the distance between a TAOM and its ground-mounted antennas: personnel safety, antenna isolation requirements, and hardware limitations. Each TAOM ground-mounted antenna's individual requirements are—

- HF whip antenna. Separation between two HF whip antennas should be a minimum of 400 feet. Because of these separation constraints, two HF antennas cannot be roof-mounted on the same shelter and used simultaneously. Special attention should be given to radiation patterns and reflective areas of the antennas.
- UHF antenna. Separation between two UHF antennas should be a minimum of 20 feet. Special attention should be given to radiation patterns and reflective areas of the antennas.
- VHF antenna. Separation between two VHF antennas should be a minimum of 40 feet. Special attention should also be given to the radiation patterns and reflective areas of the antenna.
- HF sloping dipole. If multiple HF sloping dipole antennas are to be collocated, the separation should be a minimum of 260 feet mast-to-mast. Special attention should also be given to the radiation patterns and reflective areas of the antennas.

Distance Between TAOMs and Radars

The distance between a TAOM and a radar is determined by the method of interface. The TAOM can interface with the radar set

by direct connection (fiber optic cable) or indirect connection (remote radio sets). If fiber optic cable is used, the maximum distance between the TAOM and radar set is limited to the length of the fiber optic cable. The length of a TAOM's radar interface fiber optic cable is 2,000 meters. Therefore, a directly coupled radar set must be within a 6,560-foot radius from the TAOM. Operators should allow for adequate cable slack to prevent cable connector stress, which could damage the connectors when planning the TAOM-to-radar separation distances. If the remote radar interface capability of the TAOM is used, the maximum distance between the TAOM and radar is limited to 24 nautical miles/40 kilometers (software limitation).

Distance Between TAOMs

The minimum distance recommended between collocated TAOMs is 8 feet. This distance allows access to shelter cable connection panels, environmental control ducting, and adequate roof-mounted antenna separation. Inter-TAOM bus fiber optic cables dictate the maximum distance allowed between TAOMs. The length of the inter-TAOM cables is 500 meters. Therefore, the actual separation allowed between TAOMs must be less than 500 meters. When planning TAOM separation, allow for adequate cable slack to prevent cable connector stress. Excessive stress on the connectors could cause damage.

Distance Between TAOM and Pallet Assembly

The pallet assembly must be located within 25 feet of its associated TAOM.

Distance Between TAOMs and Power Sources

The TAOM requires 120/208 volt, 3-phase, 50/60 hertz configured prime power. Power is obtained from tactical generators or commercial power systems. Site location for prime power generators is determined by the location of the equipment they supply.

Air Defense-Specific Planning

The TAOC will augment the air defense specialists from adjacent and supporting agencies (Patriot, low altitude air defense, Complementary Low Altitude Weapons System, and fighter aircrew) in preparing the MAGTF operation order (OPORD). Critical decisions, including air defense apportionment and planning to achieve air superiority, must be addressed and answered. Preliminary site selections for air defense agencies are also finalized. Planning—

- Recommends the ID of defended assets and vital areas.
- Establishes coordination for and preparation of the ACE surveillance plan. The ACE surveillance plan is the foundation for all subsequent air defense operations and should consider all available means (electronic or visual) to detect, identify, and track air vehicles in the MAGTF's AO. Overlapping and redundant surveillance coverage should be achieved where possible. A reliable, swift, and redundant communications plan should also be devised to ensure rapid dissemination of detections.
- Establishes and coordinates air defense communications requirements with ACE planners to ensure continuous AAW information flow.
- Determines the operational procedures to integrate airborne early warning (AEW) into the overall air defense system; e.g., orbit areas, cross tell procedures, data links or communications.

- Recommends air defense control measures including WEZs and return to force (RTF) procedures for inclusion in the MAGTF OPORD.
- Recommends employment options for air defense weapons platforms to the ACE (radar/nonradar fighters, and Stinger).
- Ascertains the availability of air-to-air missiles and surface-to-air missiles and development of specific requirements for a resupply plan.
- Coordinates with MAGTF, AF, and joint planners on establishing airspace management and control procedures.
- Plans for the tactical redeployment/alternate siting of AAW assets in response to changes in the surveillance plan, the threat or the ground force positions.
- Identifies the need for AEW platforms to supplement radar coverage.
- Recommends tanker routing and orbit locations and assists in developing AR requirements.
- Participates in preparing the air defense appendix to the OPORD based on an analysis of the enemy air order of battle and own systems' capabilities and limitations. The air defense appendix should include—
 - ◆ Centralized/decentralized operations procedures.
 - ◆ Autonomous operations procedures.
- Includes—
 - ◆ ROE.
 - ◆ Air defense warning conditions (ADWCs).
 - ◆ Air defense states of alert.
 - ◆ Air defense weapons control status (WCS).
 - ◆ Air defense ID procedures.
 - ◆ C2 agency casualty plans and procedures.
 - ◆ WEZ/fighter engagement zone (FEZ) configuration (missile engagement zone [MEZ]/FEZ layouts).
 - ◆ Methods of coordination/deconfliction.

- ◆ RTF procedures.
- ◆ EMCON measures.
- ◆ Track telling/cross tell procedures.
- ◆ Data link configuration, connectivity, and priority.
- ◆ Communications prioritization.
- ◆ Control procedures.
- ◆ Agency casualty plans.

Alt TACC Planning

Continuation of operations depends on established detailed agency plans. Although the TAOC is responsible for assuming the role of the Alt TACC should the TACC/TADC become a casualty, the SADC and his staff will usually assume this function. Special planning considerations will be warranted when the TACC is tasked with specific duties as regional air defense commander (RADC), regional interface control officer (RICO), component rescue coordination center, etc. Planning—

- Identifies those specific tasks the SADC and staff are capable of assuming. Obviously, the SADC staff will be unable to assume the future operations functions of the TACC. Likewise, the DASC may be better suited to assume certain TACC functions relative to offensive air support and assault support.
- Predetermines procedures to initiate assumption of the Alt TACC role should the TACC become a casualty.
- Establishes procedures and delineating functions to be performed by various MACCS agencies in the event of a TACC casualty.
- Determines additional communications nets required by the Alt TACC.

Joint and Multinational Planning

The MAGTF must ensure its operations are integrated and coordinated with joint and multinational forces. A MAGTF representative must be included during the planning of joint operations; e.g., development of a joint air operations plan, airspace control plan (ACP) or an area air defense plan. The MAGTF's AAW capabilities and requirements must be addressed during planning to ensure the joint force's support and accomplishment of the MAGTF's mission.

The ACE commander, his staff, and the MACCS, as the MAGTF's air operations and AAW experts, provide joint and multinational force planners with the MAGTF's AAW capabilities and requirements. They also identify MAGTF capabilities and requirements relative to airspace control and air defense operations. Planning—

- Integrates and complements the mission of the joint force.
- Ensures the interoperability of equipment and personnel.
- Ensures the common use and understanding of terminology.
- Allows responsiveness and the massing of firepower whenever and wherever needed.
- Identifies the proper liaison and staff/agency representation between joint force components. Representatives from each component must enable and improve the information flow and provide expertise.
- Outlines procedures for airspace control and air defense degradation.
- Facilitates transition from peacetime conditions to hostilities.

Air operations, airspace, and air defense planning are integrated with the joint force's planning cycle. Input from all components

must be consolidated and integrated into the joint air operations plan, the ACP, and the area air defense plan.

The airspace control order (ACO) is published and disseminated based on guidelines established in the ACP. The ACO may be issued as part of the joint ATO or as a separate document. The ACO normally covers 24 hours. The TACC generally prepares the MAGTF ACO, whether it is published as part of a joint ACO or separately. The TAOC provides input to the future operations section of the TACC on issues that should be considered for the next ACO.

CHAPTER 4

OPERATIONS

The TAOC task-organizes its capabilities to meet air defense and airspace management needs for any size MAGTF. Furthermore, it can support the MAGTF across the full spectrum operations including operational maneuver from the sea, sustained operations ashore, and other expeditionary operations.

Operational Principles

The enemy's air and missile threat to the MAGTF air defense system includes aircraft and TMs. In combating this threat, the employment of the MAGTF's air defense plan is based three key principles: destruction in-depth; mutual support; and centralized command and decentralized control.

Destruction in-depth is based on threat detection and destruction beginning as far away from the vital area as possible and continuing as long as the threat exists. The area required to ensure destruction in-depth is referred to as the destruction area.

Mutual support stresses that AAW weapons are employed and/or located in a manner that ensures continuity of engagement. Therefore, air defense units increase the probability of preventing the penetration of the AAW vital area by hostile aircraft and missiles.

Centralized command is required for coordinated operations (unity of effort) and economy of force. However, decentralized control is required to achieve a system that has minimum reaction time and maximum survivability.

Marine Expeditionary Force

One TAOC is employed to support air operations for a Marine expeditionary force (MEF). The TAOC can be task-organized to meet the MEF's specific air defense requirements. The TAOC may be organized and equipped to operate independently in support of various contingencies. Control of MEF AAW assets is coordinated with the TAOC under the cognizance of the TACC. In amphibious operations, an EW/C site can be established ashore initially and eventually built-up into a full TAOC. Each TAOC is established where it can best provide air surveillance, airspace management, and control of aircraft and missiles in its assigned sector.

Marine Expeditionary Brigade

An EW/C site supports a Marine expeditionary brigade. It consists of two TAOMs and either one or both AN/TPS-59(V)3 and AN/TPS-63B. In amphibious operations, the TAOC is established ashore.

Marine Expeditionary Unit

The reduced level of air activity normally associated with a Marine expeditionary unit normally does not require TAOC services. Air control and airspace management functions are typically performed by US Navy air C2 agencies. However, TAOC

personnel can be deployed with a Marine expeditionary unit to assist in airspace management planning and execution functions.

The MAGTF commander uses Marine aviation to assist MAGTF efforts in support of the commander, amphibious task force (CATF), the naval expeditionary force commander, the joint task force commander or the joint force commander (JFC) in preparing and defending the battlespace. In its most common employments, the TAOC will operate in support of amphibious or joint force operations. Through its support of these operations, the TAOC will manage the MAGTF's Integrated Air Defense System (IADS).

Employment Options

The MACS's TAOC detachment will task-organize a system to meet the required capabilities needed to support its designated mission. Task organization may be as small as a single gap filler radar detachment or as large as the entire TAOC. Employment option examples follow.

TAOC Site Configuration

See figure 4-1, page 4-4. As the MAGTF's AAW and surveillance/data link facility, this configuration provides the operational capability to perform all air C2 tasks associated with the TAOC. The TAOC site is normally employed for operations requiring high levels of AAW, surveillance/ID, and airspace management support.

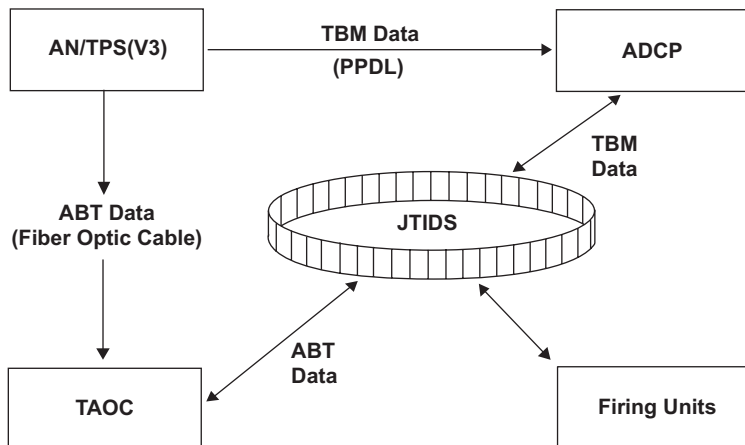


Figure 4-1. TAOC Site Configuration.

EW/C Site Configuration

See figure 4-2. An operational site that can perform most TAOC tasks, the EW/C site is primarily designed to perform air surveillance and aircraft and missile control. It is not configured to perform the senior supervisory and coordination functions provided by a TAOC site. It is employed—

- For operations requiring medium intensity levels of airspace management and/or air defense control.
- As a subordinate agency to a TAOC during high-level AAW and airspace management control operations.

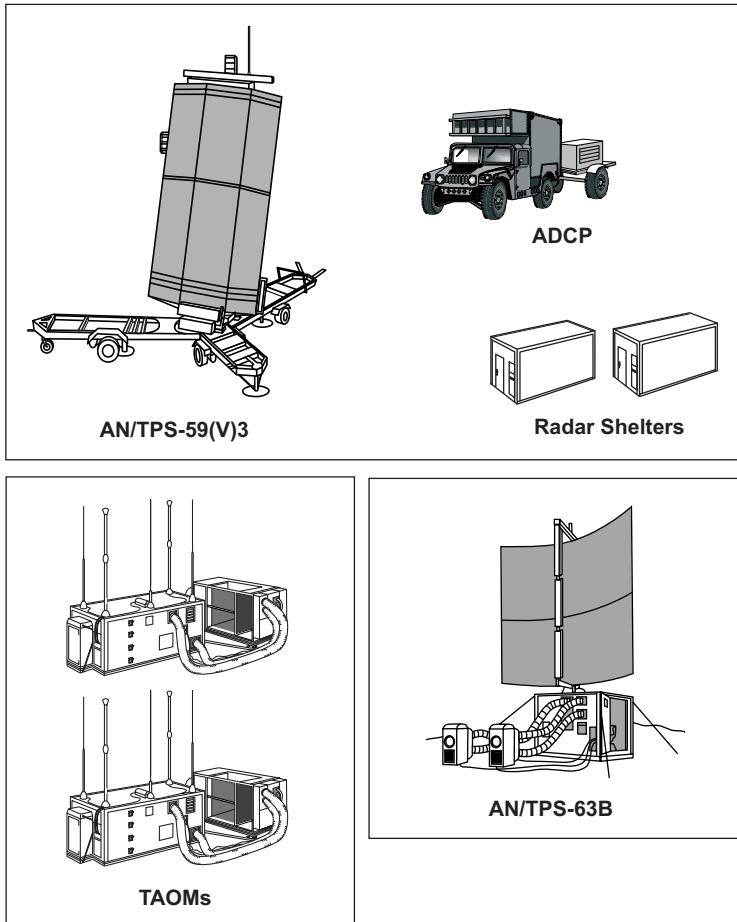


Figure 4-2. EW/C Site Configuration.

An EW/C site consists of one or two TAOMs and either one or both AN/TPS-59(V)3 and AN/TPS-63B radars. It will be forward-deployed to augment surveillance coverage of the TAOC's assigned sector and/or to act as an echelon platform for subsequent TAOC operations. The EW/C's primary responsibility is surveillance, but it may also be assigned limited CAP or GBAD control functions. Either radar may be deployed with the EW/C site to augment the TAOC's surveillance coverage. This site may digitally link its radar picture to the TAOC over single or multi-channel means.

Early Warning Radar Site Configuration

An operational site that can perform a minimum of TAOC tasks, the early warning radar site is usually limited to providing air surveillance information. It consists of one radar and support equipment (no TAOM). It is employed for operations that require low levels of airspace management and minimal air defense control or as a subordinate agency to a TAOC or EW/C in higher intensity operations. The site is used mainly to provide surveillance cueing, early warning, and/or to fill surveillance gaps. When the radar picture is electronically transferred to a TAOC or EW/C, the site is often referred to as a remote radar site. Because the early warning site does not include a TAOM, it does not provide a data link picture to other air C2 agencies.

Either radar may be deployed as an early warning radar site to augment the TAOC's surveillance coverage. This site may digitally link its radar picture to the TAOC over a single or multi-channel remote radar link (often referred to as a remote radar site in this configuration).

Alt TACC Site

The TAOC can perform many of the TACC's current operations section's (COS's) functions for 24 hours or less. With the fielding of CAC2S, common software and hardware should allow MACCS agencies to better serve as alternate sites in the event of degradation of the primary sites.

TAOC Interagency Relations

TACC

The TAOC is subordinate to the TACC and provides decentralized control functions for air defense and airspace management for the ACE commander. In high-threat scenarios, the RADC, who may be the ACE commander, may delegate authority to the SADC to divert/launch on-call air defense aircraft to meet the threat. The SADC may, in turn, delegate this authority to watchstanders within the TAOC. This serves to minimize the response time to react to the threat. The TAOC keeps the TACC informed of the current status of air defense and other AAW missions within its assigned sector, the status of AR aircraft, status of GBAD units, and portraying a timely air situation picture. In turn, the TACC provides the TAOC with the status of aircraft scheduled to support air defense missions.

SADC (or RADC)

The SADC is the MAGTF's air defense battle manager. The SADC is responsible to the RADC for the conduct of AAW

within the MAGTF's AO. The TAOC is the SADC's principal agent for implementing his near term air defense plan. The TAOC provides the SADC with the current status of air defense and AR missions, status of GBAD units, the current threat situation, and other pertinent data for the SADC to effectively manage MAGTF and attached air defense assets. The SADC provides the TAOC with information on his intentions and management of air defense assets.

Assuming the MAGTF is designated a RADC/SADC within the MAGTF AO, the TACC as the RADC and the SADF/TAOC as the SADC, will normally split the execution and planning tasks as follows.

TACC

- Publish and disseminate daily intentions message.
- Plan tactics to cover threat.
- Coordinate training.
- Coordinate joint/allied sea/land theater air and missile defense.
- Accept tactical control (TACON) of regional air defense forces.
- Respond to intelligence cueing.
- Direct weapon system firing policy.
- Direct/coordinate air defense attack operations.
- Direct/coordinate passive air defense operations.
- Coordinate with higher air defense units (area air defense commander [AADC]).
- Integrate air defense efforts with other airspace coordinating measures.
- ACE common tactical picture manager.
- RICO.
- Designate the executive agent
- Disseminate ROE.
- Coordinate AEW integration.

SADF/TAOC

- Develop surveillance plan.
- Monitor/coordinate engagements.
- Direct/redirect engagements as required.
- Evaluate threat.
- Respond to intelligence cueing.
- Coordinate RADCON.
- Direct/coordinate active air defense operations.
- Coordinate with other air defense units.
- Coordinate with adjacent non-air defense units.
- Set ADWC, WCS, state of alert, and status of equipment.
- Provide summary of air defense activity for ACE/MAGTF operational summary.
- Disseminate ROE.
- Regional track data coordinator (TDC).
- ID authority if applicable.

DASC

The DASC disseminates air defense control measures received from the TAOC to applicable MAGTF elements, Stinger units, and aircraft under the DASC's control. The DASC provides friendly aircraft information to the TAOC to assist in the aircraft ID process. The DASC also coordinates the RTF of aircraft under its control with the TAOC.

MATCD

The TAOC and MATCD coordinate aircraft departure and RTF information to assist in the aircraft ID and recovery process. The

TAOC advises the MATCD on the current air threat situation and provides air warning data for the MATCD activation and control of the base defense zone. The MATCD disseminates air defense control measures received from the TAOC to applicable MAGTF elements and aircraft under the MATCD's control.

Amphibious Operations

Amphibious operations combine ships, aircraft, weapons, and LFs into a united military effort against a hostile or potentially hostile shore. During the assault phase, air defense capabilities must be established and built-up ashore. Capabilities include low altitude air defense, aircraft, surveillance assets, and air C2 agencies. After MAGTF LF assets and units are established ashore, the CATF may transfer control of specified operations to the commander, landing force (CLF). As the MACCS becomes functional, the CATF may transfer control of all or various portions of amphibious objective area air operations to the CLF.

Initial Air Defense Capability Ashore

Initially, AF aircraft operating from supporting aircraft carriers provide airborne air defense ashore. Stinger teams, initially in direct support of the ground combat element, represent the first dedicated, operational shore-based air defense capability responsible for low altitude threats.

Air Defense Build-up Ashore

As the LF's follow-on ACE, ground combat element, and combat service support element resources build-up ashore, additional air defense assets also phase ashore. During the build-up

of MAGTF air defense ashore, Marine wing communications squadron detachments, Marine wing support squadron detachments, and MATCDs establish and operate forward operating bases. Forward operating bases allow MAGTF aircraft (including AAW-capable platforms) to establish forward bases ashore.

Early introduction of EW/C radar/control elements ashore extends shipboard weapons employment, radar surveillance, ID, and coordination/control capabilities. The EW/C site provides engagement and early warning, cueing, and surveillance capabilities against the enemy air and missile threat, including TBMs. General support Stinger platoon commanders/section leaders may collocate with the EW/C to exchange surveillance/ID information with the EW/C, landward SADC (Navy or Marine), and air warfare commander. The ACE commander, normally through the TAOC, via the SADC activates MEZs and FEZs. The TAOC must coordinate flight paths to prevent LF aircraft from penetrating a MEZ unless absolutely necessary. Typically, activating a MEZ changes RTF/ROE procedures used during the initial assault phase. All control agencies, controllers, and aircrews must adhere to the new RTF/ROE procedures. As additional general support Stinger assets move ashore, the remainder of the TAOC's equipment and personnel also phase ashore. Liaison is established with the landward sector SADC to coordinate MAGTF AAW operations. Once the TAOC and other GBAD assets are operational, they establish and maintain the required voice and digital information links with the landward sector SADC.

Transfer of Control Ashore

The CLF establishes air control facilities ashore as soon as possible. These facilities provide increased surveillance and quicker response and extend the AF's weapons control capabilities. Initially, air control agencies ashore operate as an adjunct

to agencies afloat. The TAOC and/or EW/C agencies ashore assist as needed and monitor air control aspects, including communications circuits, directly related to their tasking. The CATF decides when to pass authority from agencies afloat to ashore. Control agencies afloat continue to monitor communications and serve as a backup to shore-based air C2 agencies in case shore-based units become casualties.

Surveillance

Before transferring control of air operations to the MACCS units ashore, the ACE commander must establish an integrated and comprehensive surveillance plan for the MAGTF. Surveillance resources are employed ashore based on their capability and coverage. Therefore, the ACE commander, staff, and subordinate commanders must thoroughly analyze the surveillance requirements for the MAGTF's assigned sector addressing issues that include—

- Terrain and its masking effects.
- Threat axis of attack.
- Available surveillance resources.
- TAOC and EW/C locations.
- Ability of MATCDs to augment the surveillance system.
- Stinger sections/teams locations (in general support/direct support).
- FEZ orientation.

ACE planners must also identify any other specific requirements for aircraft surveillance capabilities; e.g., AWACS or AEW to the ACE commander. Once the surveillance system is established, the TAOC's surveillance section coordinates input from the TAOC's sensors and all other surveillance sources. Through

this compilation of air track information, the TAOC can identify detected air tracks and build a comprehensive air picture.

Control

As MACCS agencies are established ashore and become operational, TACON of various portions of the air operation may be transferred ashore. WEZs are established and GBAD units are assigned specific MEZs. As the MAGTF's IADS of interlocking engagement zones is established, changes to RTF/ROE procedures may occur. Once the TAOC is ashore and operational, TACON of landward sector air defense (including TMD) may be phased ashore to the LF SADC. Once all MAGTF resources are operational, successful execution of the MAGTF air defense plan addresses asset apportionment/allocation, coordination, C2, and management.

Post-Assault Operations

Once the amphibious assault operation ends and the AF dissolves, the CLF begins post-assault operations. AAW operations conducted during the post-assault are similar to those performed during the assault. MAGTF aviation continues to support the LF and can also coordinate with other Service air components.

Communications Nets

The MACCS's AAW assets (including aircraft) are communications-dependent. An extensive communications network is required to handle the volume and time sensitive nature of the information involved in aviation operations.

AAW's communications with the AF is through the AF AAW control and reporting nets. The Navy TACC and Marine TACC, TADC, and TAOC are included on these nets. The TAOC will use—

- Fighter air direction nets for CAP control.
- Tactical ATC nets to control all other aircraft.
- Antiair intelligence and antiair control nets for GBAD control.
- Various command nets for coordination with the MACCS to include the tactical air command net, air operations control, and handover/cross tell communications nets.

Marine aviation communicates with the other Services through the MACCS. The MACCS provides voice and data connectivity between Marine aviation and joint services. The MACCS operates on all joint doctrinal communications nets and TDLs. The TAOC operates on the air defense command and control net, track supervision net, data link coordination nets, voice product nets, and is a PU in the data link architecture (Link-11, -11B, and -16).

Joint and Multinational Operations

The MAGTF may operate as part of a joint or multinational force. If supporting joint or multinational operations, the MAGTF is assigned an AO by the JFC. The JFC should assign airspace control and air defense sectors that coincide with the MAGTF's air defense and airspace control assets and capabilities. Sectors normally include the MAGTF's zone of action and assigned objectives. The joint force's surveillance and AAW operations are conducted under the guidance of and in accordance with JFC objectives. The JFC may designate an AADC to coordinate and integrate the joint force's entire air defense

efforts and an airspace control authority (ACA) responsible for the overall operation of the airspace control system. The MAGTF should be assigned as RADC/SADC within the MAGTF AO. It is likely there will be attached air defense forces from other Services, allies or coalition partners assigned TACON to the MAGTF within or adjacent to the AO.

Surveillance/Data Link Interoperability

As the primary surveillance agency in the MACCS, the TAOC will integrate its effort with the other Service/country's air C2 agencies in joint or multinational operations. The TAOM facilitates the TAOC's interoperability with the joint force air C2 agencies through employment of various TDLs. TAOC interface coordination responsibilities will be delineated in the operational tasking data links (OPTASKLINKs). The TAOC surveillance section manages the surveillance/data link operations of the TAOC under the direction of the TACC interface coordination officer (ICO)/RICO.

AAW

The TAOC will perform its AAW mission under the direction of the SADC, who will coordinate MAGTF air defense operations with the RADC/AADC. The TAOC weapons section may be controlling Marine and joint/multinational interceptors and GBAD assets. The TAOC's air defense responsibilities will be outlined in the tactical operational data message and/or RADC daily intentions message.

Airspace Control

The TAOC will serve as the primary airspace control agency of the MAGTF and will coordinate its efforts under the ACA. The

TAOC's airspace responsibilities are also delineated in the tactical operational data.

Joint Theater Missile Defense Operations

Traditionally, AAW, including offensive AAW and air defense, focuses on attacking enemy aircraft before and after launch, airfields, air defense systems, and radars. Since evolving technology has expanded the threat to include TMs (TBMs and CMs), the role of AAW and the MAGTF IADS must also expand. The Marine Corps conducts TMD as a subset of AAW. MAGTF TMD operations fall under MAGTF AAW operations in naval expeditionary, amphibious, and joint operations. Joint theater missile defense (JTMD) is the integration of joint force capabilities to destroy enemy TBMs and CMs before or after they launch. JTMD also includes disruption of enemy TM operations through mutually supporting passive defense, active defense, attack operations, C2, and communications system support measures.

Passive Defense Measures

Passive defense measures reduce the vulnerability and minimize the effects of damage caused by enemy attack. They include TM early warning; nuclear, biological, and chemical (NBC) protection; and countersurveillance. Passive defense also includes such measures as deception, camouflage and concealment, hardening, EW, mobility, dispersal, redundancy, recovery, and reconstitution. Passive defense is the responsibility of unit commanders at all echelons. Within the MAGTF AO, passive defense operations within the RADC/SADC realm of authority will normally be coordinated within the TACC.

Active Defense Operations

Active defense operations protect against a TM attack by destroying TM airborne launch platforms and/or destroying TMs in flight. Operations include multitiered defense-in-depth against enemy TMs through multiple engagements. Air, land, sea, space, and special operations assets conduct multiple engagements. Active defense operations also include active EW that disrupts the enemy's remote or on board guidance systems. The JFC normally assigns overall responsibility for JTMD active defense operations to the AADC. Active defense forces are under the operational control of their component commanders. MAGTF active defense operations will normally be directed by the SADC/TAOC.

Attack Operations

Attack operations destroy, disrupt or neutralize TM launch platforms and communications. Attack operations also destroy, disrupt or neutralize TM logistics structures and reconnaissance, surveillance, and target acquisition platforms. TMD attack operations also include offensive actions taken by air, land, sea, space, and special operations forces. The JFC normally tasks component commanders to conduct JTMD attack operations within their assigned AOs. The TACC will normally coordinate attack operations with the MAGTF combat operations center.

Communications System Support

Communications system support for JTMD operations must use existing joint and Service communication systems and resources. TMD communications support is an integrated system of doctrine, procedures, organizational structures, facilities, and supporting intelligence. TMD communications support includes missile warning

and cueing of defense systems by missile warning sensors and ground stations. Communications system support provides command authorities at all levels with timely and accurate data and systems to plan, direct, and control TMD operations.

Doctrinal and Operational Parallel

JTMD—

- Operations parallel and fit within the existing doctrinal framework of AAW.
- Active defense operations fall under active air defense.
- Passive defense measures fall under passive air defense measures.
- Attack operations fall under offensive AAW.
- Communications system support uses existing joint and Service communication systems and resources. The MACCS provides C2 for MAGTF AAW and TMD operations.

TMD

The AN/TPS-59(V)3 detects and tracks TBMs. Cueing information is sent to the TAOM and sent to the ADCP for transmission over Link-16.

Alt TACC Operating Procedures

Assumption of the Alt TACC role is contingent on certain circumstances and events. The SADF and/or TAOC may be required to assume the Alt TACC role when the Marine TACC cannot perform all or part of its mission. Activating

the Alt TACC usually occurs as a result of one of the following conditions:

- TACC as an operational casualty. The TACC's declaration as an operational casualty is the most severe situation where the SADF and TAOC would assume the Alt TACC role. The unexpected loss of functions may occur when the TACC sustains significant equipment loss or damage or personnel casualties.
- TACC movement/echelon. When the TACC would not maintain an austere manual capability during its movement and subsequent build-up to full operational capability, the SADF and/or TAOC may function as the Alt TACC.

The Alt TACC—

- Provides limited TACC operational functions for command continuity when the TACC becomes a casualty for a limited or specified period of time.
- Is designed to assume only those functions associated with the TACC's COS. The Alt TACC is responsible for coordinating and supervising the execution of the current day's ATO. Alt TACC functions do not include promulgation and distribution of ATOs.
- Is designed to function for only a limited or specified period. Alt TACC operational periods should be measured in terms of hours rather than days; i.e., through the end of the crew watch or to the completion of the current ATO. The SADF and TAOC are limited by personnel and equipment to support sustained Alt TACC operations. TACC functions are returned to the TACC once it can perform its functions manually.

TACC as an Operational Casualty

The first step in the TAOC assuming the role of Alt TACC is the TACC being declared an operational casualty. Confirmation may be received from higher headquarters or from adjacent agencies. When MACCS agencies have lost communication with the TACC for a preplanned, specified period, the SADF and TAOC will initiate procedures to assume the Alt TACC role. Before assuming the Alt TACC role, the TAOC—

- Attempts to contact the TACC on all required nets to include secondary paths and circuits.
- Contacts other MACCS agencies in direct communication with the TACC; i.e., the DASC and MATCDs and request they attempt to contact the TACC on applicable communications circuits.
- Requests the TAOC's system control and technical control facilities contact the Marine aircraft wing system control to confirm or deny that the TACC is a casualty.
- Directs an airborne aircraft to attempt contact with the TACC on UHF/VHF circuits, which the TACC is required to monitor.

If the above actions do not result in contact with the TACC by any agency, the TAOC will assume the Alt TACC role.

Notification by the TACC Prior to Loss of Functions

When the TACC is planning movement to a new/alternate location, the TACC may coordinate with the SADF/TAOC to designate when the Alt TACC will be activated. This situation allows for a coordinated phasing of Alt TACC functions to the SADF and TAOC, thus facilitating the assumption of TACC operational functions.

Alt TACC Functions

Upon assumption of the Alt TACC role, the SADF and TAOC will assume certain functions associated with the TACC COS. They include—

- Coordinating USMC air defense efforts with joint and multinational Service agencies.
- Integrating MACCS data link participants with joint and multinational Services.
- Acting as the operational point of contact for execution of the daily ATO.
- Coordinating with Marine aircraft groups (MAGs) to ensure adequate aviation resources are available to execute the ATO and to determine the availability of additional aircraft sorties to meet immediate aviation requirements.
- Managing MAGTF aviation resources to include strip launch and divert authority to meet immediate aviation requirements.
- Establishing EMCON postures for the MACCS commensurate to the radio-electronic threat.
- Processing and coordinating search and rescue (SAR) and tactical and related applications program efforts within the assigned AO.
- Realigning/retasking aircraft to meet changes in the air and ground threat or the MAGTF commander's focus of effort.
- Maintaining current friendly and enemy ground and air situation information to include the ground, air, and missile orders of battle.

Situation Displays

The Alt TACC will normally be located within the SADF. Situation displays provide the Alt TACC staff with a means to

monitor the current and projected air and ground situation. A typical Alt TACC will include the following displays:

- The air defense situation display provides information on the current status of airborne and GBAD assets.
- The ATO display graphically tracks the current ATO. Generally, all mission types on the ATO will be displayed within the Alt TACC.
- The communications display normally includes a list and location of communications nets within the Alt TACC and various unit call signs.
- The status display provides information on the operational status of various MACCS agencies.
- The cross tell display graphically depicts the current air situation. The cross tell board may augment or be used in lieu of an automated (data link) presentation in the Alt TACC.
- Intelligence displays are maintained by the squadron's intelligence Marines and will depict the enemy ground order of battle, air order of battle, and missile order of battle. Intelligence Marines will also provide maps and status information on the friendly ground situation and scheme of maneuver, air assets by location, and missile locations for surface-to-air missile units.

Communications Nets

Upon assumption of the Alt TACC role, certain communications nets not normally guarded by the SADF/TAOC must be activated. An exact delineation of nets the Alt TACC needs to guard is exercise/operation-specific. However, certain nets are generic to any situation.

Tactical Air Request/Helicopter Request

These nets provide a means for forward ground combat elements to request immediate air support. Intermediate ground combat echelons monitor the net and may approve, disapprove or modify the request. After the request has been filled, the DASC uses the net to brief the requesting agency on the details of the mission. Damage assessments are also passed. Other net participants include terminal controllers and the force fires coordination center/fire support coordination center. The tactical air request (TAR) net may be designated for use in the HF or VHF spectrum.

Tactical Air Direction

The tactical air direction (TAD) net provides a means for the direction of aircraft in the conduct of offensive air support missions and for the DASC to brief support aircraft on target information or assignment. Normally a VHF or UHF net, TAD nets are also monitored by terminal air controllers; e.g., forward air controller (airborne); tactical air coordinator (airborne); and tactical air control party.

Direct Air Support

The direct air support net provides a means for the DASC to request direct air support aircraft from the TACC. It may also be used to report/request aircraft stationing, fuel and ordnance states, and the progress of ongoing direct air support missions. HF is the normal medium used.

Airboss Connectivity

Communication between the Alt TACC and the airboss is essential to provide the airboss with information on ATO changes and to determine aircraft status or availability from the MAGs.

Digital Communications

Responsibilities on data link management or participation requirements should be outlined in the applicable OPTASKLINK. Data link networks may require reconfiguration following a TACC casualty.

Manning and Responsibilities

Upon notification that the TAOC will assume the Alt TACC role, SADF and TAOC crewmembers will take on additional responsibilities associated with the Alt TACC function.

SADC

- Assumes the duties as the ACE senior watch officer (SWO) until such time that another SWO is designated or until the TACC is prepared to reassume its duties.
- Coordinates and executes all aviation tasks occurring within the MAGTF's AO.
- Is also responsible for overall coordination of the Alt TACC crew.

SADC Watch Officer

- Assumes the responsibilities normally associated with the TACC's air defense coordinator and tactical air watch officer.
- Plans and allocates air defense aircraft to air defense control units within the MAGTF's AO. He recommends changes to the SWO (SADC) regarding RADCON, air defense, and weapons release conditions.
- Coordinates directly with the airboss to determine the current status and/or availability of fixed-wing (FW) assets to meet the current ATO's requirements or changes in the threat situation.

GBAD Representative

The GBAD representative assists the SADC/RADC watch officer in the execution of his tasks.

SADC Plotters

Plotters continue to track the FW ATO and maintain the cross tell board.

SADC Intelligence Officer

The SADC intelligence officer assumes the responsibility of coordinating intelligence dissemination within the MACCS.

SAD

The senior air director (SAD) coordinates TAOC crew functions and provides additional Marines to man the Alt TACC. The SAD will also coordinate directly with and advise the SADC on the current status of all air activity within the MAGTF's AO.

SWD

The SWD coordinates with and advises the SADC watch officer on all matters pertaining to the threat's air activities. In the absence of a SADC watch officer, the SWD assumes those functions of the TACC air defense coordinator.

STD

The STD will continue to monitor the DASC handover net and will establish communications for rotary-wing (RW) check-ins. The traffic section, with the SADC watch officer, coordinates

directly with the DASC to maintain timely information on the status of CAS and assault support missions.

The traffic section guards the direct air support and TAD nets. The direct air support net is normally the key coordination net between the TACC and the DASC. TAD nets monitor the status of FW aircraft assigned CAS missions and provide aircraft with briefs prior to conducting their CAS missions.

When additional radio net operators are not available, the traffic section will assume responsibility for monitoring the TAR net and maintaining the current status of ongoing and pending TARs.

SID

The SID assumes those functions normally associated with the TACC's ICO and TDC. Assignments for primary and secondary responsibilities for these tasks are normally outlined in the OPTASKLINK. Functions may include—

- Assignment/designation of primary surveillance areas for MRUs.
- Designation/maintenance of track production areas.
- Assumption of TDC functions.
- Reconfiguration of digital data links to ensure a comprehensive air picture is maintained.
- Coordination with data link participants external to the MACCS.

Other data link machine functions may need to be assumed to include acting as the Link-11 NCS or gridlock reference unit. The SID will also coordinate manual cross tell responsibilities for surveillance agencies within the MAGTF AO.

Additional Net Operators

Additional net operators are required to monitor the TAD, direct air support, and TAR/helicopter request nets. If a sufficient number of Marines is not available in the current TAOC crew manning, additional operators need to be called in to augment the additional radio monitoring requirements.

RW Functions

Tasks associated with monitoring and coordinating the RW ATO's execution will normally be delegated to the DASC. The DASC, in turn, will report the current status and projected shortfalls of assault support functions to the Alt TACC. If not already authorized, the DASC will be delegated strip launch authority for assault support missions and divert authority for immediate medical evacuation missions. Functions of the TACC's RW tasker, which include direct coordination with the RW MAGs, will also be delegated to the DASC.

Augmentation

When the Alt TACC is expected to function for an extended period of time or when adequate coordination can be accomplished prior to the TAOC assuming Alt TACC functions, communications and personnel augmentation may be required.

Communications

Additional communications equipment and operators is situation-dependent. Projected requirements for long-haul and

multichannel communications assets should be considered during the planning cycle. Depending on the TAOC's requirements for air-to-ground communications, additional UHF assets may also be required to perform Alt TACC functions.

Personnel

The TAOC is not organized to perform Alt TACC functions for an extended period. Therefore, if the TAOC is expected to assume Alt TACC functions for longer than normally expected, i.e., beyond the end of the crew watch or ATO day, the TAOC will require augment personnel from other units. When requesting augments, the TAOC should specify that sufficient personnel should be provided to man two 12-hour crews. Augments would include—

- SWO—one per crew.
- Intelligence representatives—two per crew.
- FW tasker—one per crew.
- RW tasker—one per crew.
- Close battle coordinator—one per crew.
- Plotters—two per crew.
- Radio net operators—two per crew.

Unit Tasks

Squadron Administrative Officer

The squadron administrative officer assists the operations officer in preparing any messages requiring release if Alt TACC responsibilities are assumed.

Squadron Intelligence Officer

- Maintains current information on friendly and threat ground, air, and missile orders of battle and ensure this information is posted in the SADP.
- Coordinates with the TACC on intelligence matters impacting on future friendly ground operations.
- Is prepared to act as the intelligence dissemination point for the MACCS if the TACC becomes a casualty. Should the TACC become a casualty, specific preparations should be in place to receive the required MACCS intelligence support as air combat intelligence, a component of the TACC, was likely providing this support.

MACS Operations Officer/TAOC Detachment Commander

- Coordinates with the TACC on probable actions to be taken if the TACC becomes an operational casualty.
- Ensures the SADP is functionally designed and prepared to meet Alt TACC requirements.
- Determines and requests Alt TACC personnel augmentation if the TAOC is to assume Alt TACC functions for an extended period.
- Coordinates with the communications-electronics officer to ensure required Alt TACC nets are designated in the radio guard chart or Annex K to the operation plan/OPORD.
- Ensures Alt TACC procedures are included as an integral portion of each TAOC crew brief.

Services/Supply Officer

The services/supply officer will coordinate with the operations officer/TAOC detachment commander.

Communications-Electronics Officer

- Coordinates with the operations officer to ascertain and designate additional operational net requirements should the TAOC be required to assume the Alt TACC role.
- Determines additional communications augmentation required for assumption of Alt TACC responsibilities.
- Ensures alternate voice and data communications paths designated in Annex K are sufficient to meet MACCS requirements should the TAOC assume the Alt TACC role.
- Plans for and is prepared to activate required communications to airbases and joint and multinational Service agencies.

APPENDIX A

OPERATIONS BRIEF FORMAT

The operations brief—

- Should be developed based on planning conducted at the MACCS (MACG) planning staff level.
- Incorporates specifics from the MACCS commander's brief, however, must be appropriately tailored for the TAOC.
- Should incorporate specific issues to the MACS, beyond the scope of the commander's brief, which are required for effective TAOC employment.
- Is designed to provide the TAOC detachment commander with a standardized, comprehensive, and concise format to brief critical TAOC crewmembers and the SADC for an operation or exercise. The briefing format will then allow TAOC crews to develop and present their crew briefs prior to execution.
- Format is not designed to script every possible item that could be included in a TAOC crew brief, nor do all the items listed need to be included.

General Situation

Enemy Forces

- Ground forces disposition:
 - ◆ Enemy troop locations.
 - ◆ Forward edge of the battle area.
 - ◆ Projected movements.
- Locations of known/suspected airbases.

- Location, number, type, and variant of aircraft:
 - ◆ FW.
 - ◆ RW.
 - ◆ Unmanned aerial vehicles.
- Possible loadouts/ordnance/delivery techniques:
 - ◆ Air-to-surface missiles (ARM/general/theater).
 - ◆ Precision guided munitions (forward-looking infrared radar/television/laser/command).
 - ◆ Iron bombs.
 - ◆ NBC capabilities.
 - ◆ Infrared countermeasures capabilities.
- Enemy air capability to target air defense priorities.
- EW threat:
 - ◆ Airborne/ground EW support systems/capabilities.
 - ◆ Airborne/ground electronic attack systems/capabilities.
- Locations/systems/capabilities of surface-to-air missile threat.
- Surface-to-surface threat to C2 and air defense priorities:
 - ◆ Special operations/terrorist threat.
 - ◆ Expected air threat axis and likely avenues of approach.
 - ◆ Expected times of attack.
 - ◆ Most likely enemy COAs.
 - ◆ Most dangerous enemy COA.

Friendly Forces

- Airfields and locations/divert.
- Aircraft mission, locations, and loadouts:
 - FW.
 - RW.
 - Unmanned aerial vehicles.
- C2 agencies, capabilities, and locations.

Commander's Intent

- Main effort/friction areas.
- Strengths to exploit.
- Vulnerabilities enemy may exploit.
- TAOC mission.

Joint and Multinational Interoperability Issues

- Interface with the joint force air component commander/ACA/AADC.
- Airspace control area/sectors.
- Air defense area/region/sector.
- Interface with International Civil Aviation Organization and host nation ATC facilities.
- ATO input and receipt means/procedures.

Communication Systems Employment Plan

- Air defense priorities.
- Surveillance coverage and radar contracts.
- Responsiveness to the threat.
- Destruction area (base defense zones/MEZ/FEZ/crossover zones/points/joint engagement zones).
- Data links:
 - ◆ Connectivity/configurations.
 - ◆ Interface control unit/ICO.
- Manual cross tell procedures.
- Orbit areas (AEW/CAP/tankers/CAS stacks/electronic attack/EW support).
- Routing (minimum risk routes/fade/bugout/IFF turn on and off lines).
- Airspace coordination areas.
- Additional airspace control measures.

- NAVAID locations (tactical air navigation system/VHF omnidirectional range/nondirectional beacon).
- Lame duck procedures.
- CAP management and control.
- Tanker management and control.
- AEW/airborne agency coordination procedures.
- Aircraft handover procedures.
- Initial ADWC/WCS.
- Initial states of alert (aircraft/Stinger/air defense artillery).
- Initial GBAD/CAP mode of control:
 - ◆ Authority to change mode.
 - ◆ Procedures for autonomous operations.
- ROE:
 - ◆ ID authority.
 - ◆ Engagement authority.
 - ◆ ID criteria.
 - ◆ Commit criteria.
 - ◆ Self-defense criteria.
 - ◆ Impact of night on ROE.
- Tactical recovery of aircraft and personnel/medical evacuation:
 - ◆ Assets/locations.
 - ◆ Casualty collection points.
 - ◆ Zones/safe areas.
- Communications:
 - ◆ Planned and exceptions; current period for communications-electronics operating instructions.
 - ◆ Critical information flow.
- Communications assignments:
 - ◆ Frequencies/callsigns.
 - ◆ Required communications nets to be monitored.
 - ◆ Prioritization for restoration.
- Data link specifics:

- ◆ Data link reference point/unit system coordinate center.
- ◆ NCS.
- ◆ Frequencies/nets/callsigns.
- ◆ Addresses (batteries/PUs/RUs).
- ◆ Track blocks.
- Crypto change times.
- EMCON/EP plan to include RADCON and ZIPLIP mission procedures. (ZIPLIP is a directive call to minimize radio transmissions.)
- Code words.
- Required reports (equipment/frequency interference reports/meaconing, intrusion, jamming, and interference to include required times or time of event).
- ATO distribution to subordinate agencies.
- Intelligence connectivity.
- Casualty procedures:
 - ◆ Functional degradation.
 - ◆ Data link and voice communications.
- Delegation of authority:
 - ◆ CAP launch.
 - ◆ WEZ activation/deactivation.
 - ◆ RADCON management.

Time Hack

Questions?

APPENDIX B

TAOC CREW BRIEF FORMAT

Principal TAOC crewmembers conduct organized briefings prior to assuming the watch. Crew briefs should be as detailed as practical but may be abbreviated to expedite the brief and concentrate on TAOC section particulars prior to or immediately following the crew's mass brief. The normal briefing order is the—

- SAD (introductory comments).
- Intelligence representative.
- System configuration coordinator.
- SID.
- STD.
- SWD.
- SAD.
- SADC/RADC/ACE commander/SWO.

The minimum required information to be passed in the TAOC crew mass brief is specified in Marine Corps Order (MCO) 3501.9B, *Marine Corps Combat Readiness Evaluation System (MCCRES)*.

Intelligence Representative

- Weather:
 - ◆ Current airfield/operating area conditions.
 - ◆ 6-hour forecast for airfields/operating area.
 - ◆ Divert field conditions.
- Friendly ground situation.
- Friendly air situation.

- Enemy ground situation:
 - ◆ Special operations forces and activities.
 - ◆ Operations impacting on friendly operations.
- Enemy air situation to include the air order of battle:
 - ◆ Locations of known or suspected airbases.
 - ◆ Number and type of suspected aircraft threat.
 - ◆ Possible ordnance loads and configurations.
 - ◆ Aircrew training level.
 - ◆ Missile order of battle.
 - ◆ High-speed ARM capabilities and tactics.
 - ◆ Attack profiles.
- Enemy naval order of battle.
- Enemy electronic order of battle.
- Enemy surface-to-surface weapons capabilities.
- Enemy surface-to-air capabilities and locations.
- Vulnerability windows.
- NBC capabilities and employment means.

System Configuration Coordinator

- System configuration/equipment status:
 - ◆ Mass memory unit (to include master mass memory unit).
 - ◆ Radar interface unit.
 - ◆ CU.
 - ◆ CIU (to include master CIU).
 - ◆ Digital data bus.
 - ◆ Printer units.
 - ◆ Digital communication units.
 - ◆ Data terminal sets.

- Communications configuration/status:
 - ◆ Direct access trunks.
 - ◆ Single destination nets.
 - ◆ Multidestination nets.
 - ◆ UHF nets/channelization.
 - ◆ Crypto assignments.
 - ◆ Switchboard access.
 - ◆ Phone numbers.
 - ◆ Hot lines.
 - ◆ Other circuits.
- Data communications:
 - ◆ SADF.
 - ◆ Radar voice control access unit.
 - ◆ SADF voice control access unit.
- Radar availability:
 - ◆ AN/TPS-59(V)3 radar, IFF, Mode IV.
 - ◆ AN/TPS-63B radar, IFF, Mode IV.
- Seating positions.
- System degradation and manual reconfiguration procedures.
- Crypto changeover times.
- Authentication devices and location.
- Required reports.

SID

- TAOC's sector of responsibility:
 - ◆ Warning areas.
 - ◆ Civil air routes.
 - ◆ Restricted areas
 - ◆ Area restrictions.

- ◆ High-density airspace control zone.
- Area entry/exit points.
- Available radars to include minimum and maximum range.
- Terrain features affecting radar detection.
- Threat air axis and likely avenues of approach.
- SO's sectors of responsibility (sectors should overlap between SOs).
- TAOC acquisition, threat, and auto ID modes.
- System configuration:
 - ◆ Sector inhibits.
 - ◆ Censor areas.
 - ◆ Clutter gates
 - ◆ Declination.
 - ◆ Radar tilt.
 - ◆ Radar throttling.
 - ◆ Threat zones.
 - ◆ Hostile/missile profile data.
- ID criteria:
 - ◆ IFF/selective ID feature information.
 - ◆ IFF turn on/off lines.
 - ◆ Mode I, II, and III information.
 - ◆ Aircraft ID profiles.
- Classification criteria with flow chart.
- Theater/national asset ID assets and capabilities.
- Data link configuration:
 - ◆ Link-1.
 - ◆ Link-11.
 - ◆ Link-11B.
 - ◆ Link-16.
- Responsibilities; e.g., interface control unit, TDC, force track coordinator or NCS:
 - ◆ Participants with PU/RU assignment.

- ◆ Track block assignments.
- ◆ Primary/alternate configurations.
- ◆ Processing of near real time tracks.
- ◆ Filters.
- Manual cross tell procedures.
- EMCON:
 - ◆ RADCON plan.
 - ◆ ZIPLIP procedures.
 - ◆ EP plan/procedures.
 - ◆ ARM profiles/parameters.
 - ◆ Stop buzzer frequency/channel.
 - ◆ Applicable brevity codes/code words.
 - ◆ Current ZIPLIP/RADCON.
- Section symbol management responsibility.
- Reports required (to include meaoning, intrusion, jamming, and interference/frequency interference report and report routing).
- Surveillance responsibilities in the Alt TACC role.
- Section internal and external communications requirements.
- Section casualty procedures.

STD

- Non-air defense FW events scheduled on the ATO:
 - ◆ Deep air support packages.
 - ◆ Joint/non-US events.
 - ◆ Stealth events.
- Check-in and check-out points and altitudes.
- Approach and departure routes.
- Tactical routing and major contact points for air defense and itinerant aircraft.
- RTF/minimum-risk route procedures.

- Known safety of flight hazards.
- Location/status of NAVAIDs.
- Military and nonmilitary airspace considerations:
 - ◆ No-fly areas.
 - ◆ No-fire areas.
 - ◆ Restricted areas
 - ◆ Operating areas.
 - ◆ Deconfliction procedures with civil airways/Federal Aviation Administration.
 - ◆ Visual flight rules/instrument flight rules regulations.
- Handover/takeover procedures (internal and external).
- Tanker information:
 - ◆ Slide and retrograde plan.
 - ◆ Track locations.
 - ◆ Join-up procedures.
 - ◆ Giveaway amounts.
 - ◆ Scheduled tanking events.
 - ◆ Prioritization.
- AEW and airborne electronics intelligence tracks and/or orbits.
- Emergency procedures.
- SAR procedures:
 - ◆ SAR unit location and type.
 - ◆ Availability.
 - ◆ Launch authority.
 - ◆ Coordination procedures.
- Hung ordnance procedures/drop locations.
- Appropriate code words/brevity codes.
- Symbol management.
- Traffic section responsibilities in the Alt TACC role.
- Reports required.
- Section communications (internal and external).
- Section casualty procedures.

SWD

Air defense assets in the sector under TAOC control to include alert/readiness states, fuel, weapons loadouts, and locations:

- Fighter aircraft (radar, visual CAP).
- Alert/readiness states.
- Fuel.
- Primary and alternate weapons loadouts.
- Fighter locations.
- Dedicated air defense tanker support.
- GBAD units.
- CAP/FEZ manning priorities.
- Relief plan for aircraft, likely friendly tactics to be employed (section, division, etc.), and FEZ manning priority.
- Radar contracts with radar fighters.
- Air defense priorities.
- Utilization of weapons engagement zones (MEZ, FEZ):
 - ◆ Activation/deactivation plans.
 - ◆ Casualty plans.
 - ◆ Data link connectivity.
 - ◆ Manual cross tell procedures.
- ADWC and WCS to include authority to set conditions.
- ROE:
 - ◆ Beyond visual range criteria and authority.
 - ◆ Electronic ID criteria.
 - ◆ Visual ID criteria.
- Air raid warning procedures.
- Emergency actions to be taken by aircraft, controllers, and SAW units.
- Fire control orders.
- Routing within the IADS.

- Information flow requirements:
 - ◆ Critical versus noncritical.
 - ◆ Controller/aircrew cadence.
- Air raid warning procedures.
- Positive and procedural control measures.
- Link-4A operations.
- Alternate and supplemental sites for SAW units.
- Communications:
 - ◆ Communications brevity procedures/code words.
 - ◆ Secure communications means.
 - ◆ Gingerbread/authentication procedures.
 - ◆ Internal communications.
 - ◆ External communications.
- Weapons section responsibilities in the Alt TACC role.
- Reports required.
- SAW casualty procedures.
- Section casualty procedures.

SAD

- System configuration priorities.
- Concept of operations:
 - ◆ TAOC's role in AAW.
 - ◆ Location of higher/adjacent/subordinate units.
 - ◆ Command relationships.
 - ◆ ACE commander's guidance.
 - ◆ Coordination procedures for higher and adjacent air defense agencies.
- Status of phasing air defense responsibilities ashore.
- Alt TACC procedures.
- TAOC casualty procedures:

- ◆ Rally point.
- ◆ Units to assume TAOC functions.
- ◆ Personnel augmentation requirements.
- Alternate TAOC locations.
- Coordination requirements with the SADF.
- Safety requirements (air and ground).
- Communications requirements (internal and external).
- Individual casualty procedures.
- Administrative information:
 - ◆ Watch schedules.
 - ◆ Camp security responsibilities.
 - ◆ Special instructions.
 - ◆ Sitdown time.
- Classified material (verify):
 - ◆ Location and responsibility.
 - ◆ Documents.
 - ◆ Fill devices
 - ◆ Crypto changeover times (classified).
- Crypto fill deletion times (classified).
 - ◆ Crew relief procedures.
 - ◆ Time and location of debrief.
 - ◆ Time hack.

SADC/RADC/ACE Commander/SWO

General comments.

Questions?

APPENDIX C

TRAINING

Every Marine Corps leader has the responsibility to establish and conduct technical and tactical training for Marines to accomplish the unit's mission. Tools available to assist leaders in establishing an effective training plan are relevance, standardization, efficiency, and specificity. Due to the complexities of amphibious, joint, and multinational operations, the importance of individual, crew, and unit level training for TAOC personnel cannot be understated. The success of individual, crew, and unit training must be qualitatively measured to identify training deficiencies and create a baseline for designing future training. The impact from meaningful, quality training will reflect on a Marine's proficiency.

Individual Training

MCO P3500.54, *Training and Readiness (T&R) Manual*, standardizes TAOC controller and operator training requirements. It specifies training events and position requirements to progress through various level qualifications. Follow-on formal training is available to those Marines who demonstrate military occupational specialty (MOS) proficiency.

Formal Schools

Entry Level Training

This training is for air defense control officers (MOS 7210), tactical air defense controllers (MOS 7236), and air control electronics

operators (MOS 7234) at Air Schools, Marine Corps Communications Electronics School, Marine Corps Air-Ground Combat Center, Twentynine Palms, CA.

Air Defense Control Officers Course

This course provides instruction on Marine Corps aviation C2; TAOC system capabilities and configuration; employment and crew operations; surveillance, traffic, and weapons functioning; principles of air defense; and air intercept control.

Air Control Electronics Operator Course

This course provides the same instructional package as the air defense control officers course but without the AIC training. It is a prerequisite for the tactical air defense controller course.

Tactical Air Defense Controller Course

This course provides air intercept control training to corporals and sergeants.

Graduate Level Training

This training is for MOS 7210 and MOS 7236 students who exhibit technical and tactical proficiency and are selected by their commands to attend mid- and high-level MOS training. Training includes the Strike Fighter Tactics Instructor Course (commonly known as TOPGUN), Marine division tactics course, and the weapons and tactics instructor (WTI) course.

Strike Fighter Tactics Instructor Course

This course provides controllers with advanced training in threat and friendly air tactics; weapons systems capabilities; and naval

power projection doctrine. Prerequisites include qualification as an AIC instructor.

Marine Division Tactics Course

This course provides controllers with ground and practical application instruction in doctrine, tactics, and weapons employment for a division or more of Marine fighters in a multibogey environment as part of an IADS. Marine Aviation Weapons and Tactics Squadron 1 instructors teach the Marine division tactics course.

WTI Course

This course provides students advanced training and practical application on planning and execution of the six functions of Marine aviation. MOS 7210 students receive specific instruction in MACCS and TAOC planning and SADC/TAOC operational execution. Prerequisites include SWD qualification with MEF-level exercise experience. Students receive MOS 7277 designation.

WTI Commanders Course

This course is held at Marine Corps Air Station, Yuma, AZ. It provides field grade officers with an opportunity to examine and discuss MACCS employment.

Follow-on School

This additional formal school is available for field grade officers.

On-the-Job Training

Most TAOC controller and operator MOS training is conducted at the squadron level. Requirements for academic and

practical application training and position qualification for TAOC controllers and operators are specified in MCO P3500.54. A specific training and readiness (T&R) syllabus exists for MOS 7210 air defense control officers, MOS 7236 tactical air defense controllers, and MOS 7234 air control electronics operators. The aviation T&R information management system computes and tracks individual readiness. Training is conducted at four progressive levels. Completing each level reaches a given level of combat readiness.

Core Skill Introduction Training (100 Level)

This training is completed at the Marine Corps Communications Electronics School entry-level school in Twentynine Palms, CA. It includes the basic skills training required by TAOC personnel to operate TAOC equipment and function as a TAOC crewmember.

Core Skill Basic Training (200 Level)

This level is the first of two phases where the TAOC operator and controller establish basic core competency.

Core Skill Advanced Training (300 Level)

Upon completion of this second phase, TAOC operators and controllers will be core competent.

Core Skill Plus Training (400 Level)

Completion of this level is not normally accomplished during a TAOC operator's initial tour. This training is for the senior supervisory positions within the TAOC crew.

Instructor Level Training (500 Level)

TAOC personnel are trained in various instructional techniques such as preparing courseware, delivering a period of instruction, briefing, debriefing, and supervising.

Crew Training

For TAOC controllers and operators, maintenance personnel, and the SADF staff, TAOC crew training is normally conducted through the TAOM's built-in simulation capability. The TAOM's simulation capability provides operators with the ability to design air defense scenarios of varying complexity based on the crew's training requirements. Crew training need not include the entire crew, but may be designed to specifically challenge an individual TAOC section on its functioning and procedures. Crew training drills are extremely important to identify crew shortcomings, enhance inter-crew coordination, test air control procedures, and prepare the crew to interface with external agencies.

Unit Training

Unit training takes on many forms, including command post exercises, simulated exercises, and field training exercises (FTXs). MACS personnel are intimately involved in preparing training plans and coordinating with higher, adjacent, and subordinate C2 and support elements.

Marine Aviation Planning Problem Exercises

Marine aviation planning problem exercises are low cost, low overhead training that allow commanders to train their staffs to perform special integration and control functions in a simulated environment. Exercises are particularly effective for determining C2 requirements to support possible contingencies.

MACCS Integrated Simulated Training Exercise

The MACCS integrated simulated training exercise (MISTEX) is a MACG locally produced exercise that involves detailed preparation of a simulated scenario and its subsequent execution at the MACCS level. The MISTEX can prepare units for upcoming FTXs or contingencies. Individual Marine participation in filling a crew position during a MISTEX is a T&R requirement for position qualification.

Joint System Training Exercises

Similar to the MISTEX, joint system training exercises provide integrated systems training that incorporates the challenges of integrating the MACCS in joint operations. Scenarios have been developed to support joint C2 training for probable contingency operations worldwide.

Other Unit Training

In addition to command post exercise and simulated exercise-type training, the MACS often deploys for FTXs. Field training provides a unit with the most beneficial training opportunities available, living and operating in conditions similar to those in real world operations.

Evaluation Tools

Evaluation tools to identify training deficiencies are MCO 3501.9B and MCO P3500.54. The Marine Corps Combat Readiness Evaluation System is a standardized Headquarters, Marine Corps directed evaluation program designed to measure a unit's warfighting readiness. It specifies mission performance standards that agencies are expected to perform during their wartime mission. MCO P3500.54 specifies individual performance standards.

APPENDIX D

GLOSSARY

Section I. Acronyms and Abbreviations

AADC	area air defense commander
AAW	antiair warfare
ABT	air breathing target
ACA	airspace control authority
ACE	aviation combat element
ACO	airspace control order
ACP	airspace control plan
ADCP	air defense communications platform
ADWC	air defense warning condition
AEW	airborne early warning
AF	amphibious force
AIC	air intercept controller
Alt TACC	alternate tactical air command center
AO	area of operations
AR	aerial refueling
ARM	antiradiation missile
ATC	air traffic control
ATO	air tasking order
AWACS	Airborne Warning and Control System
AWC	assistant weapons controller
C2	command and control
CAC2S	common aviation command and control system
CAP	combat air patrol
CAS	close air support
CATF	commander, amphibious task force
CIU	communications interface unit
CLF	commander, landing force
CM	cruise missile
COA	course of action
COS	current operations section
CU	computer unit

DASC	direct air support center
ECU	environmental control unit
EMCON	emission control
EP	electronic protection
EW	electronic warfare
EW/C	early warning/control
FEZ	fighter engagement zone
FTX	field training exercise
FW	fixed wing
GBAD	ground-based air defense
GBDL	ground-based data link
HF	high frequency
IADS	Integrated Air Defense System
ICO	interface coordination officer
ID	identification
IFF	identification, friend or foe
JFC	joint force commander
JTIDS	Joint Tactical Information Distribution System
JTMD	joint theater missile defense
LF	landing force
LVS	Logistics Vehicle System
MACCS	Marine air command and control system
MACG	Marine air control group
MACS	Marine air control squadron
MAG	Marine aircraft group
MAGTF	Marine air-ground task force
MATCD	Marine air traffic control detachment
MC	missile controller
MCO	Marine Corps order
MCWP	Marine Corps warfighting publication
MEF	Marine expeditionary force
MEP	mobile electric power
MEZ	missile engagement zone
MHE	materials handling equipment
MISTEX	Marine air command and control system (MACCS) integrated simulated training exercise
MOS	military occupational specialty

MRU	.....	military radar unit
NATO	.....	North Atlantic Treaty Organization
NAVAID	.....	navigation aid
NBC	.....	nuclear, biological, and chemical
NCS	.....	net control station
OCU	.....	operator console unit
OPORD	.....	operation order
OPTASKLINK	.....	operational tasking data link
PPDL	.....	point-to-point data link
PU	.....	participating unit
RADC	.....	regional air defense commander
RADCON	.....	radiation control
RICO	.....	regional interface control officer
ROE	.....	rules of engagement
RTF	.....	return to force
RU	.....	reporting unit
RW	.....	rotary wing
SAD	.....	senior air director
SADC	.....	sector air defense commander
SADF	.....	sector air defense facility
SAR	.....	search and rescue
SAW	.....	surface-to-air weapon
SID	.....	surveillance identification director
SO	.....	surveillance operator
STD	.....	senior traffic director
SWD	.....	senior weapons director
SWO	.....	senior watch officer
T&R	.....	training and readiness
TACC	.....	tactical air command center (USMC); tactical air control center (USN)
TACON	.....	tactical control
TAD	.....	tactical air direction
TADC	.....	tactical air direction center
TAOC	.....	tactical air operations center
TAOM	.....	tactical air operations module
TAR	.....	tactical air request
TATC	.....	tactical air traffic controller
TBM	.....	theater ballistic missile
TDC	.....	track data coordinator

TDL	tactical data link
TIG	tactical air operations module interface group
TM	theater missile
TMD	theater missile defense
TTI	time to intercept
UHF	ultrahigh frequency
US	United States
USAF	United States Air Force
USMC	United States Marine Corps
VHF	very high frequency
WCS	weapons control status
WEZ	weapon engagement zone
WTI	weapons and tactics instructor

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. See also **air defense**. (JP 1-02)

air defense—All defensive measures designed to destroy attacking enemy aircraft or missiles in the Earth's envelope of atmosphere, or to nullify or reduce the effectiveness of such attack. Also called **AD**. (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)

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)

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

base defense zone—An air defense zone established around an air 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. Also called **BDZ**. (JP 1-02)

close air support—Air action by fixed- and rotary-wing aircraft against hostile targets that are in close proximity to friendly forces and that require detailed integration of each air mission with the fire and movement of those forces. Also called **CAS**. (JP 1-02)

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

direct air support—Air support flown in direct response to a specific request from the supported unit. (MCRP 5-12C)

direct air support center—The principal air control agency of the US Marine air command and control system responsible for the direction and control of air operations directly supporting the ground combat element. It processes and coordinates requests for immediate air support and coordinates air missions requiring integration with ground forces and other supporting arms. It normally collocates with the senior fire support coordination center within the ground combat element and is subordinate to the tactical air command center. Also called **DASC**. See also **Marine air command and control system; tactical air operations center**. (JP 1-02)

electronic warfare—Any military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or to attack the enemy. Also called **EW**. The three major subdivisions within electronic warfare are: electronic attack, electronic protection, and electronic warfare support. a. **electronic attack**. That division of electronic warfare involving the use of electromagnetic energy, directed energy, or antiradiation weapons to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability and is considered a form of fires. Also called **EA**. EA includes: 1) actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception, and 2) employment of weapons that use either electromagnetic or directed energy as their primary destructive mechanism (lasers, radio frequency weapons, particle beams). b. **electronic protection**. That division of electronic warfare involving passive and active means taken to protect personnel, facilities, and equipment from any effects of friendly or enemy employment of electronic warfare that degrade, neutralize, or destroy friendly combat capability. Also called **EP**. c. **electronic warfare support**. That division of electronic warfare involving actions tasked by, or under direct control of, an operational commander to search for, intercept, identify, and locate or localize sources of intentional and unintentional radiated electromagnetic energy for the purpose of immediate threat recognition, targeting, planning and conduct of future operations. Thus, electronic warfare support provides information required for decisions involving electronic warfare operations and other tactical actions such as threat avoidance, targeting, and homing. Also called **ES**. Electronic warfare support data can be used to produce signals intelligence, provide targeting for electronic or destructive attack, and produce measurement and signature intelligence. (JP 1-02)

emission control—The selective and controlled use of electromagnetic, acoustic, or other emitters to optimize command and control capabilities while minimizing, for operations security: a. detection by enemy sensors; b. mutual interference among friendly systems; and/or c. enemy interferences with the ability to execute a military deception plan. Also called **EMCON**. See also **electronic warfare**. (JP 1-02)

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

future operations section—1. In Marine air-ground task force (MAGTF) operations, a section normally under the staff cognizance of the G-3 that focuses on planning/producing new fragmentary orders or the next change of major subordinate command mission. This section forms and leads the integrated planning effort with a planning horizon of 72 to 120 hours out. It develops branch plans and sequels. 2. In Marine aviation, that portion of the tactical air command center and aviation combat element commander's battlestaff responsible for the detailed planning and coordination of all future air operations conducted by the aviation combat element in support of the MAGTF. The section plans for and publishes the next air tasking order(s) (normally a 48 to 72-hour period). Also called **FOS**. (MCRP 5-12C)

gap filler radar—A radar used to supplement the coverage of the principal radar in areas where coverage is inadequate. (JP 1-02)

high-altitude missile engagement zone—See **weapon engagement zone**.

high-density airspace control zone—Airspace designated in an airspace control plan or airspace control order, in which there is a concentrated employment of numerous and varied weapons and airspace users. A high-density airspace control zone has defined dimensions, which usually coincide with geographical features or navigational aids. Access to a high-density airspace control zone is normally controlled by the maneuver commander. The maneuver commander can also direct a more restrictive weapons status within the high-density airspace control zone. Also called **HIDACZ**. (JP 1-02)

identification—1. The process of determining the friendly or hostile character of an unknown detected contact. (JP 1-02, part 1 of a 3-part definition)

joint force air component commander—The commander within a unified command, subordinate unified command, or joint task force responsible to the establishing commander for making recommendations on the proper employment of assigned, attached, and/or made available for tasking air forces; planning and coordinating air operations; or accomplishing such operational missions as may be assigned. The joint force air component commander is given the authority necessary to accomplish missions and tasks assigned by the establishing commander. 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)

low-altitude missile engagement zone—See **weapon engagement zone**.

Marine air command and control system—A system that provides the aviation combat element commander with the means to command, coordinate, and control all air operations within an assigned sector and to coordinate air operations with other Services. It is composed of command and control agencies with communications-electronics equipment that incorporates a capability from manual through semiautomatic control. Also called **MACCS**. See also **direct air support center**; **tactical air operations center**. (JP 1-02)

Marine air-ground task force—The Marine Corps' principal organization for all missions across the range of military operations, composed of forces task-organized under a single commander capable of responding rapidly to a contingency anywhere in the world. The types of forces in the Marine air-ground task force (MAGTF) are functionally grouped into four core elements: a command element, an aviation combat element, a ground combat element, and a combat service support element. The four core elements are categories of forces, not formal commands. The basic structure of the MAGTF never varies, though the number, size, and type of Marine Corps units comprising each of its four elements will always be mission dependent. The flexibility of the organizational structure allows for one or more subordinate MAGTFs to be assigned. In a joint or multinational environment, other Service or multinational forces may be assigned or attached. Also called **MAGTF**. (MCRP 5-12C)

Marine expeditionary brigade—A Marine air-ground task force (MAGTF) that is constructed around a reinforced infantry regiment, a composite Marine aircraft group, and a brigade service support group. The Marine expeditionary brigade (MEB), commanded by a general officer, is task-organized to meet the requirements of a specific situation. It can function as part of a joint task force, as the lead echelon of the Marine expeditionary force (MEF), or alone. It varies in size and composition, and is larger than a Marine expeditionary unit but smaller than a MEF. The MEB is capable of conducting missions across the full range of military operations. In a joint or multinational environment, it may also contain other Service or multinational forces assigned or attached to the MAGTF. Also called **MEB**. (MCRP 5-12C)

Marine expeditionary force—The largest Marine air-ground task force (MAGTF) and the Marine Corps' principal warfighting organization, particularly for larger crises or contingencies. It is task-organized around a permanent command element and normally contains one or more Marine divisions, Marine aircraft wings, and Marine force service support groups. The Marine expeditionary force is capable of missions across the range of military operations, including amphibious assault and sustained operations ashore in any environment. It can operate from a sea base, a land base, or both. In a joint or multinational environment, it may also contain other Service or multinational forces assigned or attached to the MAGTF. Also called **MEF**. See also **Marine air-ground task force**; **Marine expeditionary unit**. (MCRP 5-12C)

Marine expeditionary unit—A Marine air-ground task force (MAGTF) that is constructed around an infantry battalion reinforced, a helicopter squadron reinforced, and a task-organized combat service support element. It normally fulfills Marine

Corps' forward sea-based deployment requirements. The Marine expeditionary unit provides an immediate reaction capability for crisis response and is capable of limited combat operations. In a joint or multinational environment, it may also contain other Service or multinational forces assigned or attached to the MAGTF. Also called MEU. See also **Marine air-ground task force**; **Marine expeditionary force**; **Marine expeditionary force**. (MCRP 5-12C)

minimum-risk route—A temporary corridor of defined dimensions recommended for use by high-speed, fixed-wing aircraft that presents the minimum known hazards to low-flying aircraft transiting the combat zone. Also called **MRR**. (JP 1-02)

missile engagement zone—See **weapon engagement zone**.

mutual support—That support which units render each other against an enemy, because of their assigned tasks, their position relative to each other and to the enemy, and their inherent capabilities. (JP 1-02)

naval tactical data system—A complex of data inputs, user consoles, converters, adapters, and radio terminals interconnected with high-speed, general-purpose computers and its stored programs. Combat data is collected, processed, and composed into a picture of the overall tactical situation, which enables the force commander to make rapid, accurate evaluations and decisions. Also called **NTDS**. (JP 1-02)

near real time—Pertaining to the timeliness of data or information which has been delayed by the time required for electronic communication and automatic data processing. This implies that there are no significant delays. Also called **NRT**. (JP 1-02)

offensive air support—Those air operations conducted against enemy installations, facilities, and personnel to directly assist the attainment of MAGTF objectives by the destruction of enemy resources or the isolation of the enemy's military forces. Also called **OAS**. (MCRP 5-12C)

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**. (MCRP 5-12C)

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

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, dispersion, reconstitution, redundancy, detection and warning systems, and the use of protective construction. See also **air defense**. (JP 1-02)

priority intelligence requirements—Those intelligence requirements for which a commander has an anticipated and stated priority in the task of planning and decision making. (JP 1-02)

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

sector air defense commander—A commander designated the responsibility for an air defense sector within a region. Responsibilities may include, but are not limited to, coordinating actions between regions and sectors; evaluating the results of engagements within the designated region or sector; forwarding observations and results of engagements within the assigned region or sector to the area air defense commander (AADC); requesting from the AADC or, when authorized, directing changes to the air defense alert and weapons release conditions commensurate to the threat; and, when necessary, requesting from the AADC additional air defense assets. Sector air defense commanders further distribute air defense aircraft to control agencies within their sector. The controlling agencies, in turn, are responsible for executing the air defense mission through the coordination, control, and integration of aircraft and surface-to-air weapon systems under their direction. Also called **SADC**. (MCRP 5-12C)

sector air defense facility—An adjunct facility to the tactical air operations center (TAOC) that provides the equipment necessary for the sector air defense commander to perform anti-air warfare combat coordination functions. Sector air defense facility workstations emulate the TAOC situational and menu

displays and allow for shared use of tactical air operations module voice communication assets. Also called **SADF**. (MCRP 5-12C)

tactical air operations center—The principal air control agency of the US 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 anti-air 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. Also called **TM**. (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**. a. **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**. b. **high-altitude missile engagement zone**. In air defense, that airspace of defined dimensions within which the responsibility for engagement of air threats normally rests with high-altitude surface-to-air missiles. Also called **HIMEZ**. c. **low-altitude missile engagement zone**. In air defense, that

airspace of defined dimensions within which the responsibility for engagement of air threats normally rests with low- to medium-altitude surface-to-air missiles. Also called **LOMEZ**. d. **short-range air defense engagement zone**. In air defense, that airspace of defined dimensions within which the responsibility for engagement of air threats normally rests with short-range air defense weapons. It may be established within a low- or high-altitude missile engagement zone. Also called **SHORADEZ**. e. **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)

ZIPLIP—A directive call to minimize radio transmissions. (MCRP 3-25B)