



**THE SIX FUNCTIONS
OF
MARINE AVIATION**

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CHAPTER ONE

AIR RECONNAISSANCE

Lesson Purpose:

To introduce the reader to missions, tasks and capabilities of air reconnaissance assets

Reference(s):

- (a) FMFM 5-10, Air Reconnaissance
- (b) FMFM 3-2-1, UAV Company Operations
- (c) OH 3-2, Intelligence
- (d) Lightning Bugs and Other Reconnaissance Drones - W. Wagner
- (e) War Through the Ages - L. Montross
- (f) History of U.S. Marine Corps Operations in WWII - Shaw
- (g) Gallipoli - A. Morehead
- (h) National Geographic, Oct 1987, "Doc" Edgerton - The Man Who Made Time Stand Still

I. Introduction

A. Historical Overview

1. Throughout the history of armed conflict, opposing forces have sought to control the high ground. The reason is simple: better observation and fields of fire. With the advent of aerial platforms, it was soon found that one could obtain observation of the enemy and terrain without necessarily paying the price of taking the high ground. The French experimented with military observation balloons as early as the 1790's. Observation balloons became very popular in the American Civil War.
2. By 1914, with the outbreak of World War I, aircraft were designed solely for reconnaissance. The aerial engagements that occurred between pilots and observers were waged with pistols, carbines, hand grenades and even shotguns. The concept of aerial reconnaissance had not yet been embraced by the more conservative general staffs of the era. Though the dense "fog of war" blinded the opposing forces, both sides placed their trust in cavalry patrols rather than aerial reconnaissance. Consequently, many opportunities were lost.
3. The following excerpt describes aerial reconnaissance in support of a landing force at Gallipoli:

...No machine guns had been fitted at this stage, but instead, there was available a supply of iron spikes; these the pilot or the observer could aim at such of the enemy who appeared below, rather in the manner of a hunter spearing a bear. Although these spikes emitted an unpleasant whirring noise as they descended, and no doubt created a feeling of extreme insecurity among the infantry below, they seldom hit anything. For the rest, Samson's pilots carried a revolver, binoculars, and a lifebelt or an empty petrol can to hold onto in case they fell into the sea. The observers were equipped with a rifle, charts and a watch.

On Tenedos, an airfield 800 yds long had been constructed with the aid of Greek workmen who uprooted a vineyard and with oil drums filled with cement rolled the ground moderately flat. But it was not altogether a satisfactory base. From the island the Gallipoli peninsula could be clearly seen, but Cape Helles was seventeen and a half miles away, and Gaba Tepe, where the Australians and New Zealanders were to land, thirty-one miles, and these were formidable distances for an aircraft in those days. Constantinople, of course, was out of the question.

Samson, doing a great deal of flying himself, was already beginning to produce useful results despite the hazards. Carrying volunteer Naval Officers as observers, usually light-weight midshipmen, he got his new radio-telephone into use, and the spotting for fleet guns greatly improved. Since the radio-telephone was a one-way system, the warships checked back the messages they received with a searchlight. Several bombardments had been carried out in this way, notably the raid on Maidos on April 23.

Much of the most important part of Samson's work, in these last days before the attack, was his photography of the enemy entrenchments...

II. Body

A. PURPOSE OF AIR RECONNAISSANCE.

Simply stated, when a commander commits his troops to battle, he does so with certain risks. The ultimate purpose of any type of reconnaissance is to reduce the commander's unknown risks. Since we're dealing with aerial reconnaissance, we'll break reconnaissance down into two categories.

1. Strategic Reconnaissance.

The gathering of information which is used to affect policy on the national or international level. This information is used by strategic planners and is conducted mostly by National or Theater assets. Some USMC aircraft are utilized in this role to a limited extent, but not as their primary mission.

2. Tactical Reconnaissance.

Tactical air reconnaissance is the use of air vehicles to obtain information concerning terrain, weather, and the disposition, composition, movement, installations, lines of communications, electronic and communication emissions of enemy forces. Also included are artillery and naval gunfire adjustment, and systematic and random observation of ground battle areas, targets, and/or sectors of airspace. There is currently no manned aircraft in the Marine Corps that performs tactical air reconnaissance as a

primary mission. The Pioneer RPV system is assigned to the UAV company of the SRI Group in each MEF. The Pioneer system is the only dedicated air reconnaissance system in service with the USMC.

B. RECENT EXAMPLES

1. WWII

- a. As technology improved during World War II, we no longer utilized hand held cameras as done during World War I. Cameras were mounted in a variety of aircraft, to include the P-38, P-51, and the larger, B-24.

(1) Tinian

One of the more successful Pacific campaigns of World War II was the conquest of Tinian. Major General Harry Schmidt was of the opinion that photographic reconnaissance, "left nothing to be desired". The reconnaissance effort included seven dedicated aerial photo missions which were flown by various Army Air Corps and Naval units. From these, excellent mosaic maps of the entire island were constructed and distributed to all echelons down to battalion commanders. In the Fourth Marine Division, not only the Commanding General and his staff, but all regimental and battalion commanders and even some company commanders made several flights over the island in order to familiarize themselves with the terrain on which they would have to fight. Based on aerial photos, the intelligence section estimated the enemy troop strength to be 11,350. (Within 550 of the actual number of Japanese on the island). Aerial reconnaissance greatly reduced unknown risks for the Tinian operation.

(2) Normandy

One of the great concerns prior to Operation Overlord was the possibility of the German army reinforcing the beaches at Normandy. Due to recent technology, night photography under huge strobe lights was available. A reconnaissance mission was able to determine that the Germans were ill-prepared for an attack at Normandy on the night prior to the invasion, and thereby reduced the unknown risks of the operation.

- b. The tactics associated with aerial reconnaissance progressed tremendously during World War II. Early in the war, reconnaissance aircraft were slow but very stable photography platforms. These aircraft often went unarmed and unescorted. Needless to say, many were lost due to enemy action. Later in the war, faster and better armed aircraft were utilized. In the case of the P-38 and the P-51, the ability to self-protect increased survivability substantially.

2. Korea/Vietnam

- a. As aircraft evolved into the jet age, aerial reconnaissance capabilities also increased. Radar imaging came into being, as did the ability to image areas at night with new infrared technology. Electronic reconnaissance also evolved during this time.
- b. During this time period, unmanned reconnaissance vehicles came into their own.

Numerous unmanned vehicles were used during the Vietnam War. They were used on high risk missions over North Vietnam and made a large number of flights over the Chinese mainland. (See ref (d))

C. PRESENT DAY CAPABILITIES

1. Unmanned Aerial Vehicles

- a. Currently, the MAGTF has only one asset that performs aerial reconnaissance as its primary mission - the Unmanned Aerial Vehicle.
- b. UAV Company. The mission of the UAV Company is to conduct day and night UAV operations in support of the MAGTF. Tasks included in the mission are to:
 - (1) Detect, recognize, identify, and locate targets in support of the MAGTF.
 - (2) Assist in the adjustment of indirect fire weapons.
 - (3) Conduct real-time reconnaissance, surveillance, and intelligence collection.
 - (4) Provide support for rear area security.
 - (5) Assist in search and rescue (SAR), helo route and LZ reconnaissance, and bomb damage assessment (BDA).
 - (6) Provide airborne radio relay. (this capability does not presently exist)
 - (7) Identify follow-on requirements and develop UAV tactics and techniques.

c. Pioneer UAV

- (1) Advantages and capabilities
 - (a) Real time information via Remote receive Station (RRS)
 - (b) Small visual, infrared (IR), and radar signature
 - (c) No risk to aircrew
 - (d) Day TV Camera/Night FLIR Sensor
- (2) Disadvantages and limitations
 - (a) Must have line of sight between UAV and ground control station (GCS)
 - (b) Relatively small field of view
 - (c) Must establish communication between MACCS agencies and ground control station

- (d) Not foul wx capable
- (e) large embarkation footprint
- (f) Unique fuel requirement

2. Aircraft

The Aviation Combat Element (ACE) of the MAGTF has no assets that perform air reconnaissance as its primary mission. All aircraft are assigned the secondary mission of visual reconnaissance.

a. EA-6B

This four seat multi-mission aircraft's primary mission is electronic attack (EA), however, it is capable of electronic warfare support measures (ES). It should be noted that the ES capability of the EA-6B is significantly reduced while conducting EA simultaneously.

b. AH-1W NTS

The NTS upgrade to the AH-1W has added significant tactical reconnaissance capabilities to any MAGTF. Improved day optics allow for TV recording with up to a 34x magnification, while the FLIR has added a nightline capability with up to 25x magnification.

D. FUTURE DEVELOPMENTS

1. Joint Source Imagery Processing System (JSIPS). JSIPS is a system currently under joint development (with the USAF as lead service). It will augment the Marine Corps' present capability to produce imagery and to collect data from varied sources. JSIPS consists of a multiple van setup which will increase the logistical requirements for its employment. The Marine Corps will, with JSIPS, increase their Tactical Exploitation of National Capabilities (TENCAP) possibilities.
2. F/A-18D. Beginning in FY 1991, certain F/A-18D aircraft were designated as being "reconnaissance capable". This means that the airframe is able to accept a reconnaissance pallet in place of the internal gun pod. Currently 30 aircraft are configured for reconnaissance, however with the recent cancellation of the Advanced Tactical Air Reconnaissance System (ATARS), no replacement system has been identified. In addition, certain modifications to the APG-65 radar of the F/A-18D will allow for a limited radar reconnaissance capability.
3. UAV. UAV's are scheduled to move to the Marine Aircraft Wing in Dec 95. Movement to the MAW should dramatically improve UAV availability and reliability. The current plan for Marine Corps UAV's is to extend the service life of Pioneer. The cancellation of the Hunter program is the reason for this course of action.

E. TASKING PROCESS

When an intelligence officer puts together an aerial collection plan he must take several

principles into account. These are given below.

1. Principles of Collection Agency Tasking

- a. Capability - The physical ability of each available collection agency to collect the information pertinent to each requirement must be examined.
- b. Suitability - Of the collection agencies that are capable, the ones which will be most efficient and effective should be selected.
- c. Multiplicity - Whenever possible, each collection requirement should merit the assignment of two or more collection agencies.
- d. Balance - The desirability of ensuring that collection agencies are neither overworked nor under-employed.
- e. Reserve - Holding back some assets in order to exploit an opportunity or to correct a failure.

2. Request Process

- a. RFI's - Requests for Information are established by commanders and staffs at all levels. RFI's are passed to the G/S-2 at each level for consolidation. The G/S-2 provide answers that they have available at their echelon. Once all RFI's are consolidated at the highest level, a collection plan is formulated. Certain RFI's will be filled by air reconnaissance. If this is the case, the intelligence section will fill out a Joint Tactical Air Reconnaissance/Surveillance request (JTAR/S).
- b. JTAR/S - This form is prioritized by the G/S-2 and passed to the ACE Headquarters. TACC Future Operations Section assigns the mission via the air tasking order. The JTAR/S will then be forwarded to the squadron.
- c. Mission Reports. Printed imagery should not be expected unless the requester specifically requests it. The dissemination system is set up to send out verbal reports. One exception is the UAV company. If a remote receiving station is located in the right place, such as the regimental FSCC, the requester can watch the mission as it's being flown or obtain video tapes of the mission. Prints are available from an aerial platform but expect to have some delays.

2. Visual Reconnaissance.

In a dynamic environment, visual reconnaissance, performed by any MAGTF aviation asset, may be the most timely source of information. It is the responsibility of all aircrew to thoroughly debrief with the intelligence section.

III. Summary

We must never lose track of the fact that intelligence will drive operations during war time. As Winston Churchill so wisely put it, "However absorbed a commander may be in the elaboration of his own thoughts, it is sometimes necessary to take the enemy into account." (Reference G)

CHAPTER TWO

ANTIAIR WARFARE

Lesson Purpose:

To introduce the reader to the concepts of antiair warfare.

References

- (a) Joint Pub 1-02, DOD Dictionary of Military and Associated Terms
- (b) FMFM 5-1, Marine Aviation
- (c) FMFM 5-50, Antiair Warfare
- (d) FMFM 5-40 Offensive Air Support
- (e) FMFM 5-41 Close Air Support/Close In Fire Support

I. Introduction

- A. From WWI to the present, antiair warfare (AAW) has been an integral part of Marine Aviation and an essential ingredient to success. Historically this function has been required with varying degrees of intensity depending upon the extent and nature of the enemy air threat. Marine forces have not had to actively counter a meaningful enemy air threat since WWII. Today, however, the sophistication and magnitude of antiair weapons systems available to even third world countries pose a serious threat to any mission we may be assigned. With this in mind we must understand the function of AAW so that we can apply it against all potential threats. To do this we will try to answer the following questions:
 - What is AAW?
 - What are the types of AAW?
 - What is the purpose of AAW?
 - What are the principles of AAW?
 - What is the Marine Corps AAW system?

II. Body

- A. Antiair warfare (AAW) is the action that is required to destroy or reduce to an acceptable level the enemy air and missile threat.
- B. There are two general types of AAW: Offensive AAW (OAAW) and air defense. OAAW constitutes operations conducted against enemy air or air defense systems before they can launch or assume an attacking role. OAAW operations in or near the objective area consist mainly of air attacks to destroy or neutralize hostile aircraft, airfields, radars, air defense

systems, and supporting areas. Air defense consists of defensive measures designed to destroy attacking enemy aircraft or missiles or to nullify or reduce the effectiveness of such attack (Joint Pub 1-02). Air defense can be further broken down into two categories: active air defense and passive air defense.

1. Active air defense is direct defensive action taken to destroy attacking enemy aircraft or missiles or to nullify or reduce the effectiveness of such an attack. It includes such measures as the use of aircraft, interceptor missiles, air defense artillery, non-air defense weapons in an air defense role, and electronic countermeasures.
 2. Passive air defense constitutes all measures, other than active air defense, taken to minimize the effects of hostile air action. These measures include the use of cover, concealment, camouflage, deception, dispersion, and protective construction.
- C. OAAW objectives include weakening the enemy's offensive air capability to a manageable level, thereby gaining access to a zone of airspace for a specified timeframe to allow friendly air operations and local air superiority in conjunction with friendly operations. These objectives can be incorporated into three specific areas: preemptive measures, suppression of enemy air defenses (SEAD), and local air superiority measures.
- D. OAAW is defined by three specific tasks, each with its corresponding objective.

1. Preemptive Measures.

The objective is to weaken the enemy air threat before the enemy can make effective use of his air defense systems (air-to-air elements, ground-to-air elements, and support C3 structure) and prevent attainment of MAGTF objectives. Preemptive measures are required in the early phase of an amphibious operation and in sustained operations ashore. Preemptive measures allow subsequent air and ground operations to proceed without prohibitive interference. Preemptive measures can include_

- Air strikes on enemy airfields to destroy or damage aircraft, facilities, and logistic support.
- Attacks on command and control facilities and surveillance systems.
- Air strikes on the enemy's aircraft supply and support, such as railroads and convoys.
- Offensive air-to-air sweeps to search out and destroy enemy aircraft.

2. Suppression of Enemy Air Defenses (SEAD).

The objective of SEAD is to gain access to a defined zone of airspace that will allow MAGTF operations to proceed. SEAD may become periodic in nature, applied at a critical time that will allow air and ground forces to proceed without prohibitive interference from the enemy's air defense systems. SEAD is an important part of any campaign and the MAGTF must plan a coordinated effort against the enemy air defense threat. Sustainability of a coordinated GCE/ACE SEAD plan is a function of asset availability.

See FMFM 5-40/5-41 for detailed SEAD planning. In conventional warfare, SEAD will include the following strategy mix:

- a. Direct confrontation of the enemy's air defense with ground forces.

- b. Direct confrontation of the enemy's air defense with air forces.
 - c. Direct confrontation of the enemy's air defense with naval forces.
 - d. Command and Control Warfare (C2W)
3. Local Air Superiority Measures.
- Even with successful application of preemptive measures and SEAD, a residual air threat may still exist. This threat may be of such a nature and magnitude that friendly air operations are still possible and survivable with proper application of local air superiority measures. The objective of local air superiority measures is to prevent the enemy residual air threat from affecting the execution of friendly operations to the point of prohibitive interference in a specific zone of action. Local air superiority measures may be used separately or in conjunction with preemptive measures and SEAD. Local air superiority measures can include:
- a. The use of offensive combat air patrols
 - b. Escort and self-escort tactics
 - c. The use of aircraft onboard countermeasures and maneuvers
- E. The primary purpose of AAW is to gain and maintain AIR SUPERIORITY. Air superiority is "that degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by the opposing force." The significant points for analysis in the preceding definition are "prohibitive interference" and "at a given time and place." In planning the conduct of an operation, the requirement exists to address these points in detail. For example, the single greatest vulnerability of an amphibious task force is during the ship-to-shore movement. Once forces are ashore, vulnerability still exists, but to a lesser degree. Therefore, the term "prohibitive interference" is relative to "a given time and place" and must be analyzed for each phase of a particular operation. The greater the scope of the operation, the more encompassing this analysis must be. The question arises as to the precise meaning of the term "prohibitive." A prohibitive level of interference exists for each phase or element of an operation beyond which success is improbable. The lack of success of any particular aspect of an operation is not necessarily characterized by abject failure. It may be limited to levels of damage or interference which, if received, will seriously jeopardize the accomplishment of the assigned mission. Consequently, analysis of the major facets of the operation determines the level of interference which is prohibitive. Once this determination is reached, the required AAW measures to minimize this "prohibitive interference" can be ascertained.
- F. The Principles of AAW. The principles which have evolved from years of experience are: destruction in depth, mutual support, and centralized command and decentralized control. The application of these principles is necessary to achieve and preserve air superiority.
- 1. Destruction-in-Depth is considered the most important principle of AAW. The primary goal is to destroy the enemy air threat at its source. The area required to ensure destruction-in-depth is designated as the Air Defense Sector. The Air Defense Sector

consists of the vital area, the destruction area, and the surveillance area. By means of operation plans and orders, the Air Defense Sector is made known to subordinate units of the MAGTF and to interested external commands. Effective communications range, detection range, weapons range (friendly and enemy), and the relative danger from an air or surface attack all govern the expansion or contraction of this area.

a. Vital Area.

A vital area is a designated area or installation to be defended by air defense units. It contains the facilities, units, and installations necessary for the MAGTF to accomplish its mission. The outward edge or boundary of the vital area is always the reference point in applying destruction-in-depth principles. There may be one or more vital areas, depending on the scope of the operation. The probable method of air delivery, the anticipated weapons to be used by the enemy, and an overall standoff range by which enemy air attacks must be destroyed are examined in determining and designating the vital area. The vital area corresponds with designated Air Defense priorities.

b. Destruction Area.

The destruction area is an area in which it is planned to destroy or defeat the enemy airborne threat. It begins at the edge of the vital area. The size of the destruction area will depend upon the situation; however, the goal of every air defense system should be to make the destruction area as large as possible. The three factors which normally determine the size of the destruction area are the capabilities of the air defense weapons system, engagement sequence, and surveillance capabilities. The destruction area is normally divided into four geographical subdivisions: the missile engagement zone, crossover zone/line, fighter engagement zone and base defense zone. The missile engagement zone is that geographical division of the destruction area where surface-to-air missiles have primary responsibility for destruction of airborne targets. It is normally established to include the maximum range of the surface-to-air missile system. The crossover zone/line is that area in which a target normally ceases to be an air intercept target and becomes a surface-to-air missile target. The use of a crossover zone/line may not be necessary with aircraft utilizing INS manning the FEZ. The fighter engagement zone is that part of the destruction area in which interceptor aircraft have the responsibility for destroying airborne targets. The base defense zone is an air defense zone established around an air base and limited to the short range air defense weapons system defending that base. In the joint arena, the terms air intercept zone, crossover point and missile intercept zone may be used to describe the destruction area.

c. Surveillance Area.

The surveillance area is the area in which air search, detection, and tracking are accomplished. It must extend beyond the destruction area to allow enough time for warning and identification so that reaction time will permit engagement as the target reaches the destruction area. This surveillance area is not coincidental with the destruction area as it is not limited by intercept positive control restrictions. Further, the destruction area is oriented totally toward the assigned air defense sector of responsibility, while the surveillance area might extend into another air defense sector. Special visual zones in specific avenues of approach may be used beyond the vital area or surrounding installations to further supplement surveillance coverage. The surveillance area must be large enough to provide maximum reaction

time and a maximum number of engagements and destruction with minimum penetration of the vital area.

2. Mutual Support.

This concept involves the simultaneous engagement of a target by multiple elements of the same type weapon. In this way, the MAGTF increases the probability of preventing the penetration of the vital area by hostile aircraft or missiles. Proper location and/or employment of assets ensures that each target is within range of several AAW elements. This integrated and overlapping pattern of mutual support and continuity of engagement minimizes any reduction in effectiveness of the AAW system resulting from the loss of one or more of its elements.

3. Centralized Command and Decentralized Control is the third principle of AAW and offers the best means of achieving economy of forces while minimizing reaction time and vulnerability to losses. Coordinated operations and economy of force require centralized command. To achieve a system that has minimum reaction time, maximum damage resistance, and inherent self-sufficiency requires the capability to function under decentralized control.

G. The Anti-air Warfare System.

Successful accomplishment of AAW requires that the total capability of the MAGTF be merged into a single, flexible AAW system. This system must be capable of operating independently or as an integral part of the overall amphibious task force or joint task force AAW system. An effective AAW system integrates all available AAW assets and requires that the tasks of surveillance, control, and weapons employment be performed.

1. Surveillance.

This is concerned with detecting, locating, and identifying hostile targets on the ground and in the air and transmitting this information to a control agency.

2. Control.

This is the function of directing and coordinating the employment of weapons systems involved in destroying the enemy air capability. The AAW system should also provide the means to maintain positive control over friendly air support operations to prevent mutual interference in the accomplishment of missions.

3. Weapons Employment.

This involves the effective utilization of assets to destroy or reduce the enemy's capability for an air attack.

4. Over the years, equipment and procedures have evolved to ensure that the required degree of air superiority can be attained. The Marine Air Command and Control System (MACCS) is capable of integrating all AAW assets into an effective air defense system. It permits centralized coordination and supervision of air operations at the highest level, but also has the flexibility to permit decentralized control by subordinate agencies so that immediate threats can be engaged.

III. Summary

- A. AAW is everyone's job, if we are to achieve the required degree of air superiority. In combat, one of the major factors affecting our success is the enemy threat. Our ability to cope with this ever changing threat can only be improved through training. If our AAW doctrine is to be sound, we must spend more time planning and integrating our tactics.

CHAPTER THREE

ASSAULT SUPPORT

Lesson Purpose:

To acquaint the reader with the function of assault support, and examine the missions, tasks and considerations for employment of each assault support asset.

References:

- (a) FMFM 5-1, Marine Aviation
- (b) FMFM 5-30, (Coordinating Draft) Assault Support
- (c) FMFM 5-40, Offensive Air Support
- (d) FMFM 5-41, Close Air Support/Close In Fire Support
- (e) FMFM 6-21, Tactical Fundamentals of Helicopterborne Operations

I. Introduction

A. Assault support provides the MAGTF commander the ability to concentrate his strength against selected enemy weaknesses using speed and surprise. It provides operational and tactical mobility as well as logistics support to the MAGTF. The MAGTF commander bases his decision about the extent and use of assault support on the following METT-T considerations:

- MAGTF's mission and concept of operations.
- The enemy's capability to interrupt movement of assault support assets.
- The effect of terrain and weather on assault support missions.
- Helicopter availability and lift capability.
- Time available for planning, rehearsal and briefing.

The MAGTF commander uses assault support to focus combat power at the decisive place and time to achieve local combat superiority. Using assault support, the commander can rapidly concentrate forces or redeploy those forces as necessary. It allows him to apply and sustain combat power and strike the enemy where he is unprepared. This function comprises those actions required for the airlift of personnel, supplies and equipment into or within the battle area by helicopters or fixed wing aircraft. These are the general categories of assault support:

1. Combat assault operations

2. Aerial delivery
 3. Aerial refueling
 4. Air evacuation
 5. Tactical Recovery of Aircraft and Personnel (TRAP)
 6. Air logistical support
 7. Battlefield illumination
- B. Assault support operations may be tactical, logistic or administrative in nature. As with any operation conducted by the MAGTF, assault support requires detailed, coordinated and concurrent planning at all echelons to increase operational efficiency and the chances for success.

II. Body

A. Helicopter Missions and Tasks.

Marine helicopters provide air mobility of personnel, supplies and equipment, combat utility support, close air support and other air support for the landing force during ship to shore movement and within the objective area during subsequent operations ashore. Tactical missions generally consist of helicopterborne assaults to seize critical terrain, isolate enemy formations, attack an enemy's flank/rear or conduct raids or patrols. Administrative and logistical missions include supply or resupply of troops, movement of equipment, messenger and liaison service, and casualty and prisoner of war evacuation. We will now look at the specific missions of the different helicopter squadrons.

1. Marine Medium Helicopterborne Squadron (HMM: 12 CH-46E).

The HMM squadron, operating medium lift helicopters, is organized to conduct operations as an entire squadron. This is the mainstay of the Marine Corps troop lift capability.

a. Mission.

The mission of the HMM is to provide assault support of combat troops, supplies and equipment during amphibious operations and subsequent operations ashore.

b. Tasks.

- (1) Provide combat assault support of troops, supplies and equipment during amphibious operations and subsequent operations ashore.
- (2) Conduct assault support for evacuation operations and other maritime special operations.
- (3) Provide support for mobile forward arming and refueling points (FARPS).
- (4) Provide airborne control and coordination for assault and assault support operations.

- (5) Maintain a self-defense capability to counter ground-to-air and air-to-air threats.
- (6) Maintain the capability to operate from amphibious shipping, other floating bases, and austere shore bases as required.
- (7) Maintain the capability to deploy and conduct extended range operations, employing auxiliary internal aircraft refueling (appropriate assigned aircraft).
- (8) Maintain the capability to operate at night, in adverse weather, and under instrument flight conditions at extended ranges.
- (9) Augment local search and rescue (SAR) assets and provide aeromedical evacuation of casualties from the field to suitable medical facilities or other aeromedical aircraft.
- (10) Perform organizational maintenance on assigned aircraft in all environmental conditions.

2. Marine Heavy Helicopter Squadron (HMH: 16 CH-53E or 8 CH-53D).

The HMH squadron, operating heavy lift helicopters, is organized to conduct operations as either an entire squadron or in detachments operating under the control of another command element.

a. Mission.

The mission of the HMH is to provide assault support of equipment, supplies and combat troops during amphibious and subsequent operations ashore. This is the only heavy lift asset for the Marine Corps.

b. Tasks

- (1) Provide combat assault support of heavy weapons, equipment, supplies, and troops. Movement of heavy weapons, equipment, and supplies is the primary function, and troop assault is secondary.
- (2) Conduct tactical retrieval and recovery operations for downed aircraft, equipment, and personnel (TRAP).
- (3) Conduct combat assault and assault support for evacuation operations and other maritime special operations.
- (4) Provide support for mobile forward arming and refueling points either in the form of a Rapid Ground Refueling (RGR) platform or resupply for an established FARP.
- (5) Augment local search and rescue (SAR) assets and provide aeromedical evacuation of casualties from the field to suitable medical facilities or other aeromedical aircraft.

- (6) Provide airborne control and coordination for assault support operations.
- (7) Maintain a self-defense capability to counter ground-to-air and air-to-air threats.
- (8) Maintain the capability to operate from amphibious shipping, other floating bases, and austere shore bases as required.
- (9) Maintain the capability to deploy and conduct extended range operations, employing auxiliary internal aircraft refueling (appropriate to assigned aircraft)
- (10) Maintain the capability to operate at night, in adverse weather, and under instrument flight conditions at extended ranges.
- (11) Perform organizational maintenance on assigned aircraft in all environmental conditions.

1. Marine Light/Attack Helicopter Squadron (HMLA: 18 AH-1W/9 UH-1N).

The HMLA squadron, operating both utility and attack helicopters, is organized to conduct operations as either an entire squadron or in detachments operating under the control of another command element.

- a. Mission. The mission of the HMLA is to provide combat assault helicopter support and attack helicopter fire support and fire support coordination for aerial and ground forces during amphibious operations and subsequent operations ashore. Support is provided in relation to specific aircraft tasks.

b. Tasks

(1) Specific Utility Helicopter Tasks

- (a) Provide an airborne command and control platform for command elements.
- (b) Augment local search and rescue (SAR) assets and provide aeromedical evacuation of casualties from the field to suitable medical facilities or other aeromedical aircraft.
- (c) Conduct combat assault and assault support for evacuation operations and other maritime special operations.
- (d) Maintain an offensive weapons capability for air-to-ground threats and self-defense capability for air-to-air threats.

(2) Specific Attack Helicopter Tasks (Offensive Air Support)

- (a) Conduct point target/anti-armor operations.
- (b) Conduct anti-helicopter operations.

- (c) Provide point and limited area air defense to counter threat aircraft.
- (d) Conduct armed and visual reconnaissance.
- (e) Augment local search and rescue assets.

(3) Combined Attack/Utility Helicopter Squadron Responsibilities and Tasks

- (a) Provide armed escort, airborne control and coordination for vertical assault support operations.
- (b) Control, coordinate, and provide terminal guidance for supporting arms to include offensive air support, artillery, mortars, and naval surface fires.
- (c) Provide fire support and security of forward and rear area forces.
- (d) Maintain the capability to operate from amphibious shipping, other floating bases, and austere shore bases as required.
- (e) Maintain the capability to operate at night, in adverse weather, and under instrument flight conditions at extended ranges.
- (f) Perform organizational maintenance on assigned aircraft in all environmental conditions.

A. Fixed Wing Missions and Tasks.

Fixed wing operations contribute to the support of MAGTF in a manner similar to helicopters. Fixed wing aircraft are employed to deliver troops, equipment and supplies to area beyond the range and lift capacity of the helicopter. They also provide medical evacuation, airborne command and control, illumination and inflight refueling.

1. Marine Aerial Refueling/Transport Squadron (VMGR: 12 KC-130).

The Marine aerial refueler/transport squadron (VMGR) provides aerial refueling and assault support to the MAGTF. The squadron also provides ground refueling to MAGTF air and ground assets.

a. Mission.

The mission of the VMGR is to provide aerial refueling service in support of Fleet Marine Force air operations and provide assault air transport for personnel, equipment supplies.

b. Tasks

- (1) Provide tactical aerial refueling service to FMF squadrons.
- (2) Provide long range aerial refueling service for air movement of FMF squadrons when other suitable means of aerial refueling services are not readily available.

- (3) Provide assault air transport for air landed and air delivered troops, supplies, and equipment when other suitable means of assault air transport are not readily available.
- (4) Provide an aircraft platform for the airborne DASC command post.
- (5) Provide ground refueling service to aircraft when other suitable means of aircraft refueling are not available..
- (6) Provide air transport service for the evacuation of casualties and noncombatants when other suitable means of transportation are not readily available.
- (7) Within the capability of assigned aircraft and equipment, maintain the capability to:
 - (a) Operate under day, night, and all-weather flying conditions.
 - (b) Operate to/from a logistic air head, advanced base, expeditionary airfield or tactical landing zone in the objective area or battle area.
 - (c) Operate with or without the assistance of airborne, surface or ground controllers.

C. Mission Categories.

Assault support missions are divided into two categories: preplanned and immediate. Both types of missions are executed in response to specific requests by elements of the MAGTF. These requests are usually transmitted on the Tactical Air Request/Helicopter Request net to the TACC/DASC, using the Assault Support Request (ASR) or Joint Tactical Airlift Request (JTAR) format.

1. Preplanned Missions.

Preplanned missions provide, by far, the most economical and efficient use of assets. In order to effectively employ assault support assets, the MAGTF commander must establish priorities and study the needs of the MAGTF. Preplanned missions are requested far enough in advance to allow coordination between the requester, the supporting unit, and fire support/air command and control agencies.

a. Scheduled Missions.

These types of missions are requested in advance and permit detailed mission planning and close coordination with the appropriate MAGTF elements. Scheduled missions are executed at a specific L-Hour or Time on Target (TOT). This type of mission allows pre-mission planning to be conducted well prior to takeoff.

b. On Call Missions.

These types of missions apply to helicopters as well. The critical elements in this category are location and time. Assets must be positioned close enough to provide a timely response. For on-call missions, only the time for execution must be

relayed. Keeping helicopters airborne, awaiting activation, is not an efficient means of reducing response time. However, staging assets (strip alert) at forward operating bases (FOB) or forward arming and refueling points (FARP) will meet this requirement. Good intelligence and proper planning should identify periods of vulnerability and "strip alert" assets can cover these time periods. Recent experience periods of time is counterproductive and ultimately reduces efficiency.

2. Immediate Missions.

Immediate missions are those which arise suddenly and can not be planned, in detail, in advance. They are launched in support of any requesting unit within the MAGTF. In order to efficiently support the immediate needs of MAGTF units, the commander will generally allocate some of his assets to provide an immediate response through the Direct Air Support Center/Helicopter Direction Center (DASC/HDC). The DASC/HDC may divert airborne assets from missions of lower priority or launch them from a FOB or FARP in response to an immediate request. Normally, very little detailed planning can be accomplished in advance of these missions. Therefore, the request must include the same detailed information provided in a preplanned request.

D. Asset Allocation.

Allocation of assault support assets will be determined by a number of factors. They normally include aircraft availability, lift requirements, aircraft capabilities, threat analysis, escort and fire support requirements, time, space and logistical requirements, and unit proficiency level. When determining asset allocation, the following should also be considered:

1. Ground Considerations.

Responsibilities for the GCE receiving assault support are:

- a. To maintain tactical integrity of units, insofar as loading space allows, for commitment in the objective area.
- b. To properly prepare and identify equipment to be air transported.
- c. To determine which equipment is to be assigned to rear and follow-up echelons.
- d. To prepare appropriate air movement plans and forms according to the capabilities of the aircraft involved.
- e. To establish the priority of loads and movement considering available aircraft and the intended tactical employment once landed.
- f. To ensure the accomplishment of the specialized training required for embarkation, aircraft ditching, in-flight safety, and unloading.

2. Air Considerations.

Responsibilities for the ACE are:

- a. To provide troop units with aircraft availability and capacities according to type.

- b. To assign aircraft serials and schedules for takeoffs and landings in accordance with identified troop unit mobility.
- c. To provide adequate ground handling for securing equipment in the marshalling area.
- d. To provide for in-flight safety and other advisory services where aircraft are concerned.

E. Employment Considerations

1. Direct Support vs. General Support.

Assault support assets are usually employed in general support of the MAGTF. However, consideration can be given to direct support of MAGTF elements for a particular phase of an operation or a specified period of time. There will be trade-offs to this type of support. A major planning factor will be logistical support for the aviation assets. Generally speaking, direct support will involve frequent movement and operation from austere sites. Logistical support will be a constraining factor. However, in certain scenarios, direct support may be the most responsive means of providing aviation support to elements of the MAGTF.

2. General Helicopter Characteristics.

The ground commander does not normally have a detailed knowledge of helicopter characteristics. Aviation personnel, on the staff, offer a source of specific information which might become necessary. In any event, the ground commander should possess a general awareness of fundamental characteristics and the effect of the environment on helicopter operations (Fig 3-1).

a. Capabilities.

Helicopters generally possess the following capabilities:

- (1) Vertical ascent/descent into and out of clear but unprepared landing areas or loading and unloading.
- (2) Load or discharge troops and cargo while hovering.
- (3) Achieve a degree of cover and concealment by use of terrain features and vegetation.
- (4) Provide significant speed, mobility, and flexibility of movement in the battle area.
- (5) Perform shuttle services, bypassing obstacles insurmountable to ground vehicles.
- (6) Operate from all types of aircraft carriers as well as platforms upon or alongside amphibious ships.
- (7) Operate under conditions of low ceilings and reduced visibility or during periods when surf conditions prohibit waterborne movement by small craft.

- (8) Transport supplies rapidly to ground units.
 - (9) Load troops and cargo from ships underway.
 - (10) Transport personnel and cargo to areas inaccessible by other means.
- a. Limitations. The following limitations apply to helicopters:
- (1) Greater logistic support required in terms of fuel, maintenance, and support personnel than with other means of support.
 - (2) Noise or rotor wash may compromise position or create difficulty in communications and vision.
 - (3) Operations are restricted under icing conditions, heavy wind, and periods of poor lunar illumination.
 - (4) Lift capabilities are directly affected by altitude, humidity, and temperature.
 - (5) Internal loads require careful calculation for safe weight and balance.
 - (6) Helicopters are vulnerable to anti-aircraft fire, surface-to-air missiles, and supporting arms and small arms fire of both enemy and friendly forces. Coordination with friendly supporting arms is of paramount importance.
 - (7) Large-scale operations require good visibility, illumination and adequate landing areas.

Type Helicopter	UH-1N	CH-46E/46E*	CH/RH-53D	CH-53E
Mission	Cmd & Ctrl Terminal Ctrl	Troop Lift	Equip/Cargo Lift	Equip/Cargo Lift
Normal Crew (Tactical)	4	4	4	4
Troop Capacity	6	18/8-10(5)	37	37
Maximum Troop Seating Capacity	13	25	55(2)	55(2)
Litter Capacity	6	15	24	24
Combat Radius(nm)	85	80/200	150	250
Endurance (hrs)(4) (Combat Load)	1+30	1+30/3+30	2+30	4+00
Payload (lbs)(5)	2000	4000/2000	8000	20000

Weapons	2.75 rockets GAU-16(.50cal) GAU-17 (7.62mm) M-240(7.62mm)	XM-2118 (.50cal)	XM-218 (.50cal)	XM-218 (.50cal)
Classification	Utility/Light	Medium	Heavy	Heavy

Notes:

- (1) Standard 53D/53E configuration includes two 650 gal aux fuel tip tanks.
- (2) Centerline seats installed.
- (3) 46* represents the CH-46 "Bull Phrog" (increased fuel capacity stub wings).
- (4) Aircraft endurance calculated with normal troop capacity and max fuel. CH-46 "Bull Phrog" troop capacity with max fuel is 10 passengers.
- (5) Payload for a/c with max fuel, optimum atmospheric conditions.
- (6) Max external lift capacity for a 50nm combat radius; 53D: 11000lbs, 53E 32000lbs.

Figure 3-1

3. General Fixed Wing Characteristics.

As with helicopter, the ground commander may not have a detailed knowledge of fixed wing characteristics. Generally, the limited number of Marine transport aircraft available will restrict operations to those conducted in conjunction with amphibious assaults, support of operations ashore or contingency plans established by appropriate commanders.

a. KC-130 Capabilities and Limitations.

- (1) The KC-130 can provide rapid ground refueling (RGR) for both helicopters and AV-8B's at FARPs and forward road sites. A KC-130 can fly 200nm, land on a 4000' dirt or highway strip and give away 45,000 lbs of fuel.
- (2) The DASC(A) is an airborne extension of the MACCS, in particular the ground DASC. It can serve to extend UHF/VHF communications coverage of the C-3 system, provide a limited echelon capability to the DASC and/or conduct DASC functions in a designated sector. The DASC(A) utilizes the UYQ-3A van.
- (3) The KC-130 can work out of unimproved short fields, day or night, utilizing the PPN-119 radar beacon for terminal guidance. The PPN-119 also provides terminal guidance for night or bad weather cargo and para-ops.
- (4) In a permissive environment, the KC-130 can be used to deliver flares for battlefield illumination.
- (5) The KC-130 will require standoff or dedicated fighter escort in the tanker role if threat dictates.
- (6) The KC-130 can provide up to 58, 000lbs fuel (giveway) during aerial refueling operations.

III. Summary

We have presented the assets which perform the assault support function of Marine Aviation. In closing, George C. Marshall said, " When the smoke cleared away, it was the man with the rifle who settled the final issue of the final issue of the field." Marine Corps assault support is the means to get that rifleman to the fight!

CHAPTER FOUR

CONTROL OF AIRCRAFT AND MISSILES

Lesson Purpose:

To introduce the reader to the Marine Air Command and Control System.

References:

- (a) Joint Pub 3-02, Doctrine for Amphibious Operations
- (b) FMFM 5-1, Marine Aviation
- (c) FMFM 5-41, Close Air Support and Close-In Fire Support
- (d) FMFM 5-50, Anti-air Warfare
- (e) FMFM, 5-52, Employment of the Low Altitude Air Defense Battalion
- (f) FMFM 5-60, Control of Aircraft and Missiles
- (g) FMFM 7-1, Fire Support Coordination

I. Introduction

- A. Control of aircraft and missiles encompasses the coordinated employment of facilities, equipment, communications, procedures, and personnel in order to enable the ACE commander to plan, direct, and control the efforts of the ACE to support the MAGTF.
- B. The agencies of the MACCS, as depicted below, are essential to the conduct of the control of aircraft and missiles. Additionally, although the TACP and other airborne controllers are not part of the administrative chain of the Marine Air Control Group, they are considered to be integral elements of the MACCS.

*Marine Wing Communications Squadron (MWCS) is the agency which ties the MACCs Together to include ACE operations.

II. Body

- A. Introduction and Phase-In of the MACCS Elements.

Having commenced the amphibious landing, a description of the phase-in of the MACCS elements and the interrelationship which will exist between the Navy agencies afloat and our MACCS agencies arriving ashore is in order. Also, a brief description of those agencies in terms of capabilities, functions and equipment will be addressed. We will begin with the Low Altitude Air Defense (LAAD) elements coming ashore.

- 1. LAAD sections may initially come ashore with the Ground Combat Element (GCE), in direct support, providing coverage of the maneuver forces. Notionally, a LAAD battery consisting of three platoons would be assigned to a MEF(Fwd) - nine sections of five teams each -

with the firing potential for 180-270 Stinger missiles (load out for each team is normally 6 missiles) plus reserves. LAAD sections supporting the assault may collocate and coordinate their activities with the FAC to deconflict supporting friendly OAS aircraft from potential threat aircraft. These sections will be controlled by their platoon commanders located in the FSCC/DASC. The LAAD commander or his representative would provide hostile early warning alerts from the Tactical Air Control Center (TACC) afloat. As the MAGTF foothold is expanded, Stinger sections would also operate in general support of the MAGTF, providing area coverage for vital areas such as airfields, port facilities or beach support areas important to the amphibious operation.

- a. The mission of LAAD is to provide close-in, low altitude air defense protection of the MAGTF.
 - (1) Stinger specifications
 - (a) Wt - 34.51lb
 - (b) Length - 60"
 - (c) Guidance - IR/UV Homing
 - (d) Max Alt - 10,000'
 - (e) Min Alt < 500'
 - (f) Max Spd - MACH 2+
 - b. LAAD is an integral part of the integrated air defense system, covering areas that other elements of the air defense system are unable to defend.
2. The next agency ashore would most likely be the Fire Support Coordination Center (FSCC). Although the FSCC is not part of the MACCS, its inclusion in this discussion is significant because of the relationship between the FSCC and its MACCS counterpart, the Direct Air Support Center (DASC).
 - a. There are FSCC's at every level of battalion-size and larger forces. In short, the mission of the FSCC is to provide coordination of supporting arms: ground artillery, surface fire support, and air assets.
 - b. The battalion FSCC coming ashore with the initial assault wave would immediately assume a limited degree of authority to coordinate supporting arms against targets of opportunity. Until the senior level FSCC is phased ashore in subsequent assault waves and control and coordination of supporting arms is passed ashore, the Supporting Arms Coordination Center (SACC), onboard the LPH/LHA will exercise overall control and coordination of supporting arms assets. To aid in air support coordination, the DASC will come ashore and locate with the senior FSCC.
3. The DASC is the principle air control agency responsible for the conduct of tactical air and assault support operations directly supporting the ground forces. The DASC answers directly to the Tactical Air Control Center (TACC afloat) when control is afloat or the Tactical Air Command Center (TACC ashore) when control is ashore.

- a. Involved with all six functions of Marine aviation with regard to their interface with the GCE, the DASC is closely associated with assault support and offensive air support operations.
 - b. Keep in mind that the DASC does not have a radar and as such, must rely on procedural control measures. Previously agreed upon and promulgated control points, altitudes, airspeeds, and other routing measures as well as positive single channel communication with aircraft will be used in order to move aircraft from one location to another in support of the ground forces.
 - c. Based on the level of air activity as well as the size of the GCE, the DASC will be task organized, and may take the form of radio/operations configured HMMWVs, a truck mounted or KC-130 configured AN/UYQ-3A, or the IDASC (AN/TSQ-155).
 - d. The DASC - FSCC interface is crucial to the integration of air support with other supporting arms. The DASC does not receive copies of the pre-planned TARs/ASRs since it is not involved in formulating the Air Tasking Order (ATO) or FRAG. The DASC is responsible, however, for executing the ATO by adjusting pre-planned schedules or diverting airborne assets at the request of the GCE. Further, the DASC is the agency responsible to locate and assign assets for immediate air support requests. Launch authority for offensive air support and assault support aircraft may be delegated to the DASC by the Senior Watch Officer (SWO) within the TACC to expedite the fulfillment of air support requests.
4. As elements of the MACCS continue ashore and the MAGTF's vital area continues to enlarge, LAAD air defense will most likely be augmented by HAWK firing platoons.
 - a. The first elements of the HAWK firing platoon may echelon to their initial firing positions ashore. The element consists of a Battery Command Post (BCP), Continuous Wave Acquisition Radar (CWAR), High Powered Illumination (HPI) radar, and launchers. Although limited in its surveillance and firepower (due to the CWAR's 10,000 ft search ceiling and single HPI fire control radar), the fire unit can provide an all-weather, day or night air defense capability to the landing force against low altitude air attacks. The remaining Pulse Acquisition Radar (PAR) and HPI of the firing platoon are subsequently moved ashore, augmenting acquisition to medium altitude and increasing the unit's engagement capability.
 - b. An additional HAWK firing platoon is landed as soon as possible to improve the air defense system ashore. The platoon will further extend radar coverage and increase firepower (additional HPIs), providing balanced coverage and weighted firepower toward expected enemy air attack directions. All reporting will be to the Sector Anti-air Warfare Commander (SAAWC), Seaward, aboard ship over the Anti-air Warfare Coordination and Reporting (AAW C&R) net, until the Tactical Air Operations Center (TAOC) comes ashore to assume responsibility as Sector Anti-air Warfare Coordinator (SAAWC) for the landward section.
 4. About the same time as the initial HAWK firing platoon arrives, an Early Warning/Control (EW/C) capability may be deployed in the form of a TPS-63 radar and AN/TYQ-23 Tactical Air Operations Module (TAOM) in order to augment the naval force's radar

surveillance picture over land and provide cueing to USMC Ground Based Air Defense (GBAD). An EW/C is usually the first element of the TAOC to come ashore.

- a. The mission of the EW/C is primarily surveillance, detection and identification of air targets. The EW/C can be assigned to control the interception of hostile air targets, provide navigational assistance to friendly aircraft or provide cueing to HAWK/LAAD. The overriding consideration is that this is a limited capability and cannot perform all the tasks of a full TAOC.
 - b. Due to limited assets, AAW control will never be phased ashore to the EW/C except in specified sectors for short periods. As with the HAWK, all reporting responsibilities will be to the AAWC aboard ship.
6. The ATC detachment is the primary terminal air control agency within the MACCS. The role of the ATC detachment is to provide continuous, all-weather radar/non-radar approach, departure, enroute and tower Air Traffic Control services within assigned controlled airspace to friendly aircraft. The ATC detachment accomplishes this role by supporting the MAGTF with up to four ATC detachments at four main air bases and/or up to four Marine ATC Mobile Teams (MMT) at four air facilities/air sites. The ATC detachment will be integrated into the air defense system as appropriate.
- a. Each ATC detachment is capable of providing all-weather Air Traffic Control services. Typically control of MAGTF aviation assets within assigned airspace is coordinated between the ATC detachment and the TAOC under the cognizance of the TACC. Each ATC detachment may provide a single MMT. Employment of the MMT may cause some degradation to Air Traffic Control services normally provided by the ATC detachment.
 - b. Normally, an MMT will be composed of four Marine air traffic controllers and two technicians. MMT's can provide continuous non-radar air traffic control services for up to 72 hours. During amphibious operations, MMT's may be established ashore initially and eventually be built up into full ATC detachments. The equipment an MMT may use at an air facility/air site is scenario dependent and may include the Remote Landing Site Tower (RLST) system, and the Marine Remote Area Approach and Landing System (MRAALS).
 - (1) The RLST is a mobile system mounted in a HMMWV. This system features an extensive communications package and an organic Global Positioning System (GPS).
 - (2) The AN/TPN-30A MRAALS is a lightweight microwave landing system which provides azimuth and DME information out to a 40 nautical mile radius, and glidescope/localizer information within 10 nautical miles for appropriately equipped aircraft.
 - c. The ATC detachment's equipment for a FOB main air base includes the Marine Air Traffic Control and Landing System (MATCALs), NAVAIDs, control tower, and mobile power.
 - (1) Marine Air Traffic Control and Landing System (MATCALs). The ATC detachment at a main air base, with MATCALs, provides continuous radar

approach, departure, and enroute air traffic control services within its assigned airspace out to a radius of 60 nautical miles. Consisting of three subsystems, MATCALs collects, evaluates and displays data, makes control decisions and disseminates information. The three subsystems of MATCALs are:

- (a) Air Traffic Control Subsystem (ATCS) is a two-dimensional (60 nautical mile) surveillance radar. The ATCS is identification, friend or foe (IFF) capable. Radar and IFF information are processed and forwarded to other agencies via TADIL-B and voice.
 - (b) The All-Weather Landing Subsystem (ALS), operating in a linear mode, is a 10 nautical mile, phased array, precision approach radar which provides Automatic Carrier Landing System (ACLS) Mode I, Mode II, and Mode III approach services for FOB all-weather landings. ACLS data exchange with appropriately configured aircraft is accomplished via TADIL-C.
 - (c) Control and Communication Subsystem (CCS). The CCS functions as a collection point for radar data produced by the ATCS and the ALS. The CCS, having a single or dual shelter capability, provides operator Processor Display Set (PDS) consoles, each with its own communications capability. The PDS consoles serve as operational workstations for the crewmembers. In addition to the intercom and switchboard circuits, the CCS provides access to high frequency (HF), ultrahigh frequency (UHF) AM, and very high frequency (VHF) AM/FM circuits. The CCS has the capability to automatically exchange certain elements of command, tactical intelligence, and situation data with other ATC detachments, TAOCs and the TACC via TADIL-B.
- (2) NAVAIDS. The ATC detachment at a main air base will also possess a dual-channel Tactical Aid to Navigation (TACAN) with Distance Measuring Equipment (DME) NAVAID. This TACAN with DME provides standard high altitude navigational/position information as well as non-precision approach information to aircrews.
 - (3) Control Tower. The control tower contains the radios and equipment necessary to provide control of friendly aircraft and ground personnel in and around a main air base.
7. As the force beachhead is expanded and additional units of the MACCS are phased ashore, the EW/C will be built-up to a full TAOC in order to provide surveillance, weapons control, and traffic management of the ACE's aviation assets.
 - a. The TAOC is characterized by three surveillance radars, one TPS-59, and two TPS-63s. It also has operations modules containing the scopes, communications and tactical data links necessary to provide surveillance, weapons control, and airspace/traffic management of its assigned sector.
 - b. With the TAOC established ashore, the commander of the landing force (CLF) may declare that he is prepared to assume AAW responsibilities in a designated sector.
 8. The next element ashore, the MAGTF TACC is designated a Tactical Air Direction Center (TADC) until the MAGTF commander assumes control of the tactical air operations in the

Amphibious Objective Area. The TADC is a function which is established for a given period of time and for a specified purpose; usually that of coordinating air operations in a given area of responsibility (Landward sector of AOA). While this TADC is being built, the Navy still retains overall control of our aviation assets through the TACC afloat.

9. Once all control functions have been passed ashore to the MACCS, the command of the MACCS will also shift ashore. At that point, the TADC becomes a Tactical Air Command Center (TACC).
10. The role of the TACC is to function as the senior MAGTF air command and control agency and to serve as the operational command post of the ACE commander or his designated representative; the Senior Watch Officer (SWO). The SWO can direct, supervise, control, and coordinate all MAGTF tactical air operations.
11. The Navy TACC then reverts to a subordinate TADC status and proceeds with their tasking. All of this movement ashore has taken some time. Typically, establishing a complete MACCS as described may take from 18 - 21 days. This could increase if severe opposition to the amphibious landing is encountered.
12. Marine Wing Communications Squadron (MWCS). The MWCS is the primary communication organization within the Marine Aircraft Wing (MAW), and is a subordinate squadron within the Marine Air Control Group (MACG).
 - a. The Marine Wing Communications Squadron (MWCS) is tasked to install, operate, and maintain expeditionary communications for the ACE of a MEF.
 - b. MWCS 28/38 consists of a Headquarters and two MWCS Detachments. WCS-18 consists of a Headquarters element and one MWCS Detachment. Each detachment is made up of a Detachment Headquarters and six operational platoons.
 - (1) At the present time, HQMC has not officially promulgated a mission statement or concept of employment. The concepts presented here are presently under evaluation by the MWCS in the FMF. The following missions will be fulfilled by the MWCD, regardless of it's organization.
 - (a) Assist in the systems planning and engineering of ACE communications for command and control of the MAGTF aviation assets.
 - (b) The MWCS is tasked with providing Communication Control (COMM-CON) for the ACE.
 - (c) Provide the senior MAGTF ACE Operations Systems Control Center (OSCC) for the ACE communication system.
 - (d) Provide the senior airfield OSCC at up to two airfields per detachment.
 - (e) Provide digital backbone communication in support of the ACE, CE, expeditionary airfields, and the primary agencies of the MACCS for up airfields, excluding LAAM Bn links.
 - (f) Provide tactical automated switching and telephone services for the ACE CE and

Tactical Air Command Center (TACC) at on airfield and up to three additional airfields as required.

- (g) Provide electronic message distribution for the ACE CE, primary MACCS agencies, and tenant units at up to four airfields.
- (h) Provide external radio communication support for ACE operation as required.
- (i) Provide Deployed Wide Area Network (DWAN) and Deployed Local Area Network (DLAN) server support for the ACE CE and primary MACCS agencies.
- (j) Provide calibration and repair of all ground common Test Measurement Diagnostic Equipment (TMDE) within the ACE.
- (k) Provide cryptographic repair services for all ground common and MACCS assigned communication security equipment within the ACE.
- (l) Provide 3d-echelon maintenance support for ground common communication/electronics equipment held by MWSG units.

III. Summary

- A. The MAGTF is task organized with the MACCS agencies necessary to perform the six functions of Marine aviation. They are organized and equipped to support amphibious operations and subsequent operations ashore. The employment of Fleet Marine Forces requires the close integration of air and ground operations to succeed on the modern battlefield.

CHAPTER FIVE

ELECTRONIC WARFARE

Lesson Purpose:

To expose the reader to electronic warfare as a function of Marine Aviation.

References

- (a) Joint Pub 1-02, DOD Dictionary of Military and Associated Terms
- (b) FMFM 3-51, Electronic Warfare

I. Introduction

- A. Electronic warfare (EW) is one of the most misunderstood functions of Marine Aviation. Electronic warfare is an essential element of combat power. Its contribution lies in exploiting enemy weakness, protecting freedom of action, and reducing security and communication vulnerabilities. A modern military force depends on electronics for command and control of forces and employment of weapon systems. Because of this dependence on electronic devices, Marine forces, as well as enemy forces, are vulnerable to actions which can reduce the effectiveness of these devices or gain intelligence from them. An electronic warfare system that enables the commander to degrade the effectiveness of enemy electronic activities is a powerful weapon that can be used to support both offensive and defensive operations. Hence, electronic warfare could be the critical factor in deciding victory or defeat.

II. Body

A. Electronic Warfare.

Electronic warfare is defined as, "Any military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or to attack the enemy." In plain language, electronic warfare is denying the enemy effective use of the electromagnetic spectrum while retaining its friendly use. Electromagnetic energy is, "Forms of radiant energy such as radio waves, infrared radiation, light waves, X-rays, gamma rays and cosmic rays."

By virtue of the above definitions we all, regardless of MOS, participate in EW because we all employ one or more forms of electromagnetic energy in the conduct of our assigned missions.

B. Divisions of Electronic Warfare

1. There are three basic divisions of EW:

- a. Electronic Warfare Support (ES).

- "That division of EW involving actions taken under direct control of an operational commander to search for, intercept, identify, and locate sources of radiated electromagnetic energy for the purpose of immediate threat recognition." Thus, ES

provides a source of information required for immediate decisions involving electronic countermeasures, electronic counter-countermeasures, avoidance, and tactical employment of forces. How does this relate to you when flying and you get strobes on your RHAW gear indicating that you might be targeted? Depending on the scenario, your reaction to the strobes will be anything from looking out in that direction to a SAM break. This is one way of utilizing ES in a tactical aircraft, and shows why EW is important to all aviators, regardless of aircraft type.

b. Electronic Attack (EA).

"That division of EW involving the use of electromagnetic or directed energy to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability." There are two components of EA:

- (1) Actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception.
- (2) Employment of weapons that use either electromagnetic or directed energy as their primary destructive mechanism (lasers, RF weapons, particle beams).

c. Electronic Protection (EP).

"That division of EW involving actions taken to protect personnel, facilities, and equipment from any effects or friendly or enemy employment of electronic warfare that degrade, neutralize, or destroy friendly combat capability."

- (1) Preventive Measures. Actions taken during training, planning, and establishment of communication and non-communication electronics systems. Examples of this would be: Have Quick radio, brevity, code words, blinking, and EA training.
- (2) Remedial Measures. Countermeasures taken when confronted with electronic countermeasures. Examples of this would be: localize the jammer (ES) and then engage it, switching frequencies, burn through, etc..

III. Summary

- A. It should be readily apparent that, regardless of MOS, everyone is involved in electronic warfare. Electronic warfare cannot take or hold ground, destroy a tank or aircraft, or repel an attack. It can, however, confuse, deceive, delay, disorganize, and target the enemy when integrated into the concept of operations. When all other considerations are equal, victory may go to the force that effectively integrates electronic warfare into their concept of operations.

CHAPTER SIX

OFFENSIVE AIR SUPPORT

LESSON PURPOSE:

To review the tasks, functions, and assets associated with USMC offensive air support (OAS) operations.

REFERENCE(S):

- (a) FMFM 1, Warfighting
- (b) FMFM 5-40, Offensive Air Support
- (c) FMFM 5-41, CAS and CIFS
- (d) FMFM 5-42, DAS
- (e) FM 34-130, Intelligence Preparation of the Battlefield

I. Introduction

- A. Offensive Air Support is defined as, "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 his military force." This presentation will serve to familiarize you with OAS and the MAGTF's potential application of its capabilities.

II. Body

A. History.

Command of the battlefield has been a goal that commanders throughout history have strived to attain and maintain. With the introduction of "flying machines", this battlefield now included the airspace over it. Balloons were first used extensively in combat for observation and artillery direction during the Civil War. From that time on, commanders have used aircraft to influence the battlefield and achieve their objectives. Attack aviation was initiated in earnest during the First World War, where sustained efforts in Armed Reconnaissance and Strategic bombing were made by the major participants. From the initial application in 1914 to the present, offensive air support has increased in importance, and in some examples, constituted the deciding factor between victor and vanquished.

B. OAS Functions

1. Combined Arms.

The MAGTF's inherent combat power is enhanced by the concept of combined arms. Combined arms is the full integration of arms in such a way, that in order to counteract one, the enemy must make himself more vulnerable to another. To accomplish this, a task

organized MAGTF will integrate its aviation assets with its organic fire support assets, to effectively support the MAGTF scheme of maneuver.

2. OAS operations apply firepower against our opponents' war making and sustaining capabilities. This firepower may be applied for one of two functions; either the neutralization or destruction of the assigned target(s).

- a. Destruction.

Destruction missions destroy enemy forces, equipment, supplies, and installations.

Destruction of the target may be difficult to achieve contingent upon the threat, target composition, MAGTF aviation assets and available weapons.

- b. Neutralization.

Neutralization missions render areas, weapons, or enemy forces ineffective for a specified time. Neutralization may be applied when we can not afford to dedicate the assets to destroy our opponent, or when we decide that the most efficient application of force would be to "shut him down" for a set period of time, rendering the requirement for destruction unnecessary.

3. The MAGTF commander utilizes OAS throughout the operational spectrum to assist in attaining MAGTF objectives. "The MAGTF commander shapes the battlefield by focusing combined arms against critical enemy vulnerabilities. The destruction or neutralization of these targets creates the conditions for decisive action. The firepower, mobility, and flexibility provided by OAS are critical in establishing favorable conditions for deep, close, and rear operations."

C. OAS categories

1. USMC OAS operations are divided into two major categories; CAS (Close Air Support) and DAS (Deep Air Support).

- a. Deep Air Support.

Deep air support can be conducted in the form of either armed reconnaissance or air interdiction. The MAGTF commander utilizes DAS to shape the battlefield. DAS is defined as "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." Contrary to popular opinion, DAS can be conducted on both sides of the FSCL. When DAS is required short of the FSCL, coordination with the friendly forces is required.

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

- (2) Armed Reconnaissance. Armed reconnaissance is defined as "locating and attacking targets of opportunity, i.e., enemy material, personnel, and facilities, in assigned general areas or along assigned ground communication routes, and not for the purpose of attacking specific/located briefed targets." (Joint Pub 1-02)
Given the structural weaknesses in the MAGTF's deep targeting capability,

armed reconnaissance offers the MAGTF commander a capability to address mobile enemy force structure targets enroute to the battlefield.

b. CAS.

CAS is defined as; "air action against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces." (Joint Pub 1-02) The MAGTF commander depends upon CAS to provide a major proportion of his firepower due to the MAGTF's structural deficiencies in artillery support.

D. Mission Classification.

1. The ACE executes OAS missions as either; preplanned or immediate air support. The ACE executes both types of support in response to specific requests.

2. Preplanned missions.

Preplanned missions are either scheduled or on-call. MAGTF/ACE planners will estimate the offensive air support required for different evolutions. With this estimate of anticipated support, OAS assets will be "fragged" to provide support at a specific time or be "on the ready" to provide support when the MAGTF scheme of maneuver requires it. The use of preplanned missions allows the MAGTF commander to manage his limited OAS assets more efficiently.

- a. Preplanned Scheduled.

This type of mission is scheduled to be executed at a specific time. The MAGTF commander may use a scheduled CAS mission to provide support for a planned attack, where the attack pilots have a specific TOT and target. The preplanned scheduled classification is not restricted to CAS missions alone. Air interdiction missions or armed reconnaissance missions may be assigned specific TOTs or TOSs in as preplanned scheduled OAS.

- b. Preplanned On-call.

In many cases on call missions represent the most efficient use of MAGTF OAS assets. On-call missions are preloaded and prebriefed for a particular target array/location and then placed in an appropriate ground/air alert condition. The pilots anticipate a launch based upon their alert status. As the MAGTF order of battle dictates, the alert status will be upgraded, and if required for an attack mission, the aircraft will be launched.

3. Immediate Missions.

Immediate missions can be utilized to meet unexpected OAS requirements. The immediate classification is utilized to meet fire support needs that could not be pre-planned by the ACE planners. The immediate JTAR may be filled by diverting an attack element from a preplanned mission. While the ordnance load may not be tailored to the specific target array, the shock value of the diverted aircraft's ordnance effects may be enough to achieve the desired result. While immediate missions are utilized to cover unexpected needs, the ACE planners must assume that they will be required to cover battlefield contingencies. In this light, ordnance loads should be utilized that cover the majority of expected target types identified in the IPB process.

E. OAS Capabilities and Limitations.

OAS represents a large percentage of the MAGTF's combat power. The MAGTF commander relies upon OAS to attack targets that other supporting arms cannot, due to capability or availability. The MAGTF should integrate the fires of all its assets to achieve a combined arms effect. Historically, the fires provided by attack aviation assets have provided capabilities against targets that the GCE weapons could not address.

1. OAS Capabilities

- a. Variety of attack
- b. Observation
- c. Responsiveness
- d. Flexibility
- e. Radius of action
- f. Firepower and mobility
- g. Accuracy
- h. Morale

2. OAS Limitations

- a. Limited visibility
- b. Weather
- c. Target acquisition
- d. Target identification
- e. Time on station
- f. Radius of action
- g. Communications
- h. Enemy defenses

F. Requirements for Effective OAS.

The concepts/conditions listed below are considered essential to conduct effective OAS. The MAGTF attack aviation assets can conduct OAS operations without one (or several) of these requirements, but the results of our efforts will not be as great as if all were present. Results could be degraded in terms of aircraft survivability, weapons accuracy, and weapons effect.

1. Air superiority
2. Suppression of enemy air defenses (SEAD)
3. Cooperative weather
4. Effective targeting
5. Effective weaponry
6. Capable platforms/sensors
7. Responsive C3
8. Proficient players

G. OAS Assets

1. C3 System.

The MACCS described in the Control of Aircraft and Missiles brief is essential to the successful conduct of USMC OAS operations. It is this system, that ensures that the

required attack aviation assets get to the appropriate customer, in the shortest possible time. Since these agencies were covered in great detail already, we will move on to OAS and the MAGTF's attack aviation assets.

2. OAS Attack Aviation Assets.

The taxpayers have given the MAGTF an attack aviation force with tremendous capabilities. There are 3 different platforms that the ACE may utilize to provide OAS for the MAGTF. These platforms are the AH-1W "Cobra", the AV-8 "Harrier", and the F/A-18 "Hornet". Additionally, the primary terminal control platforms; the F/A-18D and UH-1N may be utilized in OAS operations as "shooters" when not required as a terminal control platforms. We have listed the general capabilities of each of these platforms below.

a. AH-1W Capabilities

- (1) USMC operated: 197
- (2) Airspeed with OAS configuration*

Max Speed	=	170 KIAS
Typical Delivery Airspeed	=	0-170 KIAS
Max. Endurance	=	72 KIAS

- (3) Fuel capacity:

Internal = 2037 lbs

- (4) Endurance with OAS configuration:

Non-tactical	=	2.4 hours
Tactical	=	1.8 hours

- (5) Systems:

FLIR
Laser designator/Range Finder

- (6) Weapons:

Missiles: BGM-71 TOW
AGM-114 Hellfire
AGM-122A Sidearm
AIM-9 Sidewinder

Rockets: LAU-10 (5")
LAU-61 (2.75")

Guns: 20 mm Gun turret
GPU-2A Gun pod

* Typical OAS configuration = 4 Hellfire/4 TOW/750 rnds 20 MM
(or 8 of one)

(7) Communication equipment

VHF/UHF/FM

(8) Survivability equipment

RHAW	=	AN/APR-39 radar detection system
AN/APR-44	=	CW warning receiver
IRCM	=	AN/ALQ-144
Expendables	=	AN/ALE-39

b. AV-8B Capabilities

(1) USMC operated: 180

(2) Airspeed with OAS configuration*

Max Level Speed (SL)	=	500 KIAS
Typical Delivery Airspeed	=	500 KTAS
Max Endurance	=	230 KIAS

(3) Fuel capacity:

Internal	=	7,700
With 2 Drop tanks	=	11,700

(4) Endurance with OAS configuration:

** No external fuel **

Non-tactical (TOS CAS 30 min transit) = 0+50min TOS

Tactical (TOS CAS 30 min transit) = 0+30min TOS

Profiles:

LLL = 140 NM radius

HLH = 280 NM radius

HHH = 380 NM radius

* OAS Configuration for fuel computations:

6 MK-83/DECM Pod/1 AIM 9M/1 AGM-122A/300 Rnds 25MM

(5) Systems:

ARBS Optical and/or Laser tracker (not found in AV-8B Plus II)

Navigation FLIR (Night attack/Radar only)

APG-65 Radar (only Radar aircraft)

(6) Weapons

Bombs: MK-81/82/83

GBU-12/16 Laser Guided Bomb

MK-20 Rockeye/CBU-59 APAM

CBU-72 FAE/CBU-78 Gator

MK-77 Napalm

Missiles: AGM-65E Laser maverick

AGM-65F IR Maverick (Night attack/radar only)

AGM-122A Sidarm

AIM-9M Sidewinder

Guns: GAU-12 25MM

Rockets: LAU-10 (5")

LAU-61 (2.75")

Illum: LUU-2B/B Parachute Flares

(7) Communication equipment

VHF/UHF/FM

(8) Survivability equipment

RHAW: AN/ALR-67 Radar warning receiver

DECM: AN/ALQ-164 DECM Pod

Expendables: AN/ALE-39

c. F/A-18 A/C/D Capabilities

(1) USMC operated: 276

(2) Airspeed with OAS configuration*

Max Level Speed (SL) = 550 KIAS

Typical Delivery Airspeed = 500 KTAS

Max Endurance = 250 KIAS

(3) Fuel capacity:

Internal = 10,800 lbs

With Centerline Drop tank = 12,800 lbs

(4) Endurance with OAS configuration:

Non-tactical (TOS CAS 30 min transit) = 0+55 min TOS

Tactical (TOS CAS 30 min transit) = 0+35 min TOS

Profiles:

LLL = 160 NM radius

HLH = 360 NM radius

HHH = 450 NM radius

* OAS Configuration for fuel computations:

Centerline Fuel Tank/6 MK-83/FLIR Pod/2 AIM 9M/
1 AIM-7/578 Rnds 20MM

(5) Systems:

APG-65 Radar
Navigation FLIR pod (C/Ds only)
Targeting FLIR/laser designator pod (C/Ds only)
Laser Spot Tracker (Pod)

(6) Weapons:

Bombs: MK-82/83/84
MK-20 Rockeye/CBU-59 APAM
CBU-78 Gator/ MK-77 Napalm
MK-82/83/84 Destructors
MK-52/55/56 Bottom Moored Mines
MK-62/63/64/65 Quick strike Mines
Walleye I/II (+ERDL)

Missiles: AGM-65E Laser Maverick
AGM-65F IR Maverick (C/Ds only)
AGM-88 HARM
AIM-7 Sparrow
AIM-9 Sidewinder
AIM-120 AMRAAM (C/Ds only)

Guns: 20MM

Rockets: LAU-10 (5")
LAU-61 (2.75")

Misc: LUU-2B/B Parachute Flares
TALD

(7) Communication equipment:

VHF/UHF/FM

(8) Survivability equipment:

RHAW: AN/ALR-67 Radar warning receiver

DECM: ALQ-126B
ALQ-167 DECM Pod

Expendables: (60) AN/ALE-39

d. UH-1N Capabilities

(1) USMC operated: 78

(2) Airspeed with OAS configuration*

Max Speed	=	130 KIAS
Typical Delivery Airspeed	=	90 KIAS
Max Endurance	=	55-65 KIAS

(3) Fuel capacity:

Internal	=	1330 lbs
With 2 aux fuel cells	=	2350 lbs

(4) Endurance with OAS configuration:

1+15 to 1+30 hours (no fuel cells)

(5) Systems:

Laser designator/Target FLIR*
*4 MEU(SOC) AC fitted
AN/ULQ-19 Comm jamming system

(6) Weapons:

Rockets: LAU-61 (2.75")

Guns: 7.62mm GAU-17
7.62mm M-60
.50cal GAU-16
7.62 mm M-240

(7) Communication equipment:

UHF/VHF/FM/HF

(8) Survivability equipment:

RHAW: AN/APR-39 radar detector system
AN/APR-44 CW warning receiver
IRCM: AN/ALQ-144
Expendables: AN/ALE-39

III. Summary

- A. The MAGTF commander utilizes OAS as an integral part of his combined arms team. OAS constitutes a large percentage of the MAGTF's combat power making up for a structural deficiency in artillery assets. Historically, the US Marines have been on the cutting edge of attack aviation innovation. A sound understanding of the tasks, functions, and requirements associated with OAS ensure that we will continue the tradition.