Aviation Ground Support

U.S. Marine Corps

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PCN 147 000025 00
FOREWORD

Marine Corps Tactical Publication (MCTP) 3-20B, *Aviation Ground Support*, applies the philosophies in Marine Corps Doctrinal Publication (MCDP) 4, *Logistics*, and MCDP 3, *Expeditionary Operations*, to Marine Corps aviation ground support (AGS). It is the link between Marine Corps Warfighting Publication (MCWP) 3-20, *Aviation Operations*, and the tactics, techniques, and procedures contained in other Marine Corps aviation and logistic publications. In establishing the doctrinal basis for the planning and execution of AGS, this publication provides the basis for employment of AGS by the aviation combat element of the Marine air-ground task force (MAGTF) during the prosecution of war and other operations that support the Marine Corps’ mission.

Marine Corps AGS is an integral part of the aviation combat element because it extends its tactical reach and flexibility. This publication provides a common basis for understanding Marine Corps AGS and the manner in which the MAGTF can tactically exploit those capabilities. Therefore, this publication is intended for commanders and staff officers who are responsible for the planning and execution of aviation operations and for personnel involved in the execution of aviation operations. It is also intended for other doctrine centers, joint and multinational staffs, professional military educational activities, and other activities that require an understanding of Marine Corps AGS.

This publication is authoritative in nature but requires judgment in application.


Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

[Signature]

W. F. MULLEN III
Major General, U.S. Marine Corps
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Publication Control Number: 147 000025 00

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CHAPTER 1
FUNDAMENTALS

As the Nation’s force in readiness, the Marine Corps provides great versatility and flexibility to deal with situations across the range of military operations. Fighting as an integrated air-ground team, the Marine air-ground task force (MAGTF) is a task-organized force comprised of four elements: the command element, the ground combat element (GCE), the aviation combat element (ACE), and the logistics combat element (LCE).

The MAGTF’s ability to project power is enhanced by the ACE’s ability to deploy and operate in close proximity to the fighting. Potential operating sites range from urban areas containing established aviation facilities to areas with the crudest and most austere facilities. The MAGTF requires responsive air support for all types of operational areas.

AVIATION SUPPORT TO THE MARINE AIR-GROUND TASK FORCE

Marine aviation provides the MAGTF commander with a unique force. The ACE is ready for deployment and capable of fulfilling the MAGTF’s fire support and maneuver requirements across the conflict continuum within the range of military operations. This can range from military engagement, security cooperation, and deterrence activities to crisis response and limited contingency operations, and, if necessary, major operations and campaigns.

Marine aviation performs six functions in support of the MAGTF: antiair warfare, offensive air support, assault support, electronic warfare, air reconnaissance, and control of aircraft and missiles. Through these six functions, the ACE greatly enhances the MAGTF’s capabilities to conduct maneuver warfare.

Marine aviation provides significant advantages in terms of speed, flexibility, shock, and technology, allowing the Marine Corps to impose its will upon the enemy. Through Marine aviation’s function of offensive air support, accurate and destructive firepower can be brought to bear upon the enemy. Used at the right time and place, Marine aviation can capitalize and exploit fleeting opportunities created throughout the battlespace.

The ACE is organized and equipped to facilitate early deployment. Marine aviation is expeditionary in nature and organizes, trains, and equips for operations in an austere environment. Marine aviation can operate from aircraft carriers, amphibious ships, or a shore-based forward operating base (FOB). A FOB is an airfield used to support tactical operations without establishing full support facilities. A FOB may be used for an extended time. Support by a main operating base is required to provide backup support for a FOB. The ACE’s unique organic equipment set permits it to conduct sustained
expeditionary operations wherever and whenever they are required. Forward operating bases ashore can include design, construction, and operation of a new airfield (using expeditionary airfield [EAF] systems) or employment of EAF systems at an existing bare-base airfield. This operational flexibility sets the ACE apart from aviation organizations of other Services.

As an extension of sea-based aviation in littoral warfare, FOBs provide the ACE the capability to phase warfighting assets ashore in support of sustained operations. Deployment of ACE equipment, combined with essential airfield services at FOBs, can dramatically improve the responsiveness, endurance, and operational reach of the ACE. These capabilities are commonly referred to as aviation ground support (AGS), and they enable the expeditionary nature of the ACE.

FUNCTIONS

Aviation ground support is the critical component that gives Marine aviation its expeditionary capability. Aviation ground support directly supports the employment of the six functions of Marine aviation. Aviation ground support consists of the ground support functions required (except aircraft supply, maintenance, and aviation ordnance) for sustained air operations at FOBs and air bases. The ground functional capabilities of AGS support MAGTF aviation assets in austere environments.

Functions such as EAF services, expeditionary firefighting and rescue (EFR), and aircraft refueling services are unique to the aviation community. Other functions such as engineer services, motor transport, communications, and field messing—while similar to these functions in the ground communities—are tailored to enable expeditionary ACE operations. These functions allow the ACE to project its assets ashore and generate sorties at a rate beyond that capable from sea-based platforms. Aviation ground support equipment is compatible with naval aircraft. It can also support and accommodate US Army rotary-wing aircraft and US Air Force aircraft. The Marine wing support squadron (MWSS) provides the Marine aircraft group (MAG) with the following 11 AGS functions, which are discussed in detail in chapter 2:

- Internal airfield communications.
- EAF services.
- EFR services.
- Aircraft and ground refueling.
- Explosive ordnance disposal (EOD) services.
- Essential engineer services.
- Motor transport.
- Field messing.
- Routine and emergency sick call and aviation medical functions.
- Air base commandant functions.
- Airfield security operations.
**ORGANIZATION**

The MWSSs, which are subordinate units within each Marine aircraft wing (MAW), are the units responsible for AGS. Their core purpose is to enable the ACE to generate combat sorties for the MAGTF from air bases and FOBs. See Marine Corps Reference Publication (MCRP) 1-10.1, *Organization of the United States Marine Corps*, for more information and overall organization of the MAWs.

**Aviation Ground Support Department**

The AGS department is a special staff section within the MAW. It plays an integral role in managing AGS personnel and equipment tasking. The AGS department coordinates with adjacent staff sections, MAGs, and MWSSs to determine priority of tasking for AGS requirements including, but not limited to—

- The fleet assistance program (also referred to as FAP).
- AGS personnel and equipment shortfalls.
- Engineer projects.
- EOD tasking.
- AGS feasibilities of support.
- AGS specific school assignments and training.
- AGS operation plan preparation and airfield studies.
- Fuels planning.
- Exercises.

The AGS department is the AGS advocate for the MAW. The AGS department manages the overall health of AGS within the MAW. The AGS department identifies AGS issues that require community or Headquarters, United States Marine Corps visibility and assistance, as well as maintains visibility on emerging AGS or combat service support (CSS) concerns, concepts, and technologies.

Some AGS functional areas will be managed by other MAW staff. The AGS department staff remains engaged and involved in all AGS functional areas to assist in manning, training, and equipping actions in support of AGS home station, operational, and exercise requirements.

**Marine Wing Support Group**

The Marine wing support group, when activated, serves as the group headquarters that commands and controls multiple subordinate MWSSs in providing AGS for the MAW. The MWSG serves as the AGS advocate in MAWs that do not have an AGS department.

**Marine Wing Support Squadron**

The MWSS is an O-5 level command within the MAW. The MWSS’ mission is to provide AGS to enable a MAG or a composite MAG, designated site commander, and supporting or attached
elements of the Marine air control group (MACG) to conduct expeditionary operations. To support the MAG, the MWSS conducts the 11 AGS functions.

The MWSS is structured to accomplish its missions in combat and is capable of task-organizing into detachments to meet specific mission requirements. The MWSS is capable of establishing and supporting one FOB and two forward arming and refueling points (FARPs) simultaneously. The MWSS is organized into four operational companies, each with a headquarters staff made up of a company commander, executive officer, and senior enlisted advisor. Each staff section conducts its traditional staff role with the operation and logistic sections responsible for the other functions, as noted in figure 1-1.

**Figure 1-1. Notional Structure of a Marine Wing Support Squadron.**

**Operations**

The MWSS operates from an aviation ground support operations center (AGSOC) and responds to the MAG/ACE commanding officer or site commander that it is assigned to support. The AGSOC is the nucleus for the coordination and execution of AGS services for the MAG/ACE. From the AGSOC, the MWSS commander commands and controls the MWSS companies and squadron activities in accordance with the priorities established by the supported MAG/ACE commanding officer or site commander.

The squadron S-3 runs the AGSOC, which includes representation from the squadron’s other staff sections (i.e., S-1 through S-6) and subordinate companies (headquarters and service, airfield operations, engineer, and motor transport). The S-3 must have the capability to receive, prioritize, assign, and track AGS activities. In an expeditionary environment, the AGSOC must employ flexibility to support changes in operations, tempo, and the environment. The AGSOC processes AGS requests from supported units and tasks subordinate elements to respond. It manages the
AGS effort and provides the command and control for other activities important to operations, which include the following:

- Airfield operations.
- Airfield security operations.
- Base recovery after attack (BRAAT).
- Airfield damage repair (ADR) operations.
- FARP operations.
- Aircraft salvage and recovery operations.
- Base camp construction and repair.
- Base camp services for the ACE.

The AGSOC setup, internal functioning, and staffing are operationally driven and therefore change as the situation and the mission dictate. The operation of the AGSOC is established in the unit standing operating procedures.

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**LOGISTIC SUPPORT**

To conduct sustained operations ashore, the ACE will rely upon internal and external logistic support. Within the ACE, aviation peculiar logistic requirements are satisfied by the Marine aviation logistics squadron (MALS). This includes aviation supply and maintenance support for aircraft, aviation support equipment, and aviation armament and ordnance equipment. Refer to Marine Corps Warfighting Publication (MCWP) 3-20, *Aviation Operations*, and Marine Corps Tactical Publication (MCTP) 3-20A, *Aviation Logistics*, for additional information on the role of a MALS in support of Marine aviation.

The Marine logistics group or LCE shall provide CSS to supplement the ACE’s organic capabilities. The degree of support provided can encompass the following functional areas: ground supply, health services, maintenance, services, general engineering, and transportation. MCTP 3-40B, *Tactical-Level Logistics*, contains detailed discussion about the functions and subfunctions of CSS.

The MWSS possesses an organic capability to conduct the field-level maintenance of all engineer, motor transport, communications, field mess, EFR, and weapons equipment assigned. The MWSS is also capable of performing organizational- and intermediate-level maintenance on EAF systems equipment.

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**TRAINING**

The MWSS consists of personnel from over 70 military occupational specialties. These individuals must maintain occupational proficiency while integrating their abilities to perform the 11 AGS
functions. The MWSS uses applicable training and readiness standards and individual training standards to train its personnel.

As a unit, the MWSS shall train to the standards established within the Navy and Marine Corps Departmental Publication (NAVMC) 3500.117, *Marine Wing Support Squadron Training and Readiness Manual*, the standards outlined in Marine Corps Order (MCO) 1553.3B, *Unit Training Management (UTM) Program*, and various community-based training and readiness manuals.

MCO 3500.109C, *Marine Corps Aviation Weapons and Tactics Training Program (WTTP)*, identifies AGS-standardized training for officers and staff noncommissioned officers assigned to the MWSS. The Weapons and Tactics Training Program supports individual and unit combat readiness by tasking Marine Weapons and Tactics Squadron-1 to train officer and enlisted instructors to manage unit aviation training programs, develop aviation supplementary courses of instruction, standardize unit instruction certification programs, and develop and distribute academic courseware that supports the Marine Aviation Training and Readiness Program.

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**CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR DEFENSE CONSIDERATIONS**

While chemical, biological, radiological, and nuclear (CBRN) defense is not one of the 11 functions of AGS, it is important to consider the effects CBRN defense has on AGS operations. The MAW possesses an organic CBRN defense capability, as well as the equipment necessary to support and conduct CBRN defense and decontamination operations for the ACE. The ACE will normally consolidate its CBRN defense personnel and operations under the MAW/MAG for management and execution. The senior ranking CBRN defense officer/specialist, normally from the MAG, will supervise and coordinate CBRN defense activities through the MAG operations center. The MAG must coordinate CBRN defense activities with the other MWSS-supervised activities (i.e., BRAAT, ADR, airfield operations, air base operations, and airfield security operations).

A thorough and effective CBRN defense plan requires extensive coordination and participation by ACE units. Marines must continuously train for CBRN defense operations because of the potential negative impact of CBRN hazards. The ACE should schedule rehearsals and implement CBRN defense into daily operations to accomplish the mission without creating additional casualties. Rapid and proper reaction to a CBRN attack is critical for the ACE to remain effective. The MAG CBRN section can assist in the coordination of the following ACE CBRN defense activities:

- Detailed troop decontamination.
- Detailed equipment decontamination.
- CBRN reconnaissance and surveillance.

**Detailed Troop Decontamination**
The detailed troop decontamination team is formed from ACE squadron augments. Detailed troop decontamination team members and MAG CBRN defense personnel must maintain a close
relationship to ensure that proper training, supervision, and confidence are maintained. Personnel decontamination is the responsibility of the contaminated unit.

**Detailed Equipment Decontamination**
The detailed equipment decontamination team is formed from squadron members and MAG CBRN defense personnel. Team members must have a close relationship to ensure that proper training, supervision, and confidence are maintained. Equipment decontamination is the responsibility of the contaminated unit. Equipment, including aircraft, vehicles, weapons, and personal protective gear, must be decontaminated properly for continued use. An MWSS can assist by providing materials handling equipment, heavy equipment, and utilities when setting up decontamination sites.

**Chemical, Biological, Radiological, and Nuclear Reconnaissance and Surveillance**
Reconnaissance and surveillance maintains continuous monitoring of the area of operations for CBRN hazards and is essential to CBRN defense. If contamination is a factor, team members reconnoiter alternate routes and potential areas to set up detailed troop decontamination and detailed equipment decontamination sites. Reconnaissance and surveillance teams identify contaminated areas and send reports to the CBRN control center. The CBRN defense specialists at the CBRN control center calculate downwind hazards in order to alert and advise affected units. Refer to chapter 5 for additional information on the CBRN role during BRAAT.
The 11 AGS functions are divided into airfield support functions and air base support functions. Airfield support functions provide direct support to aircraft and include aircraft refueling, EAF, EOD, and EFR. Air base support functions include engineer services (horizontal/vertical construction utilities), flight line security, field messing, medical services, internal airfield communications, motor transport, and various other base camp services that do not support aviation operations. Both airfield support functions and air base support functions are critical to ACE mission accomplishment; however, the airfield support functions are unique to the MWSS and are what differentiate it from other logistic support units within the Marine Corps. Other units, such as combat logistics battalions or engineer support battalions, can perform air base support functions, but they lack the capability to perform EAF and EFR functions. The following identifies AGS functions at the company level:

**Headquarters and service company**
- Air base commandant.
- Internal airfield communications.
- Field mess.
- Medical.
- Security.

**Airfield operations company**
- Aircraft and ground refueling.
- EAF.
- EFR.
- EOD.

**Engineer company**
- Essential engineer services.

**Motor transport company**
- Motor transport services.
**Airfield Support Functions**

Airfield support functions are those activities and tasks necessary to establish and operate the flight line at a FOB. The four airfield support functions are aircraft and ground refueling, EAF, EOD, and EFR.

The MWSS airfield operations company provides the majority of airfield support functions. At FOBs, the airfield operations company provides the technical expertise, equipment, and personnel necessary to operate the flight line (e.g., emergency response, aircraft arrestment, aircraft refueling, EOD response, lighting and marking, parking restrictions). Figure 2-1 shows the organization of the airfield operations company.

![Figure 2-1. Airfield Operations Company.](image)

**Expeditionary Airfield Services**

An EAF is a shore-based aviation support system that permits landing force aircraft to operate from FOBs within effective range of ground forces. An EAF is a construction concept used to develop or enhance FOBs and should not be confused with a concept of employment for Marine aviation.

The EAF concept gives the ACE or site commander operational flexibility by providing a rapidly deployable, self-sustaining, and survivable forward air operating location that is designed to support the ACE during expeditionary operations. Prior to selecting a FOB site, ACE and AGS planners should consider the availability and use of host-nation airfields and abandoned or captured airfields, highways, and parking lots before constructing an EAF with EAF equipment. Expeditionary airfield equipment is designed to provide the MAGTF commander with maximum flexibility and ability to plan, deploy, and operate. Appendix A provides an airfield site survey worksheet.

Expeditionary airfield capability is resident within the MWSS and requires formal training. The EAF capability is essential in supporting EAF installation and operations; EAF-specific survey, liaison, and reconnaissance party tasks; and survey and airfield construction. Expeditionary airfield personnel and equipment require Naval Air Systems Command (NAVAIR) compliance, Marine Corps certification, naval funding, and Naval Aviation Maintenance Program adherence. Other valuable reference assets for EAF Marines include Air Force Instruction 13-217, *Drop Zone and Landing Zone Operations*, and Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*.

Expeditionary airfield services possess the capability to conduct expedient tactical landing zone (LZ) site surveys, selection, and marking. This capability is critical when conducting FOB operations forward of main operating bases. A tactical LZ provides the flexibility to land a KC-130
and to resupply and rapidly refuel forward units, and it also provides the ACE with the ability to project aviation power forward and sustain operations. The proper execution of a tactical LZ site survey provides the commander with critical information regarding potential tactical LZ sites, surface load bearing capabilities, LZ dimensions, safety zone, and expandability. The MWSS maintains equipment that can determine the California bearing ratios (CBRs) of soils, subgrades, and soil analysis equipment, which can determine the gradation, compression, and classification of the soil.

Expeditionary airfield equipment includes—

- Airfield surfacing systems.
- Aircraft recovery system.
- Expeditionary visual landing aids.

**Airfield Surfacing Systems.** Airfield surfacing systems require formal training and familiarization with equipment characteristics and design requirements (e.g., aircraft spacing, clearances, and fueling; airfield configurations; revetments; and ordnance safety arcs). Airfield surfacing systems provide quick, responsive, and direct support to the ACE commander in order to augment an existing airfield or provide a standalone capability. Airfield design and construction shall be in accordance with NAVAVF certification and/or installation requirements.

Installation of airfield surfacing systems involves planning for aircraft parking, thus requiring firsthand knowledge of aviation intricacies (i.e., aircraft mix, fueling requirements, and ordnance).

**Aircraft Recovery System.** The Marine Corps currently operates one aircraft recovery system: the M-31 Marine Corps Expeditionary Arresting Gear System. This system is found within the table of basic allowance for the MWSS. Applicable NAVAVF instructions and Naval Air Training and Operating Procedures Standardizations (NATOPs) dictate arresting requirements for specific aircraft by type, model, and series after an airfield is established.

Expeditionary arresting gear is essential to the operation of the EAF and enables the ACE to operate from host-nation or captured airfields that lack sufficient operating length. Marine expeditionary aircraft arresting systems provide high-cycle operations and the capability to recover US and allied tailhook-equipped aircraft. Emergency arresting of disabled aircraft is critical. Additionally, expeditionary aircraft arresting equipment provides overrun protection for aircraft during aborted takeoffs, inclement weather, and in situations where there are adverse runway surface conditions.

**Expeditionary Visual Landing Aids.** Expeditionary visual landing aids consist of airfield lighting, markings, and signage that provide illumination, depth perception cues, obstruction identification, and terminal guidance. Properly installed visual landing aids allow for safe flight operations under various mission requirements. With the assistance of lighting, marking, and supplemental equipment, the FOB has the capability to conduct safe night/low visibility operations for approach, landings, taxiing and parking of aircraft. Even if a FOB is a simple grass LZ that supports helicopter and tiltrotor operations, the installation and use of expeditionary visual landing aids can add versatility and durability to the site.
Airfield lighting and marking systems consist of equipment that can be phased into the operation as needed. These systems include the following:

- **Marine-portable lighting capability.** This system provides lighting during the initial phase of the airfield lighting operation. The Marine-portable lighting capability is normally used for lighting FARPs and tactical LZs. This capability provides a visual flight rules and night vision device capability.

- **Minimum operating strip lighting.** This system provides lighting during the intermediate phase of the airfield lighting operation. Minimum operating strip (MOS) lighting is critical in marking a usable MOS in cases where the runway or taxiway is damaged. This system provides a medium intensity nonprecision instrument flight rules and night vision device capability.

- **Sustainment lighting capability.** This capability provides sustained (long term) lighting for airfields. Sustainment lighting for an EAF does not require phasing and should be used upon availability.

- **Terminal guidance systems.** These systems provide approaching aviators a means to visually establish and maintain proper glide slope for landing aircraft. The systems utilized by the Marine Corps are the Fresnel Lens Optical Landing System, Tactical Precision Approach Path Indicator, and Night Vision Goggle Precision Approach Path Indicator. The Fresnel Lens Optical Landing System is a trailer-mounted, electro-optical guidance system that is positioned beside the runway and provides a predetermined glide slope for landing aircraft. The Tactical Precision Approach Path Indicator and Night Vision Goggle Precision Approach Path Indicator are also positioned adjacent to the runway and consists of two, three, or four units that provide a visual indication of an aircraft’s position on the glide path for the associated runway. The Tactical Precision Approach Path Indicator and Night Vision Goggle Precision Approach Path Indicator are part of the MOS lighting system.

- **Airfield marking.** Marking includes painting of airfield lines and installation of signage, wind cone assemblies, and panel markers for tactical LZs. Airfield marking provides lateral guidance cues to aviators during landings and while taxiing throughout the airfield environment.

**Expeditionary Firefighting and Rescue**

Expeditionary firefighting and rescue is a unique capability within the ACE that provides emergency services in support of FOBs and support installations. The primary and secondary mission of EFR is to save lives and protect property. Expeditionary firefighting and rescue is manned, trained, and equipped to provide services such as fire prevention, fire suppression and extinguishment, extrication and rescue, basic emergency medical services, salvage and overhaul operations, and response to hazardous material incidents.

While supporting a FOB, the EFR platoon is also responsible for the effective implementation and management of fire protection and prevention programs.

The following are EFR capabilities:

- Incident command.
- Aircraft responses.
- Structural responses.
• Vehicle/equipment mishaps.
• Tactical response team.
• Aircraft salvage and recovery operations.
• Medical emergencies/mass casualty operations.

Tactical and geographical considerations, dispersal of aircraft, and availability of finite assets within EFR units are some of the factors that impact EFR support capabilities. A thorough review of EFR requirements should be conducted during the planning phase for any operation, deployment, exercise, or expeditionary training evolution. The MAGTF commander is responsible for establishing EFR requirements on a case-by-case basis. Table 2-1 identifies minimum response requirements in gallons of water available and total gallons of water that can be pumped per minute for active FOBs and air base facilities.

<table>
<thead>
<tr>
<th>FOB/Facility</th>
<th>Requirements</th>
</tr>
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<tbody>
<tr>
<td>Main base</td>
<td>4,000 gallons/1,500 gpm (3 × major ARFF apparatus)</td>
</tr>
<tr>
<td>Air facility</td>
<td>2,000 gallons/1,000 gpm (2 × major ARFF apparatus)</td>
</tr>
<tr>
<td>Air site</td>
<td>As required in accordance with NAVAIR 00-80R-14</td>
</tr>
<tr>
<td>Air point</td>
<td>As required in accordance with NAVAIR 00-80R-14</td>
</tr>
</tbody>
</table>

Refer to National Fire Protection Association series; NAVAIR 00-80R-14, NATOPS U.S. Navy Aircraft Firefighting and Rescue Manual; NAVAIR 00-80R-14-1, NATOPS U.S. Navy Aircraft Emergency Rescue Information Manual; and NAVAIR 00-80R-20, NATOPS U.S. Navy Aircraft Salvage Operations Manual (Ashore), for information regarding EFR/aircraft rescue and firefighting requirements and employment.

**Incident Command.** In accordance with Homeland Security Presidential Directive-5, Management of Domestic Incidents, EFR personnel, as emergency responders, are certified by the Federal Emergency Management Agency based on the concepts of the National Incident Management System (NIMS). The NIMS provides a common, national approach to managing all threats and hazards. The NIMS enables Federal, state, tribal, and local governments; the private sector; and nongovernmental organizations to work together to prepare for, prevent, respond to, recover from, and mitigate the effects of incidents regardless of cause, size, location, or complexity. The NIMS provides a core set of doctrine, concepts, principles, terminology, and organizational processes that enables effective, efficient, and collaborative incident management.

**Aircraft Responses.** Expeditionary firefighting and rescue personnel possess the requisite knowledge of aircraft and safety hazards associated with rescue procedures. Mishaps involving aircraft present unique safety circumstances including flammable liquids, hazardous cargo, ordnance, and ejection seats. Extrication of the aircrew involved in an aircraft mishap requires specialized training and equipment (hydraulic rescue tools). This equipment is maintained by the EFR platoon and they are fully trained and proficient in its use.
Structural Responses. Expeditionary firefighting and rescue personnel possess the requisite knowledge, training, and equipment to perform structural firefighting. Fires involving structures can include various types of residential, commercial, and industrial buildings; along with different construction types (wood, metal, concrete, etc.). Structural responses, as with aircraft responses, require unique tactics and present specific dangers to personnel, equipment, and structures.

Vehicle/Equipment Mishaps. Expeditionary firefighting and rescue personnel are formally trained in the proper operation of extrication equipment and application techniques for automotive and tactical vehicles, as well as industrial equipment mishaps.

Tactical Response Team. Expeditionary firefighting and rescue personnel are capable of providing fire suppression/extinguishment as well as vehicle and equipment extrication in a tactical environment. An EFR tactical response team can be organized to respond to any situation that threatens the survivability of crewmembers in aircraft or vehicles, or damage to high dollar and critical assets.

Aircraft Salvage and Recovery Operations. Expeditionary firefighting and rescue personnel are capable of supporting crash and salvage operations associated with an aircraft crash or mishap. One of the primary duties of the EFR officer is the assignment as crash and salvage officer. These duties include controlling the activities, personnel, and equipment involved in the salvage operations; coordinating activities for defueling/downloading the aircraft; directing the activities for lifting, shoring, and transporting the damaged aircraft; and conducting training of salvage team members.

Medical Emergencies/Mass Casualty Operations. Expeditionary firefighting and rescue personnel are certified in basic life support and first aid. They are capable of providing initial treatment and simple triage of personnel based on the severity of their condition.

Aircraft and Ground Refueling
The ACE is responsible for bulk fuel support and daily management of bulk fuel for airfields and FARPs. The MWSS provides bulk fuel support to organizations within the boundary of the airfield, including support to other Services’ aircraft if directed in the theater bulk fuel plan. Each MWSS possesses the personnel and equipment to fulfill this responsibility and maintains the capability to store and distribute large quantities of bulk fuel for the ACE.

The MWSS has the capability to fuel fixed-wing, rotary-wing, and tiltrotor aircraft and unmanned aircraft systems and to provide ground fueling to other ACE assets (e.g., mobile electric generators, tactical motor transport, field messing facilities, AGS equipment). The MACG, MALS, and Marine unmanned aerial vehicle squadrons (also referred to as VMUs) possess tactical generators and motor transport assets and require refueling support from the MWSS.

The MWSS can deliver fuel to aircraft while engines are shut down (cold refueling) or while they are running (hot refueling). NAVAIR 00-80T-109, Aircraft Refueling NATOPS Manual, covers aircraft refueling operations. These refueling operations can be conducted at established airfields or at remote locations such as FARPs. This expeditionary fuel distribution capability provides flexibility to the ACE commander by allowing aircraft to refuel closer to the operational battle area, thus increasing aircraft turnaround speed and extending the force’s combat radius. See chapter 7 and appendix B for details regarding FARP operations.
The following aircraft and ground refueling systems organic to the MWSS are:

- Tactical airfield fuel dispensing system (TAFDS).
- Helicopter expedient refueling system (HERS).
- MK970 refueler trailer.
- Six containers together (SIXCON) modular system.
- Flatrack refueling capability.

**Tactical Airfield Fuel Dispensing System.** The TAFDS is an aviation-specific system exclusively designed for aircraft. It consists of six 20,000-gallon collapsible tanks and four 50,000-gallon tanks, which can store up to 320,000 gallons of fuel. The MWSS possesses 3 TAFDS and can store the equivalent of 960,000 gallons of fuel at a time, which allows simultaneous refueling of 12 aircraft from 12 refueling points.

**Helicopter Expedient Refueling System.** The HERS is an aviation-specific system exclusively designed for aircraft refueling. The system consists of eighteen 500-gallon pods and three 3,000-gallon collapsible tanks for a storage capacity of 18,000 gallons. The MWSS possesses 3 HERS systems for a total storage capacity of 54,000 gallons. Experienced personnel can establish a HERS site within 2 hours. Because of its flexibility and mobility, it is ideally suited to support FARP operations.

**MK970 Refueler Trailer.** Each MWSS possesses 12 MK970 refueler trailers for a total mobile storage and distribution capability of 60,000 gallons. The MK970 can be used to either fuel or defuel aircraft. The MK970 is ideally suited to support FOB or FARP operations over smooth terrain.

**Six Containers Together Modular System.** The SIXCON modules are the principal assets used by the MWSS to meet the ACE’s ground refueling requirements. The SIXCON unit consists of five 900-gallon containers and a pump module per system. Each MWSS possesses 4 SIXCONs to support the ACE ground refueling operation for a total storage capacity of 18,000 gallons. Because SIXCONs can be loaded on either medium tactical vehicle replacements (MTVRs) or Logistics Vehicle System Replacement (LVSR), it is well suited for FARP operations over rough terrain.

**Flatrack Refueling Capability.** Each MWSS possesses five flatrack refueling capabilities with the capability to transport, filter, and distribute fuel in a tactical expeditionary environment. The flatrack refueling capability has a 2,500-gallon tank and a 250-gallon per minute pump. It can fuel and defuel one aircraft or two ground vehicles simultaneously. The flatrack refueling capability is International Shipping Organization-mounted on a flatrack base; enabling rapid placement, operation, maintenance, and recovery without any construction or materials handling equipment. The flatrack refueling capability is mobile both when full and when empty, can be used in any location, and is compatible with the LVSR.

**Explosive Ordnance Disposal**
The EOD mission supports freedom of maneuver and force protection. It also provides the MAGTF with a critical enabling capability in the form of collection, reporting, and exploitation by providing access to terrain, installations, and facilities that would otherwise be denied to the
force due to hazards associated with explosive ordnance. Explosive ordnance disposal personnel possess the capability to detect, locate, access, identify, triage, diagnose, stabilize, render safe/neutralize, recover, exploit, and dispose of weapons and explosive ordnance that threaten personnel, property, and lines of communications. This includes conventional munitions, CBRN munitions, unexploded ordnance (UXO), weapons of mass destruction, homemade explosives, and improvised explosive devices.

Each MWSS EOD section consists of two teams that provide EOD support to the designated MAG and direct support to the FOBs established by their parent command. The mission of MWSS EOD section includes, but is not limited to, four specific areas:

- BRAAT.
- FARPs.
- Aircraft recovery support.
- Force protection.

Marine wing support squadron EOD teams, located within the airfield operations company, provide the ACE the capability to handle hazards associated with explosive ordnance. The MWSS task-organizes EOD response detachments, consisting of a minimum of two Marines, to support ACE elements. The MWSS EOD team provides the ACE the capability to respond to aircraft mishaps or weapons malfunctions on or off an established or EAF or a FARP. This includes, but is not limited to, misfired ordnance, jettisoned ordnance, aircraft explosive hazards, and tactical recovery of aircraft and personnel missions. The MWSS EOD teams also provide the ACE commander with the ability to promptly and safely clear area denial munitions during BRAAT operations.

During the conduct of AGS operations, EOD provides the ACE with the capability to respond to all aircraft-related explosive hazards, to include aircraft recovery support, jettisoned explosive ordnance, armed ordnance that may be partially suspended from an aircraft, or downloading of ammunition that may jam within the aircraft’s guns. The MWSS EOD section also provides the ACE commander with the ability to promptly and safely clear the area of explosive ordnance during BRAAT operations. Refer to MCTP 10-10D, MAGTF Explosive Ordnance Disposal, MCO 3571.2H, Explosive Ordnance Disposal (EOD) Program, or NAVMC 3500.66B, Explosive Ordnance Disposal Training and Readiness Manual, for further information regarding EOD employment, capabilities, and general information.

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**AIR BASE SUPPORT FUNCTIONS**

Air base support functions are those activities necessary to establish and maintain air base operations, to include base camp operations. The air base support functions include the following:

- Air base commandant functions.
- Internal airfield communications.
- Essential engineer services.
• Motor transport.
• Field mess.
• Medical services.
• Airfield security operations.

**Air Base Commandant Functions**
The MWSS provides the necessary functions and organization to plan, develop, improve, construct, maintain, and support the daily requirements of a FOB. Therefore, the ACE or site commander normally designates the MWSS commanding officer or appointed representative to perform the role of the air base commandant. The air base commandant reports directly to the ACE or site commander in matters pertaining to air base camp support.

**Planning.** Under the air base commandant, the MWSS staff is responsible for designing the air base master plan for each FOB from which the ACE operates. The air base commandant, working in support of the site commander and/or ACE staff, will plan, develop, establish, and maintain the air base layout, to include the airfield layout and base camp design.

This planning and development requires extensive coordination with units that may be operating from the air base or FOB (e.g., ACE headquarters, squadrons, MACG, MALS, LCE, a naval construction force [NCF], base defense operations center [BDOC], other security organizations). When developing an air base master plan, the air base commandant must consider the following:

• Air operations.
• Aircraft parking.
• Ammunition supply point.
• TAFDS.
• Revetments.
• Marine air traffic control (MATC) and associated radar equipment.
• Fire prevention requirements, responsibilities, and assignments (see app. C).
• Fire protection coverage.
• Aircraft arresting systems.
• Marine tactical air command center (TACC).
• Billeting.
• Messing.
• Individual unit command centers.
• Communications facilities and networks.
• Power distribution.
• Water production and storage.
• Runway layout.
• Electrical power requirements.
• Location of meteorological and oceanographic assets.
• Road networks.
• Local airfield security.
• Aircraft and ground equipment maintenance.
• Hygiene (e.g., field shower, lavatories, laundry).
• Survivability bunkers and hardening existing facilities.
• Waste management (collection/disposal).
• Training areas (especially for EFR, familiarization firing of weapons, and UXO range).
• Morale, welfare, and recreation.
• Armory.
• Increases/decreases in air base occupancy.
• Transfer, closure, or deconstruction of the air base.

In addition to the air base master plan, the air base commandant coordinates the planning and development of BRAAT and flight line security. This planning requires integration with low altitude air defense (LAAD) for air defense around the FOB, units providing air base ground security operations, and tenant aviation and ground units that can provide close air support (CAS) and protective fires.

**Logistic Requirements.** After the FOB is established, the air base commandant is responsible for the following routine logistic tasks:

• Laundry.
• Showers.
• Billeting.
• Coordinating infrastructure upgrades.
• Facilities maintenance.
• Trash collection.
• Field messing.
• Water distribution.
• Power distribution.
• ACE internal ground refueling.
• Lavatory servicing (contracted).
• Airfield shuttle service.
• Personnel augmentation.
• Vehicle parking.
• Traffic control.

**Internal Airfield Communications**

The dynamic nature of airfield operations necessitates dedicated and readily available communications support. While the MACG provides the assets and coordination to support the ACE’s external communications and command, control, and coordination requirements, the MWSS provides assets and coordination to support the internal communications requirements as defined.
by the site commander. The MWSS’ resident communications assets can link an air base’s ACE units and supporting agencies with up to two FARPs.

The MWSS is responsible for establishing and maintaining communications in and around the airfield or FOBs, including ACE units operating adjacent to the airfield or FOB. Because of the large footprint and hazardous nature of unit operations, some ACE units will locate outside the airfield or air base area. The ACE ammunition supply point and the MWSS bulk fuel storage and water production sites are generally located away from the airfield or FOB. Because of this geographic separation, the MWSS should make a special effort to ensure these organizations are integrated into the ACE’s communications architecture.

The MWSS communications platoon has a variety of communications equipment ranging from high frequency, ultrahigh frequency (UHF), and very high frequency (VHF) radios to telephone switchboards. The MWSS communications responsibilities include a tactical telephone service in and about the airfield, including tenant ACE units.

Operations may allow for the transition from radio to telephone to improve reliability and security, reduce cost, and access commercial and defense switched networks. Tactical telephone service gives an ACE the capability to install local area networks, wide-area networks, and other data systems critical for sharing information between commands and activities. Local area network connectivity is the most efficient method for rapid movement of information and is essential for dissemination of critical operational information.

To provide tactical telephone service outside of the airfield, MACG equipment and personnel are used to maintain a multichannel radio link to higher agencies and adjacent airfield communications elements. Access to DSN [Defense Switched Network], SIPRNET [SECRET Internet Protocol Router Network], and NIPRNET [Non-classified Internet Protocol Router Network] are pre-established through multichannel radio communications.

Radio communications are necessary to manage ground transportation around the airfield or FOB and support convoy operations outside of the airfield. The MWSS communications platoon provides the necessary radio and wire line communications for the AGSOC to coordinate transportation movements. This includes, but is not limited to——

- Convoys to and from FOBs sites, such as FARPs.
- Ground movement of personnel and equipment in and around the airfield.
- Logistic support of the ACE, including resupply and the movement of ordnance.
- Mobile security patrols in and around the airfield.
- Flight line security.
- EOD response.
- Aircraft recovery.
- Communications between the airfield and its adjacent facilities, such as ammunition supply point and petroleum, oils, and lubricants (POL) sites.
- Wire systems installation, operation, and maintenance.
• Local area network access for tenant ACE units and the resident MWSS sections.
• Airfield services (i.e., EFR, EAF).

**Essential Engineer Services**
The engineer company of the MWSS provides essential engineer services to meet the general engineering requirements of their respective MAG or an ACE. The company consists of four platoons (as depicted in fig. 2-2).

![Figure 2-2. Engineer Company.](image)

The three main categories of engineer services provided by the engineer company are general engineering services, utilities, and materials handling and heavy equipment services.

**General Engineering Services.** The engineer company provides a host of general engineering services necessary to support the ACE during operations. The following list identifies tasks that the engineer company must provide:

- Engineer reconnaissance and survey.
- Construction and maintenance of mission-essential base camp requirements, to include—
  - Revetments for TAFDS and HERS.
  - Temporary bunkers.
  - Temporary aircraft parking areas.
  - Structures for work and billeting.
- Erection and construction of steel prefabricated structures and aircraft revetments.
- Development, improvement, and maintenance of EAFs and air base drainage systems.
- Camouflage expertise, equipment, and assistance to support ACE camouflage requirements.
- Technical expertise in assessing bomb damage and the personnel and equipment necessary to perform ADR.
- Mine detection capability.
- Combat engineer services (e.g., countermobility, obstacles).
- Construction, improvement, and maintenance of vertical takeoff and landing and vertical/short takeoff and landing facilities.
- Soils engineering.
- Soil stabilization and dust mitigation.

**Utilities.** The MWSS possesses a host of equipment to provide mobile electric power to the ACE airfield, base camp, and satellite locations. To increase habitability during sustained operations, an MWSS is capable of providing laundry and shower support. It is equipped to produce and store...
sufficient quantities of potable water to support the ACE and to provide for personal hygiene. The utilities platoon also maintains refrigeration units that can support the messing and medical needs at the air base. The MWSS has the capability to provide area lighting for the ACE. The separate branches for electrical, refrigeration, and water supply/hygiene are organized within the utilities platoon.

**Materials Handling Equipment and Heavy Equipment Services.** The MWSS engineer company maintains the personnel and equipment necessary to repair, improve, and maintain existing unimproved or gravel roads within the ACE operating area; construct and maintain expedient roads; and meet the materials handling equipment needs of the ACE during buildup, deployment, and support operations. The MWSS can design, construct, and maintain unsurfaced assault LZs, as well as earth preparation for EAF construction. Deliberate engineering design and maintenance of concrete or asphalt surfaced runways and taxiways will require NCF support. The engineer company also has the equipment necessary to support base recovery and ADR.

When first deploying to a FOB or existing airfield, the engineer company sends drafting and surveying personnel to the site to properly design and layout the base camp and air base area. Engineer technical reconnaissance can confirm the utility of landing sites that were proposed prior to the operation, as well as identify future upgrade and repair requirements. The information gathered can then be transposed into graphical representation through the use of computer-aided design software. This information includes necessary utilities support, temporary shelters, and vertical and horizontal construction.

**Motor Transport**

The aviation motor transport company provides light, medium, and heavy vehicle transportation support for the ACE. It typically provides intra-base support to move items that are essential for ACE operations at a FOB (i.e., ordnance, personnel, fuel, and supplies and equipment), as well as wrecker support for the ACE. Because the MAG headquarters and their respective squadrons do not have organic tactical vehicles on their table of equipment, the MWSS maintains assets to fulfill the tactical vehicle needs of the MAG. Additionally, it provides MAG personnel with the training necessary to become licensed to operate tactical vehicles.

During the establishment of a FOB, the company dedicates its medium and heavy vehicles toward transporting the ACE’s numerous containers (i.e., aviation maintenance, EAF, and Marine air command and control system) and aviation-related supplies and equipment. The motor transport company also provides the ground vehicles used to establish and operate FARPs.

Organizationally, the company consists of the headquarters section, a maintenance platoon, and an operations platoon that consists of light/medium and heavy sections (see fig. 2-3 on page 2-14).

The LCE provides the majority of intra-base support for the ACE and supplements the MWSS for line haul transport during FOB establishment and reception, staging, onward movement, and integration (also referred to as RSO&I). To maximize efficiency amid these activities, the AGSOC will synchronize the employment of organic materials/cargo/container handling equipment to offload these vehicles. Additional details related to transportation operations within the MAGTF are contained in MCTP 3-40F, *Distribution and Transportation Operations*. 
Field Mess
The food services platoon of a headquarters and service company is capable of establishing and operating a field mess that can feed up to 3,500 ACE personnel two hot meals per day. Using organic equipment, such as the expeditionary field kitchen, the MWSS can feed ACE personnel working aboard a FOB, as well as ACE units located at remote locations. The operating schedule for the mess can be aligned to meet the needs of ACE operations, including the requirement to feed night crew personnel. Marine Corps Reference Publication (MCRP) 3-40G.1, Marine Corps Field Feeding Program, provides additional details related to food service equipment and field feeding operations.

Medical Services
Each MWSS is structured with an organic medical section to support the ACE. The MWSS medical support section comes equipped with sufficient medical equipment and supplies to establish a flight line aid station to provide medical care to one FOB and its tenant units. In addition to routine sick call, flight line aid stations provide aviation medicine; preventative medicine; and laboratory, X-ray, and pharmacy services support. An MWSS is capable of providing Role 1 medical care. For more information on casualty management refer to Joint Publication (JP) 4-02, Health Service Support, or MCTP 3-40A, Health Service Support Operations.

Airfield Security Operations
The MWSS is not manned and equipped to conduct defense for an entire FOB. The MWSS trains and focuses on providing flight line security, which is designed to defend the infrastructure and facilities that are critical to sortie generation. Because aircraft are considered high-value targets by the enemy, the flight line requires controlled access and heightened security. The MWSS will secure the flight line based on guidance from the ACE and will coordinate this security with the BDOC and MAGTF rear area operations center (RAOC). In addition, the security of ground threats at air points will be the responsibility of the MWSS.
CHAPTER 3
AIRFIELD OPERATIONS AT FORWARD OPERATING BASES

The ACE has the capability to operate from naval vessels or shore-based airfields to provide timely aviation support. When conducting shore-based operations, the ACE should use existing facilities when available. The MWSS can employ organic general engineering and EAF equipment to improve the facility’s suitability or expand its capacity if an existing air facility is inadequate. Rapid establishment of a FOB ashore significantly improves the ACE’s operational reach and responsiveness. When the tactical situation requires a FOB to be established ashore, planners should consider time and effort required for the establishment, logistic effort, and the duration that the airfield will need to be occupied. In most cases, improvement or expansion of an existing airfield or similar infrastructure is preferred over construction of a new airfield/air base. Appendix A provides an airfield site survey worksheet.

AIRFIELD SITE CONSIDERATIONS

Planners have the following four main options when considering site selection of an airfield:

- Host-nation airfields.
- Captured or abandoned airfields.
- Highways or parking lots.
- Constructing an EAF.

Host-Nation Airfields
Planners could choose to occupy host-nation airfields, if available. Occupying host-nation airfields requires coordination with the host country and may require special authorizations and agreements to be established in order to accommodate Marine Corps aircraft and sortie generation.

Captured or Abandoned Airfields
Using captured or abandoned airfields is another option that planners can consider. Using these airfields may require significant repairs to existing facilities in order to accommodate Marine Corps aircraft. Additional facilities that are not available may need to be constructed in order to ensure aviation operations.
Highways or Parking Lots
Using roads, highways, or parking lots is a third option that can be used in the site selection of an airfield. However, this method may not be applicable to all type, model, and series of aircraft. There may be limitations on the type or number of aircraft that can utilize these make-shift airfields.

Constructing an Expeditionary Airfield
The Marine Corps is unique as a Service in that it has the capability to establish/construct an air facility using organic assets. Site planners should take into account that the construction of an expeditionary airfield using EAF surfacing systems takes significant time and engineering effort.

CLASSIFICATIONS OF FORWARD OPERATING BASES
Forward operating bases are classified in relation to their size, location, and characteristics in the form of airfield services, logistic supportability, and maintenance capability. Main air base, air facility, air site, and air point are the four FOB classifications from which the ACE will operate.

Main Air Base
A main air base is a secure airfield capable of supporting sustained operations ashore. The base handles aircraft up to and including C-5B and C-17. Task organization requirements determine support agencies and required facilities. At a minimum, the main air base includes an intermediate maintenance activity and full ground logistic and engineering functions required to support current and future needs.

Air Facility
An air facility is a secure airfield capable of supporting squadron-sized elements and associated organizational maintenance activities. The facility sustains operations at a combat sortie rate and supports staging and replenishment of forward sites (e.g., FARPs). Normally, major maintenance functions are not performed at an air facility. An air facility stages aviation ordnance and usually has rough, terrain-capable support equipment to move and maintain aircraft and load ordnance. An air facility can be an existing airfield or an EAF.

Air Site
An air site is a secure location where aircraft pre-position to reduce response time. The site is suitable for fully loaded and armed aircraft to land and await preplanned or immediate missions. Operations are normally limited to receiving and launching previously loaded aircraft. Fuel and ordnance can be staged at an air site, but the site does not receive routine logistic support and contains minimal personnel. Operational requirements determine air site capability. Upon completion of a mission, aircraft must return to either a main base or air facility for refueling, weapons loading, and maintenance.

Air Point
Air points are designed to support specific tactical missions at predetermined geographical locations. Air points are further broken down into FARPs or laager points.
Forward Arming and Refueling Point. Forward arming and refueling points are transitory facilities established for a specific mission and duration. Organized, equipped, and deployed by the ACE commander, a FARP is normally located closer to the tactical area of operation than the ACE’s FOB. Forward arming and refueling points permit combat aircraft to rapidly and simultaneously refuel and rearm. The objective at the FARP is to minimize response time and decrease turnaround time in support of combat operations. To reduce flight time, the FARP is located as close to the objective area or the forward line of own troops as the tactical situation allows.

The FARP personnel providing support to the ACE include—

- Fuel personnel.
- Ordnance personnel.
- Plane captains.
- Site controllers.
- Communicators.
- Motor transport/heavy equipment operators (if required).
- EAF personnel.
- EFR personnel.
- EOD (mission dependent) personnel.
- Security personnel.

Aviation maintenance is generally restricted to minor repairs and adjustments performed by aircraft captains and crew chiefs. Normal equipment directly supporting FARP operations may include—

- Tactical bulk fuel systems.
- Ordnance loaders.
- Communications equipment.
- Lighting and marking systems.
- Emergency firefighting and rescue equipment.

Laager Points. A laager point is a secure location at which aircraft rendezvous, marshal, or position between missions. These points are also used while awaiting completion or activation of an assigned mission. Laager points can be isolated and independent, or adjacent to airfields, air facilities, air sites, or FARPs. Lighting, marking, and communications should be the only support required.

Support Organizations

The planning, design, construction, maintenance, and repair of a FOB directly affects the ACE’s ability to support the MAGTF. Due to the operational importance and complexity involved in constructing a new airfield and improving or repairing a FOB, an MWSS may require
augmentation by another general engineering unit. Augmentation can be accomplished by reallocating units from within the MAGTF (such as the engineer support battalion, another MWSS or NCF) or requesting support from units located externally (i.e., US Air Force Civil Engineer units). The MWSS engineer and airfield operations companies construct and provide sustained support to FOBs. See chapter 2 for additional information regarding engineer and airfield services. Additional details related to the allocation of engineer resources within the MAGTF can be found in MCWP 3-34, Engineering Operations. Information pertaining to NCF support to the MAGTF can be found in MCTP 3-34D, Seabee Operations in the Marine Air-Ground Task Force (MAGTF).

Engineer Support Battalion
The engineer support battalion has a greater engineer capacity than the MWSS. Specializing in horizontal and vertical construction, the engineer support battalion augments or reinforces the ACE’s efforts to construct FOBs. The engineer support battalion is a separate battalion in the Marine logistics group. See MCWP 3-34 for more information.

Naval Construction Force
When under MAGTF operational control, the NCF reinforces and augments the MAGTF’s general engineering capabilities and provides a civil engineering expertise and construction capability. The NCF constructs and maintains main air bases and air facilities, including permanent repairs to runways and taxiways. Tactical orientation, personnel, and equipment requirements make NCF support less feasible at air sites and air points. See MCTP 3-34D for more information.
 CHAPTER 4  
SECURITY OPERATIONS

There will always be a requirement for security area operations when Marine Corps operating forces move ashore, especially if the ACE transitions from sea-based to shore-based operations. The MWSS’s primary force protection mission is airfield security operations, which consists of a flight line and two air points.

Airfield security operations are active and passive force protection measures to prevent ground threats and other hazards from impacting aviation operations at air bases, air facilities, air sites, and air points, as defined previously in chapter 3. See figure 4-1 for an illustration of these airfield security concepts.

Flight line security is a component of airfield security operations. Flight line security is an ACE term that is used to identify internal security for critical capabilities and high value assets located
within a perimeter inside the boundaries of a base. Flight line security is often used to control access to aircraft and an aircrew, as well as to aircraft maintenance and ordnance areas or any areas that are designated by the commanders as restricted or limited access. Only designated personnel will be authorized within a flight line security area; all others must be escorted. Flight line security is an ACE internal guard function that is subordinate to and reports to the BDOC.

Air base ground security operations is an ACE term that is used to identify that capability designed to protect aviation assets and associated facilities within the inner security area, perimeter zone, and outer perimeter zone, as defined in MCRP 3-40D.13, Base Camps. Air base ground security operations is a term related to rear area security, which defines base security operations. Air base ground security operations encompass the application of rear area security, as defined in MCTP 3-30C, Rear Area Operations, and JP 3-10, Joint Security Operations in Theater. Low altitude air defense is the primary owner of the air base ground security operations mission for the ACE.

AREA SECURITY FUNDAMENTALS

The MAGTF commander is responsible for overall area security. The MAGTF commander will normally divide the security area into smaller areas of responsibility and assign them to subordinate commanders. The ACE or site commander is normally assigned the responsibility of providing the security measures for the air base from which the ACE is operating. Units are responsible for their own local security. When executing area security or unit defense, unit commanders should employ active and passive measures including, but not limited to, the following:

Active measures
- Training units in antiarmor and air defense.
- Organizing units for defensive operations.
- Equipping support and augmenting personnel with weapons and munitions.
- Conducting security patrols, route sweeps, and using aerial reconnaissance.
- Using observation and listening posts.
- Providing traffic and access control to vulnerable facilities and activities.
- Providing security to convoys.
- Positioning LAAD units in depth.
- Integrating CAS and close fire support.
- Establishing defensive positions and obstacles.

Passive measures
- Camouflaging, dispersing, and using natural cover.
- Establishing redundancy in critical facilities.
- Hardening installations.
- Using deception measures.
• Establishing dummy installations and positions.

Note: GCE assets should be tasked with airfield security missions in the MAGTF security area only in emergencies and to the minimum extent.

Security measures are proportionate to the threat. Area security measures should be sufficient to handle the threat while diminishing the impact of support units in performing their primary missions.

THREAT

Enemy forces will attempt to disrupt security areas to reduce CSS to the main battle. Combat service support facilities, air bases, lines of communications, and operations centers are considered high-priority targets for the enemy in the MAGTF’s security area. The enemy will try to—

• Disrupt MAGTF combat operations by forcing MAGTF commanders to use combat forces to stabilize their security area.
• Force CSS and AGS units to maintain a high security posture, thus degrading their capability to perform their primary functions.
• Cause the MAGTF loss of equipment, mobility, and ability to resupply.

LEVELS

Commanders must consider the enemy’s capabilities and potential impact on operations. During ACE operations, planners need to pay close attention to enemy threat organization, equipment, and potential damage to air bases and aviation operations. JP 3-10 divides the enemy threat into three levels, which commanders should use while planning and developing base security measures:

• Level I. Unit, base, and base cluster self-defense measures are used to handle Level I threats. Examples of Level I threats include the following:
  • Enemy-controlled agents.
  • Enemy sympathizers.
  • Terrorists.
  • Civil disturbances (e.g., demonstrations, riots).
• Level II. Level II threats exceed the capabilities of local self-defense measures and require the employment of response forces. Local self-defense measures must be able to contain the threat until response forces arrive. Examples of Level II threats include the following:
  • Small tactical units.
  • Irregular warfare forces.
  • Guerrillas.
Level III. Level III threats exceed local security measures and a response force’s capabilities and require timely commitment of the GCE tactical combat force (TCF). The ACE is incapable of defeating Level III threats, but will delay until TCF arrives. Level III threats consist of large tactical force operations and may include the following:

- Airborne operations.
- Air assault operations.
- Amphibious operations.
- Major air operations.

PLANNING

Area security planning starts at the theater combatant commander or joint force commander level. The combatant commander or joint force commander assigns responsibilities for joint security area (JSA) security to subordinate component commanders, such as the MAGTF commander. Efficient JSA security planning and execution requires effective and timely command and control. To plan and execute efficient JSA security, the MAGTF commander must—

- Ensure effective and timely command and control.
- Define the roles and responsibilities of each subordinate element within the MAGTF’s area security plan.
- Identify the area of operations.
- Designate the MAGTF’s rear area security coordinator.
- Assign security responsibilities for—
  - CSS and ACE facilities along main supply routes.
  - Lines of communications at remote sites located away from major CSS or ACE facilities.
  - Air defense and fire support systems.
  - Other specific security responsibilities.

Once the MAGTF commander has identified the ACE’s responsibilities, the ACE commander can develop the area security measures. Depending on the tactical distribution of ACE forces, the ACE or site commander may be responsible for several areas or bases.

Aircraft are most vulnerable while on the ground, and then in avenues while in flight routes on approach and take off. Security plans must address aggressive random foot and mobile patrols by security force personnel in these areas to detect and prevent any threats to aircraft during takeoff and landing. Patrols will be suited for mobility and firepower in order to commit immediate maximum firepower to disrupt and destroy enemy operations. Additionally, operational tempo normally requires aircraft to be staged with a full complement of support equipment; therefore, the aircraft and its fuel, ammunition, equipment, and supporting facilities are prime enemy targets and enemy indirect fires present a threat to these assets. Defense in depth with echelon approaches provides a layered methodology, with overarching and complementing security measures. It
allows for maintaining a security presence adjacent to air assets while supporting strong defensive positions along the perimeter.

The LAAD is the ACE’s primary unit capable of performing the mission of air base ground security operations. A LAAD unit can be tasked to perform air base ground security operations with augmentation, provided there is not an air threat. When conducting air base ground security operations, the unit providing air base ground security operations support is responsible for planning, coordinating, and supervising air base ground security operations for the ACE or site commander; to include ensuring active and passive security measures can be implemented in a timely manner. The unit conducting air base ground security operations should incorporate every asset at its disposal when developing the air base ground security operations plan. These assets include the use and integration of air base tenant units, general fire support agencies, ACE air defense agencies, CAS, available intelligence, law enforcement detachment, and security agencies within the MAGTF, ACE, and theater.

The MWSS is responsible for flight line security aboard a main air base, air facility, or an air site. An MWSS is capable of providing simultaneous AGS and airfield security operations, provided it has tenant unit augmentation for flight line security. The MWSS plans, coordinates, and supervises flight line security operations for the ACE or site commander, to include ensuring active and passive security measures can be implemented in a timely manner. Although the MWSS may develop the flight line security plan, the ACE or site commander is the approving authority for the plan.

Flight line security is not defined in joint doctrine, but should encompass the physical security and access control of all of the operating surfaces of the airfield on a FOB. This includes, but may not be limited to, all runways, taxiways, parking areas, aviation maintenance areas, and aviation fuel pits. The flight line security mission may also incorporate command and control facilities that are critical to sortie generation, but may not be physically located on the flight line, such as the Marine TACC or tactical air operations center (also referred to as TAOC).

The flight line security planners should anticipate the likely enemy action based on current threat assessments and build their security measures appropriately. Through thorough planning, coordination, and control, planners can develop a strong area defensive posture that will limit the enemy’s ability to disrupt ACE and airfield operations. The ultimate goal is to protect ACE assets at the FOB and allow for uninterrupted sortie generation.

Refer to JP 3-10, MCRP 3-40D.13, and MCRP 3-30C.1, *MAGTF Rear Area Security*, for further information regarding JSA security and area security planning. Appendix D contains a worksheet for security operations planning.

**COMMAND AND CONTROL**

At the joint force commander level, JSA security measures are coordinated and maintained by the joint security coordinator through the joint security coordination center (also referred to as JSCC).
The joint security coordination center is the senior JSA command and control agency. Subordinate component commanders must coordinate their security measures with the joint security coordination center.

**Marine Air-Ground Task Force**
Joint security area security measures at the MAGTF level are coordinated and maintained by the area security coordinator through the RAOC. The rear area security coordinator has area security coordinating authority over subordinate elements of the MAGTF. The area security coordinator will assign a tactical security officer to supervise security operations within the RAOC. Unit commanders assigned an area of operations or base within the MAGTF’s area of operations will assign a tactical security officer and establish a security operations center for their respective areas. The area security coordinator assists the rear area security coordinator in managing security operations with the other subordinate operations centers to ensure effective and timely command and control throughout the MAGTF’s rear area. In addition to organic personnel staffing, the RAOC may include a fire support coordinator, an air liaison officer, and a CBRN representative.

The MAGTF commander could assign the responsibility of area security to the LCE commander. In this scenario, the area security coordinator will either establish the RAOC in or adjacent to the CSS operations center. The tactical security officer and manning for the RAOC normally comes from the Marine logistics group G-2 and G-3. The Marine logistics group G-3 tactical readiness and training section has infantry officers within its structure who are well-suited in providing advice and rendering assistance on rear area security tasks. In the event that the LCE and the ACE are collocated, the LCE will normally serve as the rear area security coordinator. The LCE is usually best equipped and staffed to manage the area security mission.

**Aviation Combat Element**
The MAGTF commander normally assigns the security responsibilities of the air bases to the ACE or site commander, especially if the ACE is geographically separated from the GCE and LCE. The ACE or site commander is ultimately responsible for air base ground security operations, but normally delegates that authority. The LAAD commander will normally serve as the tactical security officer and establish the BDOC. The MWSS will coordinate the flight line security plan with the assigned tactical security officer and BDOC and that plan will be a subordinate effort of the larger air base ground security operations force.

**Organization**

Organization of the air base ground security operations force is dependent on the threat and should incorporate the fundamentals of joint and MAGTF area security concepts as prescribed in MCRP 3-30C.1. The ACE should have sufficient ground defense to provide the appropriate response to Levels I and II threats with limited reliance on TCF assistance. Level III threats require the commitment of a TCF.

The air base ground security operations forces should include standing, mobile, and response forces to ensure round-the-clock force protection and unimpeded aviation operations. The
organization of the air base ground security operations force should be proportional to the threat while limiting the impact on the ACE’s ability to provide the six functions of Marine aviation to support the MAGTF (see fig. 4-2).

The BDOC is a command and control facility established by the base commander to serve as the focal point for base security and defense. It plans, directs, integrates, coordinates, and controls all base defense efforts and coordinates and integrates into area security operations with the RAOC/rear tactical operations center.

When the ACE is designated as the base security force, the BDOC provides the management, tasking, and supervision for the air base ground security operations forces, including the MWSS providing airfield security operations. The BDOC should consist of the tactical security officer, air base ground security operations officer in charge (OIC), the air base ground security operations staff noncommissioned officer in charge, S-2, law enforcement liaison officer, and the senior supervisor for each subordinate security and flight line security force within the organization. Refer to JP 3-10 and MCRP 3-40D.13 for further information regarding area security and base defense command and control.
CHAPTER 5  
BASE RECOVERY AFTER ATTACK

Base recovery after attack activities center on restoring the mission capabilities of a base after an enemy attack. The site commander will activate the air base’s BRAAT plan. The MWSS will develop a BRAAT plan in conjunction with the site commander to address recovery following a variety of enemy methods of attack (e.g., air attack, mechanized force attack, indirect fire attack). During BRAAT, the MWSS AGSOC is responsible to the site commander for base recovery and base support activities. The MWSS will be required to operate emergency power generators and provide other essential services to keep vital facilities and utilities in operation. Initial actions include the following:

- Firefighting.
- Search and rescue.
- Medical response.
- CBRN monitoring and decontamination.
- Damage assessment of the airfield and facilities.
- MOS selection.
- EOD.
- Isolation of damaged utilities.
- Debris cleanup.

Because substantial damage is expected following an attack, the ACE must repair damage quickly to be capable of supporting aircraft launch and recovery operations. To ensure this task is accomplished, the BRAAT process has been broken down into the following elements:

- Command and control of BRAAT operations.
- BRAAT planning.
- Airfield damage assessment.
- UXO mitigation.
- MOS selection and layout.
- ADR employment.
- Aircraft arresting gear systems.
- MOS marking and lighting.
ORGANIZATIONAL RESPONSIBILITIES

The effectiveness of a BRAAT is a direct result of centralized control and decentralized execution of specialized elements.

Aviation Ground Support Operations Center
As the center for BRAAT operations, the AGSOC is responsible for collecting, analyzing, prioritizing, and reporting information pertaining to the status of the air base (see fig. 5-1). As the focal point for the air base’s recovery efforts, the AGSOC—

• Develops the site commander’s recovery plan with repair priorities.
• Coordinates execution of the recovery plan, following the site commander’s approval.
• Directs the activities of the damage assessment team (DAT), damage assessment and response team (DART), EFR, EOD, and ADR.
• Monitors mission-oriented protective posture (MOPP) levels via the CBRN control center.

Damage Assessment Teams
The DATs are responsible for reconnoitering and surveying the airfield for damage such as craters, spalls, and UXO on the runway, taxiway, and parking areas and for damage to EAF equipment that is required to conduct flight operations from the MOS. The DATs report airfield damage directly to the AGSOC. The number of teams should be based on the number of runways and airfield operating surfaces that need to be maintained. Often, the more DATs that can be fielded, the quicker battle damage can be determined and the airfield recovered. To shorten airfield restoration time, runway damage assessment and UXO assessment can be done simultaneously.

The DAT is organized to conduct ground assessment of UXO locations and bomb damage. These assessments are conducted on foot or from hardened vehicles. The DATs record airfield damage on the DAT record sheet and report the information to the MOS selection team using the North Atlantic Treaty Organization Pavement Reference Marking System. See appendix E for a more detailed discussion of BRAAT forms and procedures. A DAT normally consists of the following:

• Team leader.
• Two EOD technicians.

Figure 5-1. BRAAT Organization
• Radio operator/driver.
• Spall damage assessor.
• Two crater damage assessors.

Damage Assessment and Response Teams
The DARTs assess damage to designated critical facilities and infrastructure, report the presence of UXO, and isolate utility disruptions. Three teams are normally sufficient for a main air base. The number and skillset mix of personnel may vary in a DART, permitting each DART to perform damage assessment on a variety of systems. Personnel should have technical expertise appropriate to the type damage to be assessed (electrical, mechanical, or structural). A prioritized list of facilities and infrastructure critical to sortie generation is usually established during BRAAT planning and should be approved by the ACE/site commander. An example of DART organization is a—

• Team leader.
• Radio operator/driver.
• Utilities assessor.
• Structural assessor.
• Heavy equipment representative.
• Medical support.

The following is a recommended priority list for damage inspection by the DART:

• Command posts and control facilities directly related to combat flying squadrons.
• Communications facilities.
• POL and munitions facilities.
• Fire stations.
• Medical facilities.
• Utility plants and distribution stations.

The AGSOC will receive the information from the DART and will task the appropriate companies with the appropriate repair and damage mitigation responsibilities. An example DART report can be found in appendix E.

Minimum Operating Strip Selection Team
After an airfield has been attacked, the MOS selection team is established in the AGSOC to receive airfield damage reports from the DATs and to determine the usable areas of the airfield for aircraft launch and recovery. The MOS selection team normally consists of the following:

• A team leader who performs the quality control of the MOS selection process, recommends the MOS location to higher authorities, and prepares an estimate of the time required to repair the runway and access routes.
• A data recorder who receives coordinates of airfield damage and UXO from the DAT and records this information on an MOS selection team record sheet (app. E contains sample MOS selection worksheets).
• A data plotter who takes the information from the data recorder and plots the airfield damage and UXO locations on the airfield map (to scale) in the AGSOC.

• A MOS selector who identifies potential MOS with access routes by using templates that should correspond to the type of aircraft operating at the airfield and their MOS requirements.

Collected information is presented to the team leader who calculates the time required to repair craters and spalls and to remove or render safe any UXO located on the MOS. Once the MOS has been selected and approved by the ACE/site commander, the repair information is passed to the ADR OIC, who organizes teams to accomplish the physical repair effort.

**Expeditionary Firefighting and Rescue Team**
The EFR team is responsible for critical airfield firefighting requirements, to include structural firefighting. Expeditionary firefighting and rescue personnel are also used for search and rescue operations. These personnel are trained in first aid and are equipped with first aid kits, litters, blankets, and tools.

**Explosive Ordnance Disposal Section**
The MWSS EOD section is responsible for accurately identifying and classifying UXO, performing render safe procedures on selected ordnance, and overseeing the activities of others in a hazardous UXO environment.

**Chemical, Biological, Radiological, and Nuclear Defense Control Center**
The CBRN defense control center is responsible for the operation of the airfield CBRN survey teams, plotting CBRN contamination, advising the AGSOC on CBRN hazards, and recommending the appropriate MOPP level for the conditions.

**Airfield Damage Repair Officer in Charge**
The AGSOC forwards the airfield recovery plan, depicting the MOS requiring immediate repair, to the ADR OIC. The ADR OIC, typically the engineer company commander, directs the ADR effort. The ADR organization, planning considerations, airfield threat, and damage categories are discussed further in chapter 6.

**Roving Controller**
The roving controller reports the status of recovery activities to the AGSOC. During BRAAT operations, the roving controller is the mobile eyes and ears for the AGSOC.

**COMMUNICATIONS**

The ability to communicate is the most vital part of an efficient BRAAT operation. Table 5-1, on page 5-5, shows the recommended BRAAT communications architecture.
To maximize limited communications resources, the requirements of each BRAAT section must be fully understood. The following subparagraphs explain the requirements of each BRAAT section.

**Aviation Ground Support Operations Center.** The AGSOC must be able to communicate with its subordinate agencies during BRAAT. Initially, DATs and DARTs have the highest priority for communications. Based on damage reports from the DATs and DARTs, the AGSOC develops the airfield recovery plan for the site commander. Once approved, the plan is passed to the following organizations for implementation: ADR, EFR, EOD, and the CBRN control center.
Airfield Damage Repair Officer in Charge. The ADR OIC must have the ability to communicate with the AGSOC, roving controller, and the ADR crews. Communication with the AGSOC enables the ADR OIC to receive the airfield recovery plan, which will show the selected MOS that requires immediate repair. Communication with the roving controller permits the ADR OIC to receive supplemental information regarding the damaged area. The ability to communicate with ADR crews allows the ADR OIC to synchronize activities during the repair. The ADR OIC will normally be a combat engineer or officer.

Expeditionary Firefighting and Rescue. The EFR team receives airfield recovery directions from the AGSOC. Expeditionary firefighting and rescue directs its firefighting and rescue teams to put out fires on parked aircraft, hangars, and other air base structures.

Explosive Ordnance Disposal. The MWSS EOD section receives the airfield recovery plan from the AGSOC after completion of the DAT and DART missions. The senior MWSS EOD technician assigned to the AGSOC directs the MWSS EOD teams to the priority areas requiring UXO mitigation.

Chemical, Biological, Radiological, and Nuclear Defense. The CBRN defense teams receive direction from the CBRN defense control center and provide vital information of MOPP levels and current CBRN threats.

Roving Controller. The roving controller reports on the progress of repairs and alerts the commander of developing problems. In addition, the roving controller reports material shortfalls and equipment problems to the AGSOC.

Methods
The BRAAT communications plan must be developed before BRAAT employment. Radio, telephone, messenger, and a combination of those methods are the communications options for BRAAT.
CHAPTER 6
AIRFIELD DAMAGE REPAIR OPERATIONS

Airfield damage repair is an integral part of the BRAAT operations outlined in chapter 5. A type of large-scale, horizontal construction engineering operation, ADR is conducted on short notice, but without the aid of construction drawings or standardized plans. After an enemy attack, the ACE must repair damage quickly to support aircraft launch and recovery operations. The ACE can expect to repair the following:

- Airfield surfaces (i.e., runways, taxiways, and parking areas).
- Facility infrastructure.
- Communications facilities.
- Utilities.
- Base camp areas.
- Airfield support areas (e.g., ordnance, fuels, maintenance).

PLANNING

During development of an air base’s BRAAT plan, ADR considerations will be incorporated to address a wide range of potential damage that could be inflicted by an enemy attack. The ACE S-2 will provide ADR planners with insight relative to enemy weapon capabilities in terms of the most dangerous and the most likely weapons to be employed. These usually include air or indirect fire weapons capable of penetrating/cratering the airfield’s operating surfaces, taxiways, and parking areas or dispersing explosive ordnance (scatterable mines, cluster munitions) that either impedes flight operations or destroys EAF/navigational aid equipment. As was described in chapter 5, planning should also consider the probability that any enemy attack will also introduce UXO onto the airfield. When time and resources are available, ADR planners will procure and maintain sufficient quantity of construction materials on hand to use in response to potential ADR missions.

Categories of Damage

Enemy munitions used to attack an airfield can create various forms of damage, which are classified into four categories. Appendix E discusses crater damage and repair procedures in detail.

Spalls. Spalls are pavement damage that do not penetrate through the pavement surface to the underlying soil layers. A spall damage area could be up to 5 feet in diameter. This type of damage is generally caused by—

- Small bombs with air burst fuzes.
- Small-caliber artillery fire.
• Small rocket fire.
• Other small-caliber, contact-fuzed munitions.

**Small Craters.** Less than 20 feet in diameter, small craters penetrate the pavement, base course, and possibly the subgrade of the runway, but may not cause pavement upheaval. Small craters usually are caused by—

• Small bombs weighing less than 500 pounds.
• Specially designed bomblets.
• High-angle, medium-caliber naval gunfire with time-delay fuzes.
• Large rocket fire.

**Large Craters.** These craters are 20 feet or more in diameter. Large craters penetrate the pavement, base course, and subgrade of the runway, and always cause pavement upheaval. Large craters are caused by high-angle, large-caliber naval gunfire with time-delay fuzes and medium to large bombs weighing 500 pounds or more.

**Camouflets.** Camouflets are deep, small diameter craters, which are normally caused by large penetration-type projectiles with time-delay fuzes.

**Considerations**
An increase in the diversity and lethality of the enemy’s air- and surface-launched weapons requires planning for ADR materials, procedures, and techniques to repair bomb-damaged runways and taxiways. Airfield damage repair requirements are usually identified early in the BRAAT planning cycle to ensure personnel are trained and familiar with their duties following an attack. See the ADR personnel and equipment requirements in appendix E. Planners must consider the requirements for and availability of personnel, equipment, and repair materials when developing an ADR organization plan.

**Personnel**
Personnel within the ACE will be assigned to fill specific billets within the ADR organization. Under ideal situations, there should be one repair crew and one foreign object damage (FOD) cover crew for every crater that must be repaired. The MWSS will supply the ADR manpower as their table of organization allows. Other supported units on the airfield will be required to augment the ADR organization.

**Equipment**
After personnel requirements and availability have been determined, the MWSS will determine equipment availability for ADR by using the equipment availability matrix in appendix E.

**Repair Materials**
Airfield damage repair materials include fill materials, FOD cover, spall repair materials, and other materials necessary for crater repairs. Based on the construction of the existing airfield, environmental factors, material availability, and the FOD cover being used, ADR planners will ensure adequate quantities of repair material are ordered or on hand to make the necessary repairs following an attack. The material availability matrix, provided in appendix E, will assist in

**ORGANIZATIONAL RESPONSIBILITIES**

The ADR OIC is responsible for coordinating the actions of the crater crews, support crews, spall repair crews, aircraft recovery crews, and hauling crews. Figure 6-1 depicts the organization of the ADR detachment. The AGSOC forwards the airfield recovery plan, depicting the MOS requiring immediate repair, to the ADR OIC. The ADR OIC is responsible for directing the ADR effort.

**Crater Crew**
Each crater crew will excavate, repair, place FOD cover, and clean away debris for each assigned crater. Crater crews can work as a team or in a series depending on the number of craters, number of crews, and standing operating procedure for the unit.

**Crater Repair Crews.** The crater repair crews are responsible for removing debris and ejecta from around the craters. The crews are also responsible for backfilling the craters in preparation for the installation of a FOD cover. The number of crater repair crews depends on the availability of personnel/equipment and the scope of damage inflicted to the airfield.

**Foreign Object Damage Cover Crews.** The FOD cover crews are responsible for installing the operating surface over a crater repair. The number of FOD cover crews depends on the availability of personnel, equipment, and FOD cover material.

**Cleaning and Sweeping Crew.** This crew is responsible for the removal of debris from the MOS.

**Support Crew**
The support crew is responsible for additional motor transport support, water delivery, field maintenance, lighting and power generation, and refueling of equipment supporting the ADR effort.

**Figure 6-1. Airfield Damage Repair Organization.**
Motor Transport and Maintenance Crew. The motor transport and maintenance crew provides tactical vehicle support and maintenance required to keep the crater repair operations on schedule.

Fuels Detachment. The fuels detachment directly supports the ADR effort by ensuring that operations have the fuel necessary for uninterrupted operation.

Spall Repair Crews
Spall repair crews are responsible for repairing spalls located on the MOS. The number of spall repair crews is based on the amount of damage and the availability of personnel and equipment.

Aircraft Recovery Crew
The aircraft recovery crew consists of the MOS lighting and marking crew, the arresting gear crew, and, when necessary, the surfacing crew.

Minimum Operating Strip Lighting and Marking Crew. The MOS lighting and marking crew is responsible for the placement of the runway markings, centerline painting, edge markers, and lighting on the MOS.

Arresting Gear Crew. The arresting gear crew is responsible for the placement, operation, and repairs of the aircraft arresting gear system.

Surfacing Crew. If an expeditionary surface other than concrete, asphalt, or fiberglass reinforced polyester is being utilized, the surfacing crew will maintain or repair the surface.

Hauling Crew
The hauling crew ensures adequate crater repair materials, including fill and FOD cover material, are delivered to the craters. The number of hauling crews depends on the availability of personnel and equipment at the airfield.
CHAPTER 7
FORWARD ARMING AND REFUELLING POINT OPERATIONS

The FARP mission is to provide fuel and ordnance necessary for highly mobile and versatile helicopter, tiltrotor, and fixed-wing operations. The size of the FARP varies with the mission and the number of aircraft to be serviced. Normally, FARPs are temporary, transitory facilities established for a specific duration and mission. The objective of a FARP is to minimize response time and decrease turnaround time in support of sustained operations. Minimizing flight time to and from the FARP and reducing the refueling and rearming time within the FARP achieves this objective. The processing time at a FARP depends on environmental factors, aircraft armament, and support.

The establishment and operation of a FARP is an aviation operation. Planning and coordination of execution details involves the requesting unit and supporting elements of the MWSS, MALS, and MACG. Figure 7-1, on page 7-2, illustrates the composition of a notional FARP organization and the relationship between the FARP detachment and the MAG headquarters.

Because of the extensive MAG involvement in FARP operations—as well as focus on sortie generation—an aviator from the requesting unit is typically selected to fill the air boss position. The knowledge and experience in logistics, aircraft refueling, and security resident in the MWSS make it the ideal source for providing the FARP OIC.

The air boss deconflicts and interacts with the various agencies outside of the FARP (e.g., Marine TACC, direct air support center, LAAD, aviators), while the FARP OIC manages and supervises the activities internal to the FARP. Refer to appendix B and NAVAIR 00-80T-109 for details regarding FARP operations. Appendix B also provides forms to assist in planning. The FARP OIC is responsible for planning and execution of the FARP.

PLANNING CONSIDERATIONS

A FARP extends the combat radius of aircraft and reduces turnaround time to the objective. The combat radius should be considered in terms of distance and time. If there is any doubt that the fuel and ordnance available for a mission is insufficient, a FARP should be planned. The FARP
planners should consider location, employment techniques, refueling methods, equipment, and personnel requirements. In addition, planners should consider the following:

- Distance to the forward line of own troops or objective area.
- Number and type of aircraft to be serviced.
- Required time on station.
- Security requirements for the FARP.
- Enemy, weather, and terrain.
- Availability of adequate road networks and proximity to the main supply route.
- Distance between the FARP and the nearest bulk fuel and aviation ordnance supply points.
- Command and control requirements.
- Coordination with the LCE.

**Location**

Mission, enemy, terrain and weather, troops and support available—time available (METT-T) should dictate where the FARP site is located. The tactical dispersion of the FARP depends on the terrain. The location must allow sufficient area for ground vehicles, aircraft operations, and material movement, and it should provide terrain masking for cover and concealment.
Enemy radar and forces should be assumed to occupy any prominent terrain. To determine the available radar mask, a line of sight analysis is made of the FARP location. Three or four points with routes masked from radar detection should be established and used by aircraft leading to the FARP. By using such passive security measures, aircraft can avoid having the FARP directly detected by enemy radar and observation.

Forward arming and refueling points should be established outside a missile engagement zone (also referred to as MEZ) because the Doppler radar returns from a large number of tiltrotor and helicopter rotor systems that are close in makes it difficult to track other targets in the missile engagement zone. Therefore, FARPs should be placed behind the missile engagement zone or out of line of sight with the LAAD units.

Aircraft return routes should be thoroughly planned with the Marine TACC’s air defense staff. Windows of time and/or specific routes should be planned in advance so that air defense units are expecting friendly aircraft in their vicinity, particularly in reduced visibility. Specific routes and corridors enable the air defense system to maintain the most advantageous weapons condition and as much reaction time as possible to protect the MAGTF.

The location of the FARP will be determined by mission analysis, to include the type, model, and/or series of aircraft the FARP is being employed to support. The site selected for establishment of a FARP should not be within range of enemy artillery systems. The site should allow rapid turnaround of aircraft and accommodate cross-country movement by the vehicles transporting the FARP’s personnel, fuel, and aviation ordnance. Depending upon the tactical situation, a FARP can be positioned on the inbound, return, or outbound route in relation to the tactical objective.

**Inbound Route.** A FARP established on an inbound route—

- Ensures aircraft do not have to wait for fuel through staggered take off and arrival schedules.
- Allows assault forces to pre-position closer to the objective area.
- Provides the mission commander the opportunity to make a final analysis of the situation before continuing to the objective area.
- Allows the mission planners flexibility for time lost because of aircraft mechanical problems and possible redistribution of loads.
- Allows an aircraft to enter the objective area with the maximum fuel possible.
- Provides the ability for aircraft to return to their base while they still have sufficient fuel remaining in the event the FARP is not operational or is detected by the enemy.
- Allows embarked troops from assault support aircraft to augment the FARP security force.
- Serves as a designated alternate fueling site when minimum fuel levels are reached.

A disadvantage of a FARP established on an inbound route is that the massing of assets for final coordination can provide a prime target of opportunity for the enemy.

**Return Route.** A FARP established on the return route is used by aircraft leaving the objective area to receive fuel and ordnance resupply before returning to the objective. To confuse enemy anti-air
defenses, the return route is not on either the inbound or outbound route. A FARP established on a return route—

- Allows the mission commander the opportunity to change the plan before aircraft return to the objective area.
- Allows an aircraft to reenter the objective area with the maximum fuel and ordnance possible.

**Outbound Route.** A FARP established on an outbound route gives aircrews the option to bypass the FARP if fuel is not required. A FARP established on an outbound or return route has the following disadvantages:

- Congestion and refueling delays can be caused when aircraft returning to base converge on the FARP at the same time.
- The enemy can detect the FARP if aircraft departing the objective area are pursued to the FARP site.
- A detected, destroyed, or inoperable FARP may not be able to refuel aircraft departing the objective area.
- Personnel departing an objective area on assault support helicopters may not easily augment security for the FARP because prior briefing with ground forces or ordnance may be limited.

**Employment Techniques**

In a moderate or high threat environment, a FARP may be required to move frequently. In a low-threat environment with a static front and little enemy air activity, the requirement for FARP displacement will be reduced. Depending on the situation, multiple FARPs may be employed or a single FARP may be relocated to different sites. The mobility of a FARP or multiple FARP locations provides the commander increased responsiveness and flexibility.

During establishment of multiple FARP sites or relocation of a single FARP, the new FARP should be operational before the old FARP is shut down. Speed of movement to establish the FARP site is of prime importance and adequate time to set up equipment should be planned.

The mode of transportation used to establish FARPs should depend on the urgency of the mission. Personnel, equipment, and supplies necessary to establish and operate a FARP can be transported by ground vehicles, aircraft, or both methods of transportation.

**Ground Transported.** Establishing a FARP using ground vehicles is the most common means of employment. These FARPs are easy to coordinate, logistically flexible, and do not require the use of aviation assets to set up or resupply the FARP. These FARPs are preferred when the tactical situation, terrain, and time allow for the movement of ground assets into the desired location.

Ground-transported FARPs usually support a specific mission and number of aircraft. These FARPs are established, execute their mission, and return to the origination site. Because resupply of the mobile FARP may be necessary, planners must consider the following:

- Availability of adequate road networks.
- Location of CSS areas.
Air Delivered. The use of assault support assets is an alternate means of establishing a FARP. Air-delivered FARP's are used in tactical operations requiring rapid emplacement or when ground transportation is not achievable due to time, distance, inadequate road networks, or enemy activity. Air resupply of the FARP should be limited due to the large quantities of fuel and ammunition required, the limited availability of aircraft, and the increased probability of detection by the enemy. In addition, continued air resupply of the FARP can increase the probability of detection by the enemy.

Combination of Air and Ground Delivered. A combination of air- and ground-delivered FARP's may be operationally desirable under certain situations. For example, if an attack helicopter squadron receives a rapid commitment order, the FARP may be initially established by air with enough Classes III (bulk fuel) and V (ordnance) supplies for one turnaround per helicopter. Continued operation could then rely on ground transportation for sustainment. Inversely, a FARP may be established using ground transportation, but due to the extended distance to the original fuel source, resupply of fuel and ammunition could be provided by assault support aircraft.

Refueling Methods
Aircraft use either the hot or cold refueling method. Hot refueling is the preferred method because it is faster than cold refueling. The NA V AIR 00-80T-109 provides depictions of the four basic FARP layouts: static, cold, assault, and fixed-wing. It should be noted that FARP layout types are not the same as methods of refueling and should not be confused.

Hot Refueling. The term hot refueling describes refueling of an aircraft with the aircraft engines operating. Aircraft authorized to hot refuel are equipped with a closed-circuit refueling receiver and single-point pressure refueling receiver that incorporates an automatic fuel shutoff capability.

Cold Refueling. The cold refueling method is accomplished by shutting down the engines, waiting until the rotor blades have stopped turning (helicopters/tiltrotor only), securing unnecessary aircraft electronic and electrical equipment not required for refueling, allowing nonessential personnel to disembark, de-arming, and grounding and bonding the fuel nozzle with the aircraft. Pressure and open-port methods are used in cold refueling. An auxiliary power unit may be operational during cold refueling as long as it is not started or stopped during the fueling operation.

Refueling Equipment
The MWSS possesses a variety of fueling assets that can support FARP operations. Each asset is employed based on mission requirements, FARP location, and availability.

Helicopter Expedient Refueling System. The HERS is an expeditionary aircraft fuel dispensing system designed for use in forward areas for primarily attack helicopters. The HERS is helicopter transportable and can be inserted far forward in the battle area. This system is capable of
employing eighteen 500-gallon pods and three 3,000-gallon collapsible tanks with supporting components and a total fuel capacity of 18,000 gallons. The HERS can be rapidly installed, and it shares common components with the TAFDS that are also in the MWSS inventory. The HERS must be replenished often to give extended fuel support.

**MK-970 Refueler.** The MK-970 refueler is a 5,000-gallon, fuel-dispensing system designed for aircraft refueling. The refueler is equipped with a filter separator, recirculation system, and two refueling systems (one for under-wing and one for over-wing servicing). Normal fuel capacity is 5,000 gallons for highway travel and 4,500 gallons for cross-country travel. Fully loaded, the MK-970 is limited as a rough terrain vehicle asset; therefore, site location and accessibility are critical concerns when employing this asset to support FARP operations.

**Six Containers Together Tank Module.** The SIXCON tank module is primarily used for storing, transporting, and dispensing bulk fuel and bulk water. This container can be transported by helicopter, LVSR, or MTVRs. Five fuel storage modules and one, 125-gallon per minute fuel pump module join together to form an 8- by 8- by 20-foot configured module that can pump and store approximately 4,500 gallons of fuel. Each module can hold approximately 900 gallons. Weight distribution for some SIXCON tank modules manufactured without baffles may render its total load as top-heavy; therefore, caution must be taken when configuring SIXCON modules for FARP operations. This asset is primarily used for ground refueling, but can be used to refuel aircraft.

**Tactical Airfield Fuel Dispensing System.** The TAFDS is used to sustain flight operations at FOBs. It is made up of self-contained components that can be hooked together with quick-disconnect fittings to receive, store, transfer, and dispense aviation fuels. The design concept of the system is to meet numerous operational requirements by permitting flexibility in assembly layouts. The basic capability of the TAFDS is 320,000 gallons when configured with four 50,000-gallon and six 20,000-gallon collapsible tanks. However, any combination of collapsible tanks can be employed to meet operational capacity requirements.

**Personnel Requirements**
The FARP OIC supervises and directs FARP operations, to include the fuels section, EFR team, EOD section, ordnance crew, maintenance crew, EAF personnel, security personnel, corpsmen, and radio operators. Motor transport and heavy equipment requirements are dependent on the size and scope of the FARP. Meteorological and oceanographic support can be requested on an as required basis. The air boss is the overall authority at a FARP and is the representative of the Marine aviation command and control system on site who takes direction from the Marine TACC. However, the FARP OIC may have to assume this role if an air boss is not present.

**Fuels Section.** A minimum of six personnel are required for hot refueling aircraft when operating a two-point system: one line noncommissioned officer, one pump operator, two nozzle operators, and two refuel point operators. Twelve personnel are required to operate a four-refueling point site: two line noncommissioned officers (one per two points), two pump operators; four nozzle operators; and four refueling point operators. For planning purposes, a FARP should have a line noncommissioned officer for every two points, a pump operator for every pump, and a nozzle operator and a refueling point operator at each refueling point. The nozzle operator is a crew chief, plane captain, or qualified person per NAVAIR 00-80T-109. Additionally, it is
highly recommended that taxi directors be used at each assault support refueling point for terminal guidance.

**Expeditionary Firefighting and Rescue.** Expeditionary firefighting and rescue support is not a requirement to operate a FARP. However, when available, one EFR crew and rescue vehicle should support a FARP. Facilities that are frequently used for staging aircraft or terminal/departure points should be equipped with 150-pound clean agent extinguisher. Operations involving AV-8B or MV-22 aircraft shall be supported by a minimum of one mobile twin fire suppression system manned by a crew of two EFR personnel.

**Expeditionary Airfield Section.** Normally, two EAF Marines are assigned to a FARP. Their tasks include the layout and setup of the airfield, to include the proper spacing, marking, and lighting for aircraft operations.

**Explosive Ordnance Disposal Section.** Because of the limited number of EOD technicians within an MWSS, EOD employment must be done judiciously; therefore, the situational and operational requirements will determine EOD participation during FARP operations. Explosive ordnance disposal personnel can provide assistance during FARP operations, but they are primarily employed to clear UXO along movement routes and within the FARP site.

**Ordnance Crew.** The mission and ordnance requirements will determine the number and type of ordnance personnel to support the FARP. A minimum of four ordnance personnel are required during any cold arming/de-arming sequence, while six ordnance personnel will be required for hot loading. Flying squadron ordnance personnel may be required to conduct an arming/de-arming or a loading/downloading sequence. Intermediate maintenance activity personnel may be required to build and assemble ordnance at the FARP.

**Maintenance Crew.** Based on the mission and availability of personnel, maintenance crews may or may not be included within the FARP organization. Normally, maintenance activities within the FARP are limited. In most cases, maintenance personnel are on call. If a problem exists beyond the maintenance crew’s capabilities, additional ACE maintenance personnel and equipment are brought to the FARP to effect necessary repairs.

**Security Forces.** The composition of the security force is based on the situation, mission, and threat. These forces provide security for convoys en route to the FARP and for FARP personnel and equipment during operations. Besides focusing on ground-related threats, FARP security forces may include LAAD assets to combat air threats.

**Forward Arming and Refueling Point Layout Types**

There are four basic FARP layout types: static, cold, assault, and fixed-wing. These types are largely based on the type of aircraft being serviced and the method of refueling. There are more complicated FARP layouts depicting combinations of the basic types, but they are outside the scope of this publication. Each basic type is described briefly in the following paragraphs; however, detailed procedures and layouts for each type of FARP can be found in NAVAIR 00-80T-109.
**Static Forward Arming and Refueling Point.** A static FARP is one in which attack helicopters (AH-1W/Z, UH-1Y, and similar joint assets with forward firing ordnance) land on a designated arm/de-arm heading at each fuel point and remain with engines on and rotor blades turning. The fueling points are set up utilizing stationary equipment and aircraft are refueled using the hot method. Ordnance operations take place in a static FARP and are deconflicted by maintaining safe distances from fueling operations. The primary purpose of a static FARP is to rapidly fuel and re-arm attack helicopters to provide consistent CAS to troops on the ground. Therefore, speed of operations at the FARP site is critical to minimize the time that aircraft spend in the FARP.

**Cold Forward Arming and Refueling Point.** A cold FARP is one in which attack helicopters (AH-1W/Z, UH-1Y, and similar joint assets with forward firing ordnance) land on a designated heading at each fuel point and shutdown engines. Mobile refueling assets are then driven down the line of aircraft refueling them one at a time using the cold refueling method. Ordnance operations may take place at a cold FARP. A cold FARP is preferred over a static FARP when aircraft need to land and conduct further planning or wait a designated amount of time. Cold FARPs do not have a limited number of refueling spots due to the mobile refueling, whereas static FARPs are limited in the number of refueling spots based on equipment quantities.

**Assault Forward Arming and Refueling Point.** An assault FARP is one in which assault support aircraft (CH-53E, MV-22B, and similar joint assets) land at a designated area and taxi through fuel points. Ordnance operations do not normally take place in an assault FARP, and the aircrew are responsible for de-arming chaff and flare dispensers. Aircraft are refueled in an assault FARP primarily using the hot refueling method from stationary fuels equipment. Assault FARPs normally require a large amount of area to conduct operations due to the required safety distances. It should also be noted that assault support FARPs usually require much more fuel on hand to support aircraft than static or cold FARPs. The primary purpose of an assault FARP is to extend the range of assault support aircraft without the requirement for air-to-air refueling.

**Fixed-Wing Forward Arming and Refueling Point.** Specialized fixed-wing aircraft, such as the AV-8B and the F-35B, have the capability to conduct short/vertical takeoffs and landings while operating from expeditionary sites. Aircraft must eventually be phased ashore from ships during combat operations. Fixed-wing FARPs fill the requirement to fuel aircraft as they move to land bases prior to robust tactical fuel sources being emplaced. Ordnance operations will take place at fixed-wing FARPs, and fuel is delivered usually by the hot refueling method. Fixed wing FARPs must operate near paved surfaces or airfield surfacing systems matting, and special consideration must be given to foreign object and debris mitigation. Furthermore, planning should take into account that it is likely fixed-wing FARP sites will eventually grow into larger locations, such as air facilities or main air bases. The layout of a fixed-wing FARP is entirely situationally dependent.
DEFENSE

A FARP site requires defensive preparations to defeat both ground and air threats.

Ground Defense
Organic personnel and security forces provide the principal FARP ground defense. Reconnaissance personnel and GCE assault force personnel passing through the FARP may also be integrated into the FARP’s defense for limited periods.

Reconnaissance personnel can be used to ensure that the designated FARP location is suitable for FARP operations and can provide initial security until FARP security forces are in place. In addition, reconnaissance personnel can provide zone intelligence updates, which can be passed to the aircraft commander (airborne). Because aircraft must off-load nonessential personnel during refueling operations, disembarked assault forces may be used to augment the FARP defense while they are within the FARP and waiting to load the aircraft.

A tactical air control party can also be inserted into the FARP to provide a link with most supporting arms. Close air support for the FARP may consist of organic and nonorganic rotary- and fixed-wing aircraft. However, integration of any of these units and assets into the FARP defense requires extensive planning and coordination before execution to reduce confusion and delays.

Air Defense
Air defense could encompass rotary- and fixed-wing escorts of assault support aircraft and the integrated air defense of LAAD. Low altitude air defense personnel may be employed either separately, inserted into the FARP site area with the GCE, or accompany the FARP team. Either way, the LAAD OIC or section leader must be involved in the FARP planning to ensure LAAD personnel are properly integrated into the FARP defensive plan.

To plan the FARP air defense, the LAAD section leader should be thoroughly briefed on the FARP operations (e.g., types and number of aircraft, aircraft approach and departure direction). The LAAD section leader is normally located in close proximity with the FARP OIC to receive current aircraft information. In most cases, the LAAD section leader receives current situational awareness from the FARP communications links.

COMMUNICATIONS

Forward arming and refueling point operations require external and internal communications. The air boss requires external communications to higher headquarters and aviators in the aircraft. The FARP OIC and detachments require internal communications to command and control the following organizations within the FARP:

- MWSS detachment.
- MACG detachment.
• MALS detachment.
• LAAD.
• Security detachment.

The MACG detachment includes an element from the Marine wing communications squadron that provides external communications for the FARP, while the MWSS is responsible for the internal requirement. Agencies within the FARP will monitor the FARP control net. A Marine air traffic control mobile team (also referred to as MMT) is often collocated with a FARP to direct air traffic in and out of the FARP area.

Each organization may have its own internal frequency to coordinate its specific functions. Fuels, EFR, and EOD use the air operations net, and maintenance and ordnance use the maintenance control net for internal control.

The FARP should have both UHF and VHF capability. The number and types of frequencies within the FARP is mission dependent. If there is no MATC detachment at the FARP, aircraft will switch to FARP control on approach to receive terminal guidance.

The FARP frequencies, call signs, and radio procedures should be briefed during the aviator’s mission brief. Once the aircraft are within the FARP, radio transmissions should be kept to a minimum during refueling and arming procedures. Aircraft and ground personnel should make initial contact with one another before aircraft enter the FARP. Table 7-1 shows the communications architecture normally employed during FARP operations.

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**LAYOUT CONSIDERATIONS**

The FARP layout will be established based on the type of FARP, the equipment used, the number of refueling points required, the types of aircraft being serviced, and the ordnance support requirements. Appendix B provides some layout configurations typically used when conducting FARP operations. These layouts and others can be tailored to fit specific missions as long as NATOPS safety restrictions are met. Refer to NAVAIR 00-80T-109 for specific aviation ground refueling requirements, procedures, and limitations. When designing the FARP layout, planners must consider the following:

- The space between aircraft and refueling points must accommodate the largest helicopter expected to utilize the FARP. The standard layout should accommodate aircraft sizes up to the MV-22, which requires at least 150 feet between refueling points.
- Wind direction must be calculated to accommodate aircraft landing, refueling, and take off.
- Fueling equipment must be placed on high ground within the FARP site, because fuel vapor, which is heavier than air, collects in depressions and hollows.
- Equipment must be positioned in a location that provides adequate drainage away from the equipment and refueling points in the event of fuel spills or sudden rainfall.
High frequency radios should be maintained at a safe distance from ordnance at the FARP. If at all possible, use of satellite communications should be considered.

Approach and departure zones should be cleared of obstacles and antennas. No loose articles should be in or around the FARP. All items should be secured and fastened to avoid loose articles from becoming airborne hazards to aircraft.

FARPs should maintain controlled access to the landing points to restrict unnecessary ground traffic within the FARP site.

Dust mitigation techniques should be considered in areas with loose soil and debris.

**Routing and Aircraft Control Procedures**

Aircraft should enter a FARP from a designated initial point. If there is no MATC detachment at the FARP, individual flight leaders will provide separation and control of aircraft into the FARP. The air boss or FARP OIC will maintain VHF and UHF radio communications.

The prebriefed landing pattern shall be the same for all aircraft operating at the FARP. Procedures for wave-offs at the FARP and the staging areas should be prebriefed and conform to the pattern established in that area. The heading for final approach to the FARP should be determined during...
the planning phase and may be terrain and weather dependent. The final approach should be marked with LZ panel markers or airfield lighting assets.

Aircraft should avoid overflying the FARP while other aircraft are in the site. If other aircraft are waiting at the primary staging area, incoming aircraft will be directed to land at the alternate staging area. A right-hand landing pattern is desired. Pattern altitudes shall be specified and selected in accordance with METT-T and space and logistic considerations. Orbiting of the FARP should be avoided to prevent the enemy from detecting and targeting the FARP.

Forward arming and refueling point aircraft directors can provide terminal guidance with hand and arm signals and night vision goggle (NVG)-compatible wands. Depending on the number of aircraft and complexity of the operation, a Marine air traffic control mobile team may be used to provide procedural control to incoming aircraft and airspace deconfliction. If communication conditions allow, the flight leader will call the FARP for clearance to land at the fuel point or staging area, depending on traffic and fueling priority.

**PREOPERATIONAL PROCEDURES**

Forward arming and refueling operations are inherently dangerous due to the hazards involved with simultaneously arming and fueling aircraft under austere conditions and truncated timelines. It is imperative that all precautions be taken before operations in order to minimize risk to personnel, aircraft, and equipment. Forward arming and refueling point teams should do the following during preoperational procedures:

- Verify that a minimum of one fire extinguisher is in the immediate vicinity of the fuel source and the refueling point.
- Clear areas that may be susceptible to rotor downwash.
- Ensure that visual landing aids (e.g., panel markers, NVG-compatible lighting) are securely anchored/attached to the ground at the fuel points and pre- and post-staging areas.
- Ensure the site is clear of loose debris or FOD-producing material.
- Ensure there are no depressions or protrusions in the landing areas that exceed 10 inches.
- Ensure the slope of the FARP area (landing points) does not exceed 5 degrees.
- Use locations that minimize soil disturbance from heavy FARP equipment and aircraft.
- Verify availability of access roads.

**EMERGENCY FIRE AND RESCUE PROCEDURES**

Forward arming and refueling point personnel must follow procedural steps in case of a fire or aircraft emergency. Ground and air crewmembers should follow the basic emergency fire
and rescue reaction steps outlined in NAVAIR 00-80R-14; specific steps will depend on the emergency. Either a ground or air crewmember can handle the fire extinguisher nozzle during a fire emergency.

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**ADDITIONAL PROCEDURES**

A FARP may be established to provide fuel and ordnance for several days in support of sustained operations, or it may be required to provide fuel for a period of hours in support of a raid. Depending on the mission, FARP personnel may employ procedures for emergency breakdown and evacuation, night operations, ordnance, or crew-served weapons.

**Emergency Breakdown and Evacuation**
In the event the FARP comes under attack, participants must be familiar with the load plan and the sequence of extract. Security forces will generally be the last to depart, refueling equipment is considered expendable, and supporting arms must be preplanned and used. Standardized procedures are not established for this evolution; therefore, each mission will develop its own procedure according to METT-T and space and logistics, and the availability of supporting units.

**Night Operations**
Due to the fact aircraft are most vulnerable while on the ground, FARPs are usually operated during periods of reduced visibility (night) to improve aircraft survivability. This increased requirement for a night operation capability dictates that detailed planning take place at all levels, because night activities inherently take longer to complete. The FARP’s night activities will normally be set up for NVG operations. Taxi directors should use wands with cones or infrared chemical lights.

**Ordnance**
Loading and downloading of ordnance and fueling of aircraft must be conducted as separate activities. The aircrew preflight briefing will include the arming/de-arming location and loading/downloading locations of the FARP. Ordnance personnel should use the appropriate NATOPS checklists during ordnance activities. Refer to NAVAIR 00-80T-103, *NATOPS Conventional Weapons Handling Procedures Manual (Ashore)*.

**Crew-Served Weapons**
After refueling, an assault aircraft in the post-refueling staging area that requires ammunition for crew-served weapons will signal the ordnance personnel using prearranged signals. Arming and de-arming of crew-served weapons will be accomplished in accordance with applicable weapon procedures.
SAFETY

Safety is the responsibility of all personnel and shall be the determining factor before, during, and after activities involving aviation ordnance and refueling operations. Unsafe situations, practices, or procedures observed by any person should immediately be brought to the attention of all hands, and ordnance and refueling activities must immediately stop until the unsafe condition can be corrected or eliminated.
APPENDIX A
AIRFIELD SITE SURVEY WORKSHEET

The airfield site survey worksheet is designed to provide information concerning airfield facilities and airfield equipment that is required by the ACE to function at an airfield. Those AGS items not available at the airfield and considered mission essential will have to be embarked with the ACE. The worksheet should be completed in as much detail as possible.

The worksheet is divided as follows:

- Airfield site survey basic information.
- Section I. Airfield Suitability.
- Section II. Airfield Operations.
- Section III. Motor Transport.
- Section IV. Engineer.
- Section V. General Airfield Characteristics.
- Summary.

The following designations are specific to this appendix only:

AB ..............................................................automated branch
AC .............................................................. alternating current
AE ..............................................................automated exchange
AMHS .....................................................automated message handling system
ASR ...........................................................airport surveillance radar
DC ..............................................................direct current
DMS ............................................................defense message system
DSN ..........................................................Defense Switched Network
ILS ............................................................instrument landing system
ESWL ........................................................equivalent single wheel loading
FLIP ..........................................................flight information publication
LCN ............................................................load classification number
MHE ..........................................................materials handling equipment
PAR................................................................. precision approach radar
RBN ........................................................................... radio beacon
SID ................................................................. standard instrument departure
ST ............................................................................. single tandem gear rating
T ................................................................. twin gear rating
TACAN ............................................................ tactical air navigation
TT ................................................................. twin tandem gear rating
TDT ................................................................. twin delta tandem gear rating
VOR VHF .......................................................... omnidirection range
Airfield Site Survey Worksheet

Name ____________________________________________

Airfield Location ____________________________________________________________

Date Survey Completed ______________________________________________________

Personnel Conducting Survey

<table>
<thead>
<tr>
<th>Name/Rank</th>
<th>Position</th>
<th>Organization</th>
<th>Phone</th>
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</tbody>
</table>
Section I. Airfield Suitability

1. Airfield Lighting

Is power commercial or by generator?  Yes___  No___

Are power lines buried or above ground?  Yes___  No___

Identify type of wire used (single/double/triple conductor).

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify voltage, amp, and phase.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

2. Soil

Assess general soil conditions (e.g., rock, clay, sand), particularly in areas of possible arresting gear placement.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

3. Runways, Taxiways, and Parking Areas

Instructions for filling out data are as follows:

- Identify and complete data blocks on all runways, taxiways, and parking areas whether they are active or inactive.
- Include an airfield diagram or sketch labeling each of the runways, taxiways, and parking areas.
• Identify specific taxi routes and parking areas on the airfield diagram/sketch.
• List the published runway, taxiway, or apron strength by at least one of the following designations:
  ♦ T.
  ♦ ST.
  ♦ TT.
  ♦ TDT.
  ♦ ESWL (include associated tire pressure, if available).
  ♦ LCN.
• If listing T, ST, TT, or TDT, include the other rating, if available (e.g., if a T is given, attempt to obtain the ST, TT, and TDT rating). If a data source is the current flight information publication (FLIP), confirm with the appropriate airport officials/civil engineers. If other ratings are not available, do not convert. Every effort should be made to furnish the LCN at airports, which will support civil aircraft.
• Identify and locate all obstructions adjacent to all runways, taxiways, and parking areas. For example: Runway distance markers 4 feet high every 1,000 feet along Runway 04/22, 8 feet from runway edge. If obstacle data are listed in the current FLIP, confirm its accuracy.
• Identify and include all obstructions in the approach and departure zones that violate the standards of UFC 3-260-01. Identify all obstructions and associated heights and locate them from a known reference point adjacent or near to the obstruction.
• Record distances between adjacent runways, taxiways, and parking areas (e.g., 1,000 feet between Runway 20 and the parallel taxiway).
• Record the condition of area surfaces in regard to possible repair, FOD, and engine blast damage.
• List and locate AGS equipment, building, and barriers, which are subject to possible blast damage.
• Designate tie-down rings, which qualify as aircraft grounding points.
• Include any gross weight or other limitations imposed by airport operator/manager.
### Runway Data

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<tr>
<td>Width</td>
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<td>Slope</td>
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<tr>
<td>Published strength</td>
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<tr>
<td>Imposed weight limits (note 2)</td>
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<tr>
<td>Centerline marked</td>
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<tr>
<td>Distance markers</td>
</tr>
<tr>
<td>Edge markers</td>
</tr>
<tr>
<td>Approach lights</td>
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<tr>
<td>Threshold lights</td>
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<tr>
<td>Visual slope indicator lights</td>
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<td>Shoulders surface</td>
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<td>Width</td>
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<td>Condition</td>
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<td>Overrun length</td>
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<tr>
<td>Surface</td>
</tr>
<tr>
<td>Condition</td>
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</tbody>
</table>

**Notes:**
1. Excellent, good, fair, poor. If fair or poor, give details.
2. Imposed by host airport manager or officials.

Description, location, and height of obstruction along runways.

Example: Radar reflector 72 inches high, 300 feet left of centerline Runway 04, 550 feet from the approach end (include lighting data).
Description, location, and height of obstructions in the approach and departure zones.

Example: Trees, 322 feet mean sea level, 1,000 feet prior to threshold Runway 22, 70 feet left of the runway’s centerline (include lighting data).

_____________________________________________________________________
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Describe approach illusions, if any.

_____________________________________________________________________
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Taxiway Data

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<td>Stabilizing surface</td>
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<tr>
<td>Stabilizing width</td>
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</tbody>
</table>

Note:
1. Imposed by host airport manager or officials.

Description, location, and height of obstructions along taxiways (include lighting area).

_____________________________________________________________________
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Parking Area Data

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<td>Dimensions (note 1)</td>
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<tr>
<td>Surface</td>
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<tr>
<td>Conditions</td>
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<tr>
<td>Published strength</td>
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<tr>
<td>Imposed weight limit (note 2)</td>
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<tr>
<td>Taxi stripes</td>
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<tr>
<td>Tie-down rings</td>
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<tr>
<td>Grounding points</td>
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<tr>
<td>Shoulders stabilized</td>
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<td>Stabilizing surface</td>
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<tr>
<td>Stabilizing width</td>
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<tr>
<td>Flood lighting</td>
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</tbody>
</table>

Notes:
1. If irregular size, indicate dimensions on attached drawing.
2. Imposed by airport manager or officials.

Description, location, and height of obstructions adjacent to a parking area that will restrict aircraft movement while compiling with taxi obstacle clearance requirements (include lighting data).

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Are parking spaces made available for aircraft with explosives? Yes_____ No______ If yes, identify number and explosive limits for each (indicate location on attached drawing).

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Are parking spots marked (e.g., C-5, C-17, C-130, ILS, Civil Reserve Air Fleet B-747)? Yes_____ No______ If yes, identify.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Identify how much of the total parking space available can be allocated.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Is LCN waiver required? Yes_____ No______ If yes, will local officials grant waivers?
_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Does the slope of the parking area aggravate the breakaway and taxi power requirements?
Yes_____ No______ If yes, identify problem areas.
_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Provide remarks on any aspect of parking aircraft not covered.
_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Is space adequate for emergency vehicles to maneuver around aircraft? Yes_____ No______
If no, identify problem areas.
_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

4. ENGINE BLAST

Can engines be run up to maximum power in parking positions without damage to ground surfaces or structures? Yes_____ No______
Is an engine trim pad available for maximum power run up? Yes_____ No_____

Is a blast fence installed or planned for the engine trim pads? Yes_____ No_____

Are other aircraft, structures, or surfaces likely to be damaged by engine blast from application of breakaway power when moving from parking spot or from taxi power application as the aircraft follows designated taxi routes to and from the parking area? Yes____ No____ If yes, explain.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Is any damage to structures, surfaces, or vehicular traffic likely to occur while the aircraft is in the takeoff position when maximum engine power is applied? Yes____ No____ If yes, explain.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Provide remarks on any aspect of jet blast not covered.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

5. AIRCRAFT MOVEMENT ON THE GROUND

Identify any area not accessible to the aircraft because of surface strength, obstacles, or probable engine blast damage.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Identify any specified taxi route that aircraft would have to follow from landing to the parking areas and from the parking areas to the runways for takeoff.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Can the aircraft taxi in and out of the following areas:

• Refueling area? Yes____ No____ If no, explain in detail.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

• Loading/unloading area? Yes____ No____ If no, explain in detail.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

• Maintenance area? Yes____ No____ If no, explain in detail.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Attach, to the completed survey, an airfield drawing (8 inches by 10 inches) showing designated taxiways and the proposed parking plan that the aircraft will have to comply with while observing limitations imposed by obstacles, weight bearing capacity, probable blast damage, and width.

Provide remarks on any aspect of ground movement difficulties not covered.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________
6. EXPEDITIONARY AIRFIELD
DEVELOPMENT OR EXTENSION OF EXISTING FACILITIES

Sketch the proposed airfield showing all dimensions, to include all existing structures, of the following:

General description of the area
• Natural grade/slope.
• Type and condition of vegetation.
• Soil classification (e.g., clay, sand, gravel, other).
• Roads that cross the area or are adjacent to area.
• Potholes, depressions, or other items necessitating surface preparation.
• Obstacles, manmade or natural.

Utilities in unpaved area
• Overhead.
• Underground.
• Storm drains or any other large underground conduits and underpasses.
• Water source.

The utilization of unpaved areas for EAF development is based upon predetermination of the soil strength by personnel experienced in testing and identifying soils. Areas identified in the previous paragraphs that show potential for off-pavement aircraft operations will subsequently be tested by personnel qualified in soil mechanics and the data made a supplement to this survey. This data will include the following:

• Soil classification in accordance with the Unified Soil Classification System.
• Measures CBR and moisture content at the time of CBR measurements. Record CBRs at depths of 36 inches.
• Airfield index measured at the same time and location as the CBRs and listed at same depth.

7. BILLETING

Identify the following billeting information:

On base
• Number. ________
• Type. ________
• Total capacity. ______
  † Officer. ______
  † Enlisted. ______

Off base
• Number. ______
• Type. ______
• Total capacity. ______
  † Officer. ______
  † Enlisted. ______

8. MESSING

Identify the following messing capabilities:

On base
• Capacity. ______
• Hours of operation. ______

Off base
• Capacity. ______
• Hours of operation. ______

General remarks (e.g., quality, health standards).

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
## Section II. Airfield Operations

### 1. Flight Line Security

Type guards: Military/civilian, US/indigenous.

---

Are guards armed? Yes ______ No ______

If yes, identify type of weapon (e.g., handgun, rifle, machine gun).

---

Number of guards on each shift _____________________________________________

Do guards patrol on foot or in vehicles? _______________________________________

Are patrol dogs used? Yes ______ No ______

Do guards speak English? Yes _____ No _____

Does the transient aircraft parking area appear secure? Yes _____ No _____

Is the transient parking area well lighted? Yes _____ No _____

Were portable lights furnished for the transient parking area? Yes _____ No _____

Does the flight line have restricted access? Yes _____ No _____

Is the flight line fenced? Yes _____ No _____ If fenced, identify type (e.g., wood, chain link).

---
Did the security force appear to have inter-base radios? Yes ______ No ______

Does the security force use a restricted area badge or some other type of personal identification? Yes ______ No ______ If yes, identify type.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Did local forces provide a security check of passengers? Yes ______ No ______

Are weapons storage facilities available? Yes ______ No ______ If yes, identify type.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

2. COMMUNICATIONS

Telephones

Is there a base telephone exchange? Yes ______ No ______

Are commercial telephone lines available? Yes ______ No ______

Direct circuit:

• To ________, ________, ________.
• Type of termination:
  • Is a private branch exchange switchboard available? Yes ______ No ______
  • Is a console available? Yes ________ No _________
  • Is there a patching capability? Yes ________ No _________

DSN:

• Quantity (number of incoming, outgoing, 2-way lines):
  • Private branch exchange.
• 4-wire (where is it located).

• Precedence capability (flash, priority):
  • Private branch exchange.

• Maximum call area (e.g., worldwide, continental United States, Pacific):
  • Private branch exchange.

• 4-wire.

• Number (area code, operator assist).
Local commercial numbers (area code, operator assist):

- Are local, commercial numbers available? Yes ________ No ________
- Type _______________________________________________________
- Number/listing _______________________________________________

Communications Assets

Local area network/wide-area network services:

- Connectivity type.
  —________________________________________________________________
  —________________________________________________________________
  —________________________________________________________________

- Is there a communications infrastructure?   Yes______ No_______
- Messaging:
  - Is AMHS available? Yes ________ No ________
  - Is DMS available? Yes ________ No ________

Is DSN terminal available? Yes ________ No ________

- Identify digital subscriber terminal equipment type (AE, AB).
  —________________________________________________________________
  —________________________________________________________________
  —________________________________________________________________

- Identify any other communications assets (e.g., Mode V, II).
  —________________________________________________________________
  —________________________________________________________________
  —________________________________________________________________

- Determine highest security classification that the available circuit can process.
  —________________________________________________________________
  —________________________________________________________________
  —________________________________________________________________
Identify distance and travel time between operating locations and communications center.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify hours of operation (e.g., 24 hours/day, 7 days/week; 8 hours/day, 5 days/week).
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify routing indicator.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

**Radio**

**UHF/VHF:**

- Type (US Army/US Navy nomenclature).
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

- Quantity.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
• Frequencies available.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Identify intrabase radio (by net) and frequency.
_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Auxiliary power for communications equipment

Determine volts ________ hertz ________ .

Type of communications support to be augmented

Identify buildings and room numbers where services are required.
_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Contacts for additional communications requirements

Identify people to contact and telephone numbers for coordination of additional communications required.
_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Communications-electronics facilities/capabilities program change

Identify any major communications-electronic facilities/capabilities program changes.
_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________
Communications support at airfield

Identify any resident communications support at the airfield.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

General remarks

Provide any other general, relevant information (e.g., reliability of communications equipment and long-haul circuits and other pertinent comments).
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Provide the following information on the nearest Federal Aviation Administration center or flight service station facility:

Identify location.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify type.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify phone number.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Identify distance.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

3. STRUCTURAL FIREFIGHTING AND AIRCRAFT RESCUE AND FIREFIGHTING

Provide the following information for rescue crews:

• Are rescue crews housed and messed on the flight line? Yes ________ No ________
• Is a full suit of protective clothing available for each on-duty fire fighter (i.e., hood, coat, trousers, boots, and gloves)? Yes ________ No ________
• Is any aluminized protective clothing available? Yes ________ No ________
• Is a water supply available on the airfield for refilling crash trucks? Yes ____ No ____

Is each firefighting vehicle radio equipped? Yes ________ No ________

Can vehicles communicate with the tower? Yes ________ No ________

Equipment (provide the following for all non-Marine Corps fire protection vehicles):

• Make. ____________________________________________________________
• Number. _________________________________________________________
• Water capacity. _________________________________________________
• Foam type/capacity. _____________________________________________
• Number of turrets. ______________________________________________
• Water rate (gallons per minute) of turrets. __________________________

Identify the following information for the nearest hospital:

• Name. ____________________________________________________________
• Location. _________________________________________________________
• Distance from base. ______________________________________________

During a contingency, identify how many medical personnel will reside at the base medical facility:

• Flight surgeons.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

A-23
• Other physicians.
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________

• Medical technicians.
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________

• Dentists.
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________

• Dental technicians.
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________

• Nurses.
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________

Identify the following information to determine ambulance availability:

• Number of ambulances. ________________________________

• Crash ambulances with radios. ___________________________

• Other ambulances:
  • Military. ______________
  • Civilian. ______________
• Does a crash ambulance normally respond to all in-flight emergencies? Yes ___ No ___
• During an emergency, how many ambulances will remain at the base medical facility? __________
• Crash ambulances. __________________________________________
• Military ambulances. _________________________________________

General comments/remarks.
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

4. FUEL

Identify the following storage capacities:

• Bulk storage capability. _________________________________________
• Average inventory in bulk storage. ______________________________

Identify how the bulk storage of fuel (tank truck; tank car; pipeline; tanker/barge) is handled.
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Determine the receiving rate (simultaneously by tank truck; tank car; pipeline; tanker/barge).
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Determine the transfer rate (gallons per minute) from bulk storage to the hydrant storage tanks.
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
Identify jet fuels dispensing capabilities.

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Identify hydrant storage capabilities.

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Determine number of hydrant refueling positions. _________________________

Determine total gallons per minutes that can be pumped through hydrant systems. __________

Determine the number of aircraft that can be refueled by hydrants simultaneously. __________

Determine the number/capacity (gallons) and pumping rates (gallons per minute) of refueling vehicles (trucks).

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Determine turnaround time from flight line to fuel point, fill, and return to the flight line.

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Determine number of fuel points and pumping capacity of each.

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________
Determine distance between fuel points.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Determine compatibility of host support equipment to Marine Corps airfield.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Identify the following off base facilities:

• Where is the off base supply point? _________________________________

• Identify the storage capacity and average fill.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

• Trace POL supply back to port or refinery. If the refinery is the source, determine production capability for jet fuels.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Identify the following POL test laboratory information:

• Is one in operation? Yes ______ No ______

• Would military personnel be allowed to work in the laboratories? Yes ______ No ______
5. FOOD SERVICES

Identify the following food services capabilities:

On base
• Capacity. ________  
• Hours of operation. ________

Off base
• Capacity. ________  
• Hours of operation. ________

Do the off base eating facilities practice good standards of food preparation? Yes ___ No ___
If yes, identify the off base eating facilities that should be avoided.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Are there any foods/drinks that should be avoided by Marine Corps personnel? Yes ___ No ___
If yes, identify foods/drinks that should be avoided.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

What is the source of local water?
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Is the local water supply disinfected? Yes ______ No ______

Is the base located in a malaria risk area? Yes ______ No ______ If yes, identify the months of the year that the base is at risk.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Is the surrounding countryside in the risk area? Yes _____ No _____ If yes, identify the months of the year that the country is at risk.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

6. MEDICAL

General information

Identify topography (mountains, desert, etc.).

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify climate (tropical, arctic, etc.).

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify the following temperature ranges:

- Summer. ________ to ________
- Winter. ________ to ________
- Spring. ________ to ________
- Fall. ________ to ________

Availability of water

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<thead>
<tr>
<th>Water Availability</th>
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<td>Source</td>
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</table>
Epidemiology

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<tr>
<th>Disease</th>
<th>Occurrence</th>
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</table>

Insects, plants, and animals of medical importance

Identify the insects, plants, and animals of medical importance.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Civilian health services

Identify the organization and administration of civilian health services agencies.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify public health laws.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Provide comments on overall quality of civilian health care (include blood bank and blood testing).

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Identify significant civilian health services personnel (e.g., coroner or equivalent).

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<thead>
<tr>
<th>Significant Civilian Health Services Personnel</th>
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<tbody>
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<td>Name</td>
<td>Title</td>
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</table>

**Military medical services**

Identify the organization and administration of the military medical services.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify required and available medical logistics (civilian and military patient transport [ground or air available], blood supplies, etc.).

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Provide comments on overall quality of military health care.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Identify significant military medical personnel.

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<tr>
<th>Significant Military Medical Personnel</th>
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<td>Name</td>
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</table>
Medical material

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<tr>
<th>Production Capabilities of Medical Material</th>
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<td>Name</td>
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<th>Stockpiles of Medical Material</th>
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Local medical facilities

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<th>Local Medical Facilities</th>
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<th>Significant Personnel at Local Medical Facilities</th>
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</tbody>
</table>

Outpatient care available

Is on base outpatient care available? Yes ________ No ________

Is off base outpatient care available? Yes ________ No ________
Identify the number of flight physicians available (overseas bases only):

- US. ________
- Foreign nationals. ________

Identify the number of other physicians available (overseas bases only):

- US. ________
- Foreign nationals. ________

Identify the number of medical technicians available:

- US. ________
- Foreign nationals. ________

Identify the number of dentists available:

- US. ________
- Foreign nationals. ________

Identify the number of dental technicians available:

- US. ________
- Foreign nationals. ________

Identify the number of nurses available:

- US. ________
- Foreign nationals. ________

Identify the number of in-patient beds available:

- On base. ________
- Off base. ________

**General impression of health and sanitation of local area**

Identify any organic material (wastes) present.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Identify industrial pollutants in local water.

Determine if there is evidence of atmospheric pollution.

**General impression of local city conditions**

Determine garbage and trash accumulation.

Determine fly/insect vector population.

Determine stray animals (is rabies present) risk.

Determine sanitary compliance in restaurants, bars, and street vendors.
Determine illicit drug availability (what types and where).

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Determine the following in regards to prostitution:

• Is solicitation legal? Yes _____ No _____ If yes, where does solicitation/prostitution occur (e.g., streets, bars).

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

• Are health cards carried? Yes _____ No _____
Section III. Motor Transport

Identify support provided by the following host nation/activity:

• Light vehicles available:
  • Type (e.g., car, van, taxi service).

• Hours of operation.

• Medium vehicles available:
  • Type (e.g., bus, truck wrecker).

• Hours of operation.

• Heavy vehicles available:
  • Type (e.g., tractor-trailer, long bed).
• Hours of operation.

________________________________________________________________

________________________________________________________________

________________________________________________________________

Indicate if vehicle support is organic or host supported.

________________________________________________________________

________________________________________________________________

________________________________________________________________

Indicate how costs on fuel and repairs are handled.

________________________________________________________________

________________________________________________________________

________________________________________________________________
Section IV. Engineer

This section identifies support provided by the host nation/activity.

Obtain or produce a layout of the entire airfield and include all major construction efforts (e.g., roads, containment areas, fuels site, equipment lot, Class V site). Ensure adequate area is available for each proposed site and pay particular attention to drainage and trafficability.

1. HEAVY EQUIPMENT

Identify type of heavy equipment.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

Identify capacity of available heavy equipment.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

Identify hours of operation.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

2. MATERIALS HANDLING EQUIPMENT

Identify available cranes by the following:

• Type._______________________________
• Capacity.__________________________
• Hours of operation.__________________
Identify available forklifts by the following:

- Type. _________________________________
- Capacity. ______________________________
- Hours of operation. ______________________

3. UTILITIES

Identify available power by the following:

- AC/DC. ________________________________
- Source. ________________________________
- Voltage. ________________________________
- Wattage capacity. ________________________________
- Reliability. ______________________________

Identify available water (water points) by the following:

- Location. _________________________________
- Quantity. _________________________________
- Quality. _________________________________
- Laundry (capacity). ________________________________
- Bath. _________________________________
- Sewage treatment/human waste removal. ________________________________

Identify garbage dump locations.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

Identify any restrictions.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
Identify any hazardous materials removal requirements.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

4. CONSTRUCTION MATERIAL AVAILABILITY
   (E.G., LUMBER, FILL, SAND, GRAVEL, CONCRETE)

Identify quantity of available construction materials.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

Identify type of available construction materials.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

Determine procurement requirements.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

Determine locations of available construction materials.

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
5. CONSTRUCTION REQUIREMENTS

Is site preparation required? Yes _____ No _____ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is earth work is required? Yes _____ No _____ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is road work required? Yes _____ No _____ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is drainage work required? Yes _____ No _____ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are berms (Class V) required? Yes _____ No _____ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are bunkers required? Yes _____ No _____ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Are minefields required? Yes ______ No ______ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is concertina required? Yes ______ No ______ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are ditches required? Yes ______ No ______ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are guard towers required? Yes ______ No ______ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are aircraft revetments required? Yes ______ No ______ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are aircraft recovery systems (type and measurements) required? Yes ______ No ______
If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Is aircraft lighting required? Yes _____ No _____ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is an airfield parking lamp required? Yes _____ No _____ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is a high power run up required? Yes _____ No _____ If yes, identify requirement.
___________________________________________________________________
___________________________________________________________________
Section V. General Airfield Characteristics

This section is ACE-related and should be filled out by the ACE representative.

1. AERIAL PORT FACILITIES

Cargo terminal

Identify available covered space at cargo terminal.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Identify available outside storage space at cargo terminal.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Determine building number and/or space. _____________________________

Determine if aircraft loaders are available and quantity available:

• 40K Yes _____ No _____
• 25K Yes _____ No _____
• 10K forklift Yes _____ No _____
• 5K forklift Yes _____ No _____
• Wide-body MHE (type and capacity).
• Upper lobe Yes ______ No ______
• Lower lobe Yes ______ No ______
• Other (explain type and rate capacity).

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are pallet/container trailers available? Yes ______ No ______ If yes, identify.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are pallet/cargo scales available? Yes ______ No ______ If yes, identify type, make, and weight capability.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are flatbed trucks available? Yes ______ No ______ If yes, identify type, if rollerized, and length.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Are truck offloading/onloading ramps available? Yes ______ No ______ If yes, identify.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Is MHE repair location available? Yes _____ No _____   If yes, identify location.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is space available? Yes _____ No _____   If yes, identify where.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is there a vehicle cleaning capability/wash rack? Yes _____ No _____   If yes, identify where.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Passenger facilities

Identify location of passenger facilities.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Determine maximum capacity of passenger facilities.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Identify available eating facilities.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Identify passenger stairs (type, height capacity).
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

**Fleet service**

Identify location of fleet services.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Identify available space.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is in-flight kitchen established? Yes_____ No____ If yes, identify location of established kitchen.
If no, determine location of kitchen.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Is lavatory servicing truck available? Yes_____ No____ If yes, document type/capacity. If no, establish lavatory servicing truck.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Identify disposal facility (distance/availability).
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Cargo storage area

Determine inside storage:

• Square feet. __________________
• Identify type of flooring (e.g., concrete, dirt, gravel, asphalt).

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Determine outside storage:

• Square feet. ________________
• Identify type of surface (e.g., concrete, dirt, gravel, asphalt).

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

• Is area fenced? Yes ________ No ________
• Are outside lights available? Yes ________ No ________
• Identify any other cargo storage vehicle parking capacity other than the designated storage area is available for (give dimensions):
  • Vehicles. ________________________________
  • Wheeled. ________________________________
  • Tracked. ________________________________
  • Cargo. _________________________________
• Identify hazardous cargo build-up areas:
  • Distance to remote parking. __________________________
  • Size. ___________________________________________
  • Type surface. ______________________________________
  • Revetment type. _________________________________
  • Maximum net explosive weight allowed in holding area. __________________________

2. AIRFIELD THROUGHPUT CAPACITY

Throughput capacity is comprised of the personnel, equipment, and facilities required to perform the functions necessary for receiving, parking, unloading, processing, and clearing of all types of
cargo and passengers at an airport, and it is constrained by airfield reception, aircraft parking and unload, and clearance capabilities. In this regard, it is necessary to determine tonnage estimates for each airfield in terms of both the amount of work that could be accomplished each date over a sustained period of 30 days.

Considering the above factors, specify the tonnage that could be moved completely through the airfield during each 24-hour period:

- Current average daily throughput: ________________ short tons.
- Estimated maximum daily throughput capability (with current manpower and equipment) ________________ short tons.
- Estimated maximum throughput capability (unconstrained by current manpower requirements) ________________ short tons.

Arriving personnel, vehicles, and cargo will be moved to their final destination by rail, road, or a combination of both. The following information is required:

- Identify and indicate the distance to the nearest railheads with the capacity to load wheeled and tracked vehicles. Also, include the capabilities of loading ramps and marshalling areas.
  __________________________________________________________
  __________________________________________________________
  __________________________________________________________
  __________________________________________________________

- Identify the number and type (dual land) of major roads serving the airfield and any movement restrictions that exist in the vicinity of the airfield and/or between the airport and railheads that could prevent movement of large wheeled or tracked vehicles.
  __________________________________________________________
  __________________________________________________________
  __________________________________________________________

3. AIR MOBILITY COMMAND OPERATION FACILITIES

Is there a room or a building for operations (briefings, flight planning)? Yes _____ No _____ If yes, provide building number _____________. If no, establish a location. Identify limitations of room/building.
  __________________________________________________________
  __________________________________________________________
  __________________________________________________________
Is there a method for control of classified material available? Yes ________ No ________ If yes, identify. If no, establish control methods. Identify limitations.

________________________________________________________________

________________________________________________________________

________________________________________________________________

4. BASE OPERATIONS

Building number _______________________

Telephone _______________________

Were notices sent to pilots and aircrew? Yes ________ No ________

Are flight publications available? Yes ________ No ________

Are there customs requirements? Yes ________ No ________

Is there runway condition reading measuring equipment? Yes ________ No ________

Identify the following for the control tower:

• Does position and construction of control tower afford the operators unrestricted visibility of all approaches, runways, and taxi strips? Yes ________ No ________

• Identify the equipment limitations for guarding and transmitting on 802.11a/g [wireless standards] frequencies.

________________________________________________________________

________________________________________________________________

________________________________________________________________

• Is emergency power available for the tower? Yes ________ No ________

• Are up-to-date charts and diagrams, including crash grid maps, maintained in the tower? Yes ________ No ________

• Who operates the tower facility? _________________________________

Provide any required remarks.

________________________________________________________________

________________________________________________________________

________________________________________________________________
5. AIDS TO NAVIGATION

<table>
<thead>
<tr>
<th>Facility:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOR</td>
<td></td>
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<tr>
<td>TACAN</td>
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<td></td>
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<tr>
<td>RBN</td>
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<tr>
<td>ILS</td>
<td></td>
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<tr>
<td>Radar: PAR</td>
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<tr>
<td>Radar: ASR</td>
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</table>

<table>
<thead>
<tr>
<th>Instrument approach procedures:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Corps</td>
</tr>
<tr>
<td>Air Force</td>
</tr>
<tr>
<td>Other type (FLIP, host nation only)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard instrument departure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Corps</td>
</tr>
<tr>
<td>Air Force</td>
</tr>
<tr>
<td>Other type (FLIP, host nation only)</td>
</tr>
</tbody>
</table>

Are replacements or additions to existing facilities needed and/or expected? If yes, identify replacements or additions.

________________________________________________________________
________________________________________________________________
________________________________________________________________

Can published, standard instrument departures be used in lieu of radar vectors? Yes ________ No _________. Attach a copy of current standard instrument departures to survey.

6. AIRCRAFT SUPPORT

Identify deicing equipment, fluid, and status.

________________________________________________________________
________________________________________________________________
________________________________________________________________

Identify the following transient alert data:

- Are follow-me vehicles available? Yes ________ No ________
- Identify the operating hours. ________________________________________

A-51
• Are aircraft marshallers available? Yes ________ No ________
• Are fire guards available? Yes ________ No ________

Note: If aircraft jacking must be accomplished outdoors, designate an area where the ramp has sufficient strength and where jet blasts/prep blasts of taxiing aircraft will not affect jacked aircraft.

7. EQUIPMENT

Identify power by type available:

• Is MD-3 available? Yes ________ No ________
• Is M32A-60 available? Yes ________ No ________
• Is other power available? Yes ________ No ________ If yes, identify.

________________________________________________________________
________________________________________________________________
________________________________________________________________

• Identify any additional, required power supplies.

________________________________________________________________
________________________________________________________________
________________________________________________________________

Are air carts available (include MA-1A and M32A-60)? Yes ________ No ________ If yes, identify available air carts and any additional, required air carts.

________________________________________________________________
________________________________________________________________
________________________________________________________________

Identify, by type, the available hydraulic test stands.

________________________________________________________________
________________________________________________________________
________________________________________________________________
Identify available air compressors.

- High pressure.

- Low pressure.

Identify available heaters available and if any additional heaters are needed.

Identify available light carts available and if any additional light carts are needed.

Identify any other powered ground support equipment and if any additional equipment is needed.
Identify any available jacks available and if any additional jacks are needed.

<table>
<thead>
<tr>
<th>Type</th>
<th>Purpose</th>
<th>Available</th>
<th>Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g., C-130</td>
<td>Nose</td>
<td>E</td>
<td>1</td>
</tr>
</tbody>
</table>

Identify any available maintenance stands and if any additional stands are needed.

<table>
<thead>
<tr>
<th>Type</th>
<th>Purpose</th>
<th>Available</th>
<th>Needed</th>
</tr>
</thead>
</table>

8. MISCELLANEOUS

Are liquid oxygen/gaseous oxygen, oils, and tires/wheels (build-up) available or procurable? Yes ________ No ________ If yes, identify.

________________________________________________________________
________________________________________________________________
________________________________________________________________

Identify runway clearance vehicles (i.e., snow removal and runway sweepers).
________________________________________________________________
________________________________________________________________
________________________________________________________________

Identify if US air carriers operate through airfield.
________________________________________________________________
________________________________________________________________
________________________________________________________________
Identify North Atlantic Treaty Organization air carriers that operate through the airfield?

________________________________________________________________

________________________________________________________________

________________________________________________________________

9. SUMMARY

Summarize the airfield’s capability to support C-130/C-17/C-5 and Civil Reserve Air Fleet B-747, ILS, DC-10, and DC-8 aircraft. Include whether the airfield is capable of supporting an onload/offload, in route stop, or emergency/alternate capability. Include also any limiting factors not covered by this worksheet and measures necessary to correct all limiting factors. Include working on the ground for normal operations and for contingencies by aircraft type.

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________
**LANDING ZONE SURVEY**

<table>
<thead>
<tr>
<th>1A. LZ NAME</th>
<th>1B. ZAP INDEX NO.</th>
<th>2A. COUNTRY</th>
<th>2B. STATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

3. MAP SERIES/SHEET NUMBER/EDITION/DATE OF MAP

4. **SURVEY APPROVAL/DISAPPROVAL DATA**

<table>
<thead>
<tr>
<th>4A. DATE SURVEYED</th>
<th>TYPED NAME AND GRADE OF SURVEYOR</th>
<th>PHONE NUMBER (DSN)</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
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</table>

<table>
<thead>
<tr>
<th>4B. DATE REVIEWED</th>
<th>TYPED NAME AND GRADE OF REVIEWER</th>
<th>PHONE NUMBER (DSN)</th>
<th>SIGNATURE</th>
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</table>

<table>
<thead>
<tr>
<th>4C. DATE</th>
<th>TYPED NAME AND GRADE OF APPROVING AUTHORITY</th>
<th>PHONE NUMBER (DSN)</th>
<th>SIGNATURE</th>
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</table>

<table>
<thead>
<tr>
<th>APPROVED</th>
<th>DISAPPROVED</th>
<th>UNIT AND LOCATION</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

5. **COORDINATING ACTIVITIES**

<table>
<thead>
<tr>
<th>LZ CONTROLLING AGENCY OR UNIT</th>
<th>PHONE NUMBER (DSN)</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>RANGE CONTROL</th>
<th>PHONE NUMBER (DSN)</th>
</tr>
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<tbody>
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<td></td>
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</tbody>
</table>

6. **LZ DIMENSIONS (FEET)**

<table>
<thead>
<tr>
<th>LENGTH</th>
<th>WIDTH</th>
<th>APPROACH END OVERRUN LENGTH</th>
<th>DEPARTURE END OVERRUN LENGTH</th>
<th>LEFT CLEAR ZONE</th>
<th>LEFT SHOULDER</th>
<th>RIGHT CLEAR ZONE</th>
<th>RIGHT SHOULDER</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

7. **LZ AXIS DATA**

<table>
<thead>
<tr>
<th>A. MAGNETIC</th>
<th>B. GRID (UTM)</th>
<th>C. TRUE</th>
<th>D. SOURCE/DATE OF VARIATION DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

8. **GROUND POINT ELEVATION FOR RUNWAY**

<table>
<thead>
<tr>
<th>A. APPROACH END</th>
<th>B. DEPARTURE END</th>
<th>C. HIGHEST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. **LZ COORDINATES**

<table>
<thead>
<tr>
<th>A. SPHEROID/DATUM</th>
<th>B. GPS DERIVED</th>
<th>C. GRID ZONE</th>
<th>D. EASTING</th>
<th>E. NORTING</th>
<th>F. LZ CENTER POINT</th>
<th>G. APPROACH END</th>
<th>H. DEPARTURE END</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>WGS84 LATITUDE (D-M.MM)</th>
<th>WGS84 LONGITUDE (D-M.MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. **LZ SURFACE DATA**

<table>
<thead>
<tr>
<th>A. SURFACE</th>
<th>B. SOIL STRENGTH PROFILE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. **LZ LONGITUDINAL PROFILE**

<table>
<thead>
<tr>
<th>A. GLIDE SLOPE RATIO</th>
<th>B. LONGITUDINAL RUNWAY GRADIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. **TRANSVERSE SECTION GRADIENTS**

<table>
<thead>
<tr>
<th>A. LEFT TRANSITION AREA</th>
<th>B. LEFT GRADED AREA</th>
<th>C. LEFT SHOULDER</th>
<th>D. LEFT HALF RUNWAY</th>
</tr>
</thead>
<tbody>
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</table>

<table>
<thead>
<tr>
<th>E. RIGHT TRANSITION AREA</th>
<th>F. RIGHT GRADED AREA</th>
<th>G. RIGHT SHOULDER</th>
<th>H. RIGHT HALF RUNWAY</th>
</tr>
</thead>
<tbody>
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<table>
<thead>
<tr>
<th>I. PENETRATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>LZ NAME</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>13. LZ DIAGRAM</td>
</tr>
<tr>
<td>14. REMARKS</td>
</tr>
<tr>
<td>15. PHOTOGRAPHY AVAILABLE</td>
</tr>
<tr>
<td>□ YES □ NO</td>
</tr>
<tr>
<td>LOW LEVEL ROUTES</td>
</tr>
<tr>
<td>□ □</td>
</tr>
<tr>
<td>ROUTE NAME/DESIGNATOR</td>
</tr>
</tbody>
</table>

AF IMT 3822, 20020903, V1 *(REVERSE)*

---

A-57
APPENDIX B. FORWARD ARMING AND REFUELING POINT DOCUMENTS

The following FARP forms provide FARP personnel with a consolidated list of mission information that should be identified when planning, establishing, and operating a FARP:

<table>
<thead>
<tr>
<th>Form</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FARP Mission Objectives Form</td>
<td>B-2</td>
</tr>
<tr>
<td>FARP Organization Assignment List</td>
<td>B-6</td>
</tr>
<tr>
<td>FARP Table of Equipment</td>
<td>B-7</td>
</tr>
<tr>
<td>FARP Security</td>
<td>B-8</td>
</tr>
<tr>
<td>FARP Incident Action Plan Safety Analysis</td>
<td>B-10</td>
</tr>
<tr>
<td>FARP Diagram Example</td>
<td>B-11</td>
</tr>
</tbody>
</table>
# FARPN MISSION OBJECTIVES FORM

<table>
<thead>
<tr>
<th>1. FARPN Name:</th>
<th>2. Date/time prepared:</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Grid coordinates (8 Digit):</th>
<th>Primary</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Operational Period (date/time):</th>
<th>5a. Controlling agencies:</th>
<th>5b. Units being supported:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>Start time:</td>
<td>End time:</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>6. General area descriptions:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Obstacles:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. Elevation:</th>
<th>9. Degree of slopes:</th>
<th>10. Surface type:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>11. Aircraft &amp; ordnance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of A/C</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
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</table>

<table>
<thead>
<tr>
<th>12. Weather forecast for operational period:</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Temp:</td>
</tr>
<tr>
<td>Sunrise:</td>
</tr>
<tr>
<td>Cloud cover:</td>
</tr>
<tr>
<td>Forecast:</td>
</tr>
</tbody>
</table>


13. **FARP diagram:**

14. **Legend & Marking:**

   - Consideration: Lighting (day/night), marking (day/night), arm and de-arm heading (attack only), traffic and wave off pattern; pre and post-stage areas (assault only), spacing, wind direction, north arrow, troop embarkation and debarkation (assault only)

<table>
<thead>
<tr>
<th></th>
<th>FARP Control</th>
<th>Comm</th>
<th>Fuel Assets</th>
<th>ORD Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refueling Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAF</td>
<td></td>
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</tbody>
</table>
15. **Fuel information:**

Fuel Estimate: JP 5/8 in gallons x 6.8 = pounds

<table>
<thead>
<tr>
<th>AC</th>
<th>Capacity</th>
<th>Burn rate</th>
<th>Time</th>
<th>Fuel disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

16. **Arming/de-arming and uploading/downloading of ordnance:**

Type ordnance required:

Quantity ordnance required:

Tools required:

Support equipment required:

K-4 Trailers:

SATS Loaders:

Trucks:

MHE:

17. **Additional FARP information:**

<table>
<thead>
<tr>
<th>Fuel Resupply Information</th>
<th>Dust Abatement Information</th>
<th>Miscellaneous Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>How:</td>
<td>Method:</td>
<td></td>
</tr>
<tr>
<td>When:</td>
<td>Sq. Ft:</td>
<td></td>
</tr>
<tr>
<td>Where:</td>
<td>*% ratio to water:</td>
<td></td>
</tr>
</tbody>
</table>
18. Base radio channel utilization:

**Base radio channel utilization**

<table>
<thead>
<tr>
<th>System Cache</th>
<th>Channel</th>
<th>Function</th>
<th>Frequency/Tone</th>
<th>Assignment</th>
<th>Call Sign/Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary:</td>
<td></td>
<td>Air Boss</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td>FARP OIC</td>
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19. Attachments:

- Org assignment
- T/E requirements
- Security
- Photo reconnaissance
- FARP IAP (208)
- ORM
- Safety brief info
- Satellite image
- Hand and arm signal
- Survey if available

20. Prepared by:
# FARP ORGANIZATION ASSIGNMENT LIST

<table>
<thead>
<tr>
<th>FARP Name:</th>
<th>Date prepared:</th>
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**FARP OIC:**

**Senior Security:**

**Senior Fuel:**

**Senior EFR:**

**Senior MT/MHE:**

**Senior EOD:**

**Senior EAF:**

**Senior Comm:**

**Senior Medical:**

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**IMA:**

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**OMA maintenance:**

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**LAAD:**

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**B-6**
## FARP TABLE OF EQUIPMENT

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<td>3. Grid coordinate (8 digit):</td>
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4. Operational Period (date/time):

5. Enemy SITREP:
   - Air:
   - Ground:
   - Unmanned:
   - Others:

6. Friendly SITREP:
   - Location:
   - Scheme of maneuver:
   - Fire support available:

7. Convoy security:
   - Actions upon enemy contact:
   - Rules of engagement:
   - Check points:
   - EPW procedures:
   - Vehicle recovery procedures:
   - Vehicle hardening standard methods:
   - Lost/disabled vehicle:

8. FARP security available:
   - Organic available:
   - GCE available:
   - Supporting arms:
   - Rules of engagement:
| Actions against enemy contact: |
| % Alert in darkness: |
| Fighting positions (if applicable): |
| Control points: |
| Challenge and passwords: |
| Enemy POW procedures: |
| Designate EPW holding area: |
| Most likely avenues of approach: |

### CBRN:

| MOPP Levels: | Initials: |
| Emergency CBRN: | Pre-setup: | Procedures: |
| Decon Area: | Primary: | Secondary: |

Diagram of decon area:

### Air Defense: (in and out of MEZ):

### Search and Rescue Procedures (If applicable):

### CASEVAC Procedures:

### KIA Procedures:

### WIA Procedures:

### Other Security Information:

### Prepared By:
## FARP INCIDENT ACTION PLAN

### SAFETY ANALYSIS

<table>
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<th>Mitigations (e.g., PPE, emergency procedures, escape routes, TRAP)</th>
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4. **Consideration:**

- **Wave off:**

- **Aircraft emergency (nonfire):**

- **Aircraft emergency (fire):**
  - Arming:
  - Staging:
  - Fueling:

- **FARP/refueling point:**

5. **Prepared By:**
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APPENDIX C
BASE CAMP FIRE
PROTECTION AND PREVENTION

Providing adequate fire protection and prevention in a base camp and cantonment environment is necessary to preserve the lives and equipment of Marines. Without adequate planning for fire safety, lives and equipment could be lost or destroyed. This appendix provides guidance and fire protection and prevention procedures governing base camp and cantonment sites.

COMMANDER’S RESPONSIBILITIES

The ACE or site commander, through the air base commandant, is responsible for establishing effective fire protection and prevention programs to minimize the potential loss of life and property due to fire-related hazards. Commanders must also ensure that adequate training is provided and conducted so Marines can carry out fire protection and prevention duties. Tenant commanders shall support fire protection and prevention efforts by disseminating regulations and procedures (i.e., base camp fire bill and fire safety and prevention checklist) established by the air base commandant. In addition, tenant commanders shall ensure maximum participation during fire protection and prevention training. A class on fire regulations, fire protections measures, and the use of available fire extinguishers shall be given to camp inhabitants upon unit arrival.

CLASSIFICATION

The type of fuel that is burning determines the classification of fire. The following are the five types of fire classifications:

- Class A fires are fueled by solids (e.g., paper, wood, cloth).
- Class B fires involve flammable liquids (e.g., gasoline, oils, greases).
- Class C fires involve energized or live electrical equipment. Once the electrical source is removed, the fire reverts to one of the other fire classifications.
- Class D fires involve combustible metals (e.g., titanium, zirconium, sodium, potassium, magnesium, lithium batteries).
- Class K fires involve cooking fats and oils that burns hotter than flammable liquids.
**Basic Fire Extinguishing Methods**

The following are the basic fire extinguishing methods:

- *Cooling or quenching.* Fires fueled by solids are extinguished by reducing the temperature of the fuel below its ignition temperature.
- *Smothering or blanketing.* This process simply removes oxygen from the fire (e.g., covering a burning pan, throwing dirt on a flame).
- *Removing fuel.* Turning off the fuel supply source (e.g., natural gas, kerosene, oil) or removing solid fuel can effectively control and extinguish fires.
- *Chemical fire inhibition.* Agents such as dry chemicals or gases (halon) react with the burning fuel and interrupt the flame producing the chemical reaction, resulting in rapid extinguishment. Wet chemical agents rapidly convert burning substance to a noncombustible soap through saponification.

**Portable Fire Extinguisher**

The following are considerations for portable fire extinguisher use:

- The extinguisher must be visible, easily accessible, and maintained in good working order.
- The extinguisher must correspond to the type of fire expected (Class A, B, C, D, or K).

Personnel must be trained in the proper use of extinguishers.

**Safety**

The following are fire safety requirements:

- Warning signs indicating escape routes should be posted at the entry points to confined spaces.
- Exits, entrances, and passageways must remain free of objects and obstructions.
- Emergency vehicle access lanes shall remain clear of obstructions (e.g., vehicles, equipment, structures).

Personnel who have not been formally trained in firefighting tactics must be cautioned to exercise good judgement while combating a fire, and cautioned not to endanger themselves in the process.
CAMP LAYOUT

Camps must be laid out in such a way as to prevent fire from spreading from tent to tent. Tents should be placed so that the adjoining tent could not collapse on another tent. To prevent flames from using ropes as a vehicle, tent support ropes should not crisscross each other between tents. Trash, debris, grass, underbrush, fallen leaves, and pine needles should be cleared from around the tents to prevent fire from spreading. Special considerations should be given to the placement of supply areas, ammunition dumps, POL areas, and other areas containing combustible materials.

Tents should be configured into blocks of 6 tents: 2 rows of 3 tents with 12 feet between tents (side to side), 20 feet between rows of tents (front to rear), and 40 feet between blocks of tents (200 personnel or less). See figure C-1.

Tent blocks and individual tents should also be marked using an alphanumeric identification system to speed fire report and response times. The unit responsible for the tent and/or workspace is responsible for placing a fire extinguisher in each tent.

Figure C-1. Tent Blocks.
**FIRE PREVENTION REGULATION**

The air base commandant will establish fire regulations in the form of a base camp fire bill, which will be distributed to tenant organizations within the camp area. The fire bill and evacuation directions should be posted in a visible place on each tent or structure. The fire bill should include the following:

- A high state of cleanliness in and around tents must be maintained. Trash must be removed each day or whenever a large amount accumulates.
- Combustible waste should be collected and disposed of on a regular basis. Avoiding buildup of combustibles will prevent spread of an ongoing fire.
- Lockers and cabinets containing combustibles or hazardous supplies must be properly ventilated, located at least 50 feet away from structures, and clearly marked as flammable.
- In the event of fuel or hazardous material spills, local fire departments should be contacted and all personnel kept clear and upwind.
- Hazardous waste shall be placed in approved containers marked with the name of the substance and placed in a hazardous material staging area.
- Explosives, flares, grenades, detonating cord, and training devices will be stored in the magazine areas. If any of these items are found, EOD or ordnance personnel shall be contacted for proper recovery and disposal.
- Butt cans for cigarettes will be provided in bivouac areas. Butt cans shall be drenched with water prior to disposal.
- Tent stoves, heaters, cooking ranges, and other heat producing equipment will be placed no closer than 18 inches to a tent wall or other flammable objects (e.g., cots, tables, chairs).
- Stovepipes will have tight-fitting joints and will terminate in a standard roof jack containing a spark suppressor. Stovepipe sections extending above the apex of the tent will be supported by nonflammable guide wires.
- Open flame burning (e.g., trash, classified material, barbecue) will not be conducted without the prior approval of the fire department or air base commandant. Burn permits (see the sample permit on page 170) should be used to document requests/approval. No open flame burning will be permitted within 200 feet of a combustible building. A fire extinguisher or bucket of water will be available until fire is completely out. Burning must be contained in a 55-gallon drum/barrel with a grill on top. No burning shall be conducted if excessive wind conditions exist.
- Barrel latrines are to be burned according to regulations. Extreme caution must be used when lighting the drum. Only diesel fuel is to be used. Detailed instructions can be found in chapter 9, Preventive Medicine for Ground Forces, of Naval Medical Command Publication P-5010, *Manual of Preventive Medicine*, and MCRP 3-40A.4, *Field Hygiene and Sanitation*.

*Note:* Chapter 9 of NAVMED P-5010 is written as NAVMED P-5010-9.
• Tampering with electrical wiring or circuits is strictly prohibited. Only utility personnel should conduct repairs and modifications. To avoid overloading circuits, multiple plugs and light sockets will not be used. All personnel should be familiar with the power breakers. If an incident involving electricity occurs, the source should be secured immediately.
• Mess hall stoves and immersion heaters must be cool to the touch prior to release of pressure and refueling. Refueling will be done outside with a minimum of 50-foot clearance around all combustibles. A safety Marine will stand by with an extinguisher to observe the process. Equipment leaking liquid or vapor fuel will be removed from service until repaired.

FIRE SAFETY WARDEN

A fire safety warden shall be designated for each unit to assist the fire department (i.e., EFR platoon) in fire prevention for the unit’s shop and billeting areas. Fire safety wardens are responsible for the following:

• Posting the fire bill in their unit’s billeting areas and workspaces.
• Ensuring personnel in their units are familiar with the nearest fire alarm and fire extinguisher location in their vicinity.
• Coordinating with the fire department personnel to obtain necessary training in fire safety and prevention regulations and the operation and maintenance of fire extinguishers.
• Designating smoking areas that are away from combustible structures with a minimum of two butt cans, each half full of sand.
• Designating a predetermined muster area to be used during a fire by unit personnel to conduct roll call.
• Conducting fire safety and prevention inspections utilizing the Fire Safety and Prevention Checklist on page C-7.

FIRE PROTECTION MEASURES

The following measures are necessary to maintain an effective fire protection program:

• Billeting tents must have a minimum of one, multi-purpose, Class A-B-C fire extinguisher.
• Working spaces should have appropriate extinguishers.
• Fire points, consisting of two 55-gallon drum barrels full of water, should be established no further than 100 feet from any tent. Barrels for fire points should be painted and clearly marked for fire protection. During the winter, the barrels will be full of water treated with calcium chloride to prevent freezing.
• Fire watches will be established for each bivouac and storage area.
• A fire alarm should be installed at each fire point. The alarm must be loud and distinct.
• The communications officer shall maintain channels of communications to the base/air station fire department (i.e., EFR platoon).

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**FIRE DEPARTMENT/EXPEDITIONARY FIREFIGHTING AND RESCUE**

The EFR platoon provides structural fire protection for tent camp areas at ACE base camps. The EFR officer shall be responsible for the organization and operation of the EFR platoon and its structural component. The EFR officer will provide assistance to the air base commandant in the preparation of the fire safety and prevention programs. The EFR platoon will inspect fire extinguishers for serviceability in accordance with National Fire Protection Association standards. In addition, EFR is available to conduct classes on established fire regulations and protections measures and the proper use of available fire extinguisher to camp inhabitants as requested by unit commanders.
### Fire Safety and Prevention Checklist

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<th>No</th>
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<td>Is a unit fire warden assigned in writing?</td>
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<tr>
<td>Has the fire warden received fire warden training?</td>
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<tr>
<td>Is there a fire bill posted?</td>
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<td>Is the fire department contact info on the fire bill accurate?</td>
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<td>Do evacuation plans show routes and rally points and are they posted near all exits?</td>
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<tr>
<td>Are there designated smoking areas?</td>
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<tr>
<td>Are &quot;Designated Smoking Area&quot; signs posted?</td>
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<tr>
<td>Do occupants observe designated areas? (Only smoke in smoking areas.)</td>
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<tr>
<td>Are there cigarette waste receptacles in the smoking area?</td>
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<tr>
<td>Is there a fire extinguisher in the smoking area?</td>
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<td>Are flammable liquids stored in appropriate containers?</td>
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<td>Are flammable liquids stored away from combustibles (e.g., wood, paper, fabric)?</td>
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<tr>
<td>Is trash/rubbish removed on a regular basis?</td>
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<tr>
<td>Are coffee pots, microwaves, refrigerators plugged into individual outlets? (Multiple appliances draw too many amps for surge protectors.)</td>
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<td>Is there extensive use of extension cords and outlets (e.g., octopus/daisy chained)?</td>
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<td>Are extension cords in serviceable condition (not frayed, crushed, or have exposed wires)?</td>
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<td>Are cords out of walk ways (not under carpets or able to be stepped on)?</td>
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<td>Are heat producing appliances well ventilated?</td>
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<td>Do heated producing appliances rest on a noncombustible surface?</td>
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<td>Is electrical equipment turned off when not in use?</td>
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<td>Is malfunctioning electrical equipment taken out of service?</td>
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<tr>
<td>Is there a collection point for meals, ready to eat heaters and are they disposed of properly?</td>
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<tr>
<td>Are materials stacked in a safe manner (as to not to tip or fall)?</td>
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### Administration:

1. Inspector Name:  
2. Date/Time of Inspection:  
3. Bldg/Tent #:  
4. # of Violations:  
5. Unit Fire Warden Name:  
6. Contact Phone/Email:  
7. Alternate POC:  
8. Question Yes No Remarks

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is a unit fire warden assigned in writing?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has the fire warden received fire warden training?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a fire bill posted?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the fire department contact info on the fire bill accurate?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do evacuation plans show routes and rally points and are they posted near all exits?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Housekeeping and Maintenance:

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there designated smoking areas?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are &quot;Designated Smoking Area&quot; signs posted?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do occupants observe designated areas? (Only smoke in smoking areas.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there cigarette waste receptacles in the smoking area?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a fire extinguisher in the smoking area?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are flammable liquids stored in appropriate containers?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are flammable liquids stored away from combustibles (e.g., wood, paper, fabric)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is trash/rubbish removed on a regular basis?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are coffee pots, microwaves, refrigerators plugged into individual outlets? (Multiple appliances draw too many amps for surge protectors.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there extensive use of extension cords and outlets (e.g., octopus/daisy chained)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are extension cords in serviceable condition (not frayed, crushed, or have exposed wires)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are cords out of walk ways (not under carpets or able to be stepped on)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are heat producing appliances well ventilated?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do heated producing appliances rest on a noncombustible surface?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is electrical equipment turned off when not in use?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is malfunctioning electrical equipment taken out of service?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a collection point for meals, ready to eat heaters and are they disposed of properly?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are materials stacked in a safe manner (as to not to tip or fall)?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 10. Exits, doors, occupant load (National Fire Protection Association 101):

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are decorations/wall coverings per code (i.e., do not present a hazard)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are building numbers clearly visible from street or access route?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are areas kept clean and as neat as possible?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is combustible vegetation removed to prevent fire hazards?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are vehicles and equipment blocking access to structures/tents?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is tent spacing adequate?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there adequate access for firefighting vehicles/equipment?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are corridors/passageways, exits and doors free of obstructions?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are corridors/passageways used for storage?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are building exit doors accessible (not locked or blocked)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are tent exits accessible (not tied/zip tied closed)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do doors swing in the direction of egress travel?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do all egress routes lead outside the structure (no dead end routes)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the numbers of exits adequate for the occupancy load?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are access/egress doors adequate (height and width)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the occupancy load posted?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the occupancy adequate for the structure/tent?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are exits clearly marked?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are evacuation plans posted in multiroom structures?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are evacuation plans posted near all exits and do they depict egress routes and rally points?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are occupants instructed on the evacuation plan?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there adequate lighting in corridors, exits and stairwells?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is emergency lighting operational?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 11. Fire detection

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are adequate smoke detectors installed?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are smoke detectors affixed in all berthing/sleeping areas?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are smoke detectors in working order and tested regularly?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have smoke detectors been tampered with?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 12. Fire extinguishers:

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are adequate fire extinguishers available?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are fire extinguishers in proper working order?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are all extinguishers Underwriters Laboratories approved?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the extinguisher safety pin and tamper seal in place?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the extinguisher gauge needle in the green?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the monthly inspection tag affixed to the extinguisher and initialed?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have occupants been instructed on the use of extinguishers?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have extinguisher locations been marked and are they easily visible?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the travel distance to extinguishers adequate?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are all extinguishers mounted properly?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 13. Building utilities

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are all electrical plugs, switches and cords to code and in good repair (e.g., no exposed wires, no open junction boxes, no damaged outlet or outlet covers)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are all light fixtures properly mounted and secured to the structure/tent?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are utilities in good working order (heaters, pumps, etc.)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are generator fuel tanks leaking?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a containment area for petroleum, oils and lubricants?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments/Notes**

---

**Fire Inspector Signature:**

**Fire Warden Signature:**
Sample Open Flame Burning Permit

From: Air base commandant/fire department
To: (Person in charge of open burning)

Subj: OPEN FLAME BURNING PERMIT

Date Issued: ___________________ Date Expires: ___________________
Permit Number: ______________ Location: _______________________
Name and Signature of Responsible Person: _____________________________________
Fire Inspector/Fire Warden’s Signature and Date: _________________________________

1. Permission for open burning is hereby approved provided the conditions listed below are adhered to:

- The fire will be at least 50 feet from any combustible structure.
- The fire will be at least 200 feet from flight line, explosive, or fuel storage areas.
- A fire extinguisher/bucket of water will be on hand until the fire is completely out.
- Personnel will monitor the fire until it is completely out.
- Ashes must be drenched with water prior to disposal in trash container.
- Burning must not be conducted during excessive wind conditions (e.g., surface winds greater than 5 miles per hour or 4.3 knots).
- Burning will be conducted in a designated area approved by the air base commandant/fire department.
- Document burning will be contained in a drum barrel (55 gallons) with a grill top.

2. Any violation of the above listed conditions will result in fire extinguishment and permit revocation.

________________________________________
Air Base Commandant
APPENDIX D. AIRFIELD SECURITY PLANNING CHECKLIST

The airfield security planning checklist is a tool to assist force protection planners and security supervisors in effectively assessing threat conditions, establishing a sound air base ground security operations plan, and operating a BDOC.

<table>
<thead>
<tr>
<th>Complete</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Determine Threat Level</strong></td>
<td>(For more information on these threat levels, reference MCRP 3-40D.13, Base Camps)</td>
</tr>
<tr>
<td><strong>Level I.</strong></td>
<td>A small enemy force that can be defeated by a unit’s organic resources.</td>
</tr>
<tr>
<td><strong>Level II.</strong></td>
<td>An enemy activity that requires the commitment of a reaction force to defeat it.</td>
</tr>
<tr>
<td><strong>Level III.</strong></td>
<td>A threat that requires a commitment of a TCF to defeat it.</td>
</tr>
</tbody>
</table>

**Objectives**
- Secure rear area, local areas, and facilities.
- Prevent or minimize enemy interference with command, control, and communications operations.
- Prevent or minimize disruption of aviation operations.
- Prevent or minimize disruption of AGS.
- Provide unimpeded movement of friendly units through the area.
- Find, fix, and destroy enemy incursion areas.
- Provide quick and responsive area damage control.

**Principles**
- Establish unity of effort.
- Consider economy of force.
  - Establish base security forces/perimeter security and defense.
  - Augment with GCE, if required.
  - Employ LAAD, law enforcement, and engineers in air base ground security operations planning and operations.
  - Establish a BDOC for air base ground security operations coordination and control.
- Establish responsiveness criteria.

**Security Tasks**
- Emphasize local security (every Marine’s responsibility).
- Detect the enemy by using observation, patrols, and electronic sensors.
- Delay the enemy by using firing positions, sectors, obstacles, etc.
- Destroy the enemy (immediate reaction requires thorough planning, coordination, and rehearsal).

**Base Defense Operations Center Responsibilities**
- Ensure units are responsible for their living and workspace defense.
<table>
<thead>
<tr>
<th>Complete</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Staff BDOC 24 hours a day.</td>
</tr>
<tr>
<td></td>
<td>Develop a defensive plan that includes reaction forces.</td>
</tr>
<tr>
<td></td>
<td>Establish a reaction force for internal security and reinforcement of the air base.</td>
</tr>
<tr>
<td><strong>Intelligence Preparation of Rear Area/Air Base</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consider area of operations, area of influence, area of interest, and battlespace.</td>
</tr>
<tr>
<td></td>
<td>Convert terrain analysis into graphic information.</td>
</tr>
<tr>
<td></td>
<td>Analyze weather.</td>
</tr>
<tr>
<td><strong>Operations</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Include patrols, reconnaissance, cover and concealment, deception, immediate reaction to attack, reinforcing obstacles, natural obstacles, observation post, listening post, and sentry post.</td>
</tr>
<tr>
<td></td>
<td>Consider base configuration and positioning.</td>
</tr>
<tr>
<td></td>
<td>• Define perimeter and establish access controls.</td>
</tr>
<tr>
<td></td>
<td>• Defend against Level I and Level II threats with local augmentation.</td>
</tr>
<tr>
<td></td>
<td>• Defend against Level II threats with use of ACE or other MAGTF response forces.</td>
</tr>
<tr>
<td></td>
<td>• Defend against Level III threats with TCF augmentation.</td>
</tr>
<tr>
<td></td>
<td>• Identify natural and manmade obstacles for defense.</td>
</tr>
<tr>
<td></td>
<td>Disperse personnel, equipment, and facilities against enemy air/ground attack.</td>
</tr>
<tr>
<td></td>
<td>Locate units to mutually support one another.</td>
</tr>
<tr>
<td></td>
<td>Identify need for both cover and concealment.</td>
</tr>
<tr>
<td></td>
<td>Establish internal accessibility (airfield and base camps internal infrastructure and road networks).</td>
</tr>
<tr>
<td></td>
<td>Identify external accessibility.</td>
</tr>
<tr>
<td></td>
<td>Identify proximity to supporting units and facilities.</td>
</tr>
<tr>
<td></td>
<td>Determine security and defense capabilities (adequate against Level I threats).</td>
</tr>
<tr>
<td></td>
<td>Establish communications (BDOC has own network, thorough connectivity, and redundancy).</td>
</tr>
<tr>
<td></td>
<td>Plan fire support.</td>
</tr>
<tr>
<td></td>
<td>Plan CAS.</td>
</tr>
<tr>
<td><strong>Base Defense System</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secure the base (based on METT-T and space and logistics).</td>
</tr>
<tr>
<td></td>
<td>Use early warning systems and procedures.</td>
</tr>
<tr>
<td></td>
<td>Phase defense posture against increasing threat levels.</td>
</tr>
<tr>
<td></td>
<td>Use base alarm to signal alert posture.</td>
</tr>
<tr>
<td></td>
<td>Use available resources to augment defense.</td>
</tr>
<tr>
<td></td>
<td>Rehearse air base defense plans, increased readiness postures, and reaction forces.</td>
</tr>
<tr>
<td>Complete</td>
<td>Task</td>
</tr>
<tr>
<td>----------</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td><strong>Determine Force Protection Conditions</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Force protection condition (FPCON) Normal.</strong> Applies when a general global threat of possible terrorist activity exists and warrants a security posture.</td>
</tr>
<tr>
<td></td>
<td><strong>FPCON Alpha.</strong> Applies when there is an increased general threat of possible terrorist activity against personnel or facilities, the nature and extent of which are unpredictable. FPCON Alpha measures must be capable of being maintained indefinitely.</td>
</tr>
<tr>
<td></td>
<td><strong>FPCON Bravo.</strong> Applies when an increased or more predictable threat of terrorist activity exists. Sustaining FPCON Bravo measures for a prolonged period may affect operational capability and impact relations with local authorities.</td>
</tr>
<tr>
<td></td>
<td><strong>FPCON Charlie.</strong> Applies when an incident occurs or intelligence is received indicating that some form of terrorist action or targeting against personnel or facilities is likely. Implementation of FPCON Charlie measures will create hardship and affect the activities of the unit and its personnel.</td>
</tr>
<tr>
<td></td>
<td><strong>FPCON Delta.</strong> Applies in the immediate area where a terrorist attack has occurred or when intelligence has been received that terrorist action against a specific location or person is imminent. Normally, this force protection is declared as a localized condition. FPCON Delta measures are not intended to be sustained for substantial periods.</td>
</tr>
<tr>
<td></td>
<td><strong>Security and Control Procedures</strong></td>
</tr>
<tr>
<td></td>
<td>Subject individuals entering base to identification check.</td>
</tr>
<tr>
<td></td>
<td>Specify points of entry and exit.</td>
</tr>
<tr>
<td></td>
<td>Reinforce high-speed avenues of approach and entry points with crew-served weapons.</td>
</tr>
<tr>
<td></td>
<td>Provide redundancy in communications.</td>
</tr>
<tr>
<td></td>
<td>Use rally points and staging areas.</td>
</tr>
<tr>
<td></td>
<td>Use security enhancing equipment.</td>
</tr>
<tr>
<td></td>
<td>Develop range cards and a fire support plan.</td>
</tr>
<tr>
<td></td>
<td>Harden critical facilities and defensive/security positions.</td>
</tr>
<tr>
<td></td>
<td>Position listening post/observation post/sentry post based on threat (locate the enemy before the enemy can disrupt operations).</td>
</tr>
<tr>
<td></td>
<td>Solidify reporting procedures and signals.</td>
</tr>
<tr>
<td></td>
<td>Establish vehicle search procedures.</td>
</tr>
<tr>
<td></td>
<td>Rehearse immediate actions and upgrade threat response posture.</td>
</tr>
<tr>
<td></td>
<td>Conduct random (unpredictable) patrols.</td>
</tr>
</tbody>
</table>
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APPENDIX E
BASE RECOVERY AFTER ATTACK FORMS AND PROCEDURES

The BRAAT forms, procedures, and references in this appendix are provided to assist planners in the development and execution of BRAAT MOS selection, ADR, and DART.

MINIMUM OPERATING STRIP SELECTION

The following steps are provided as a guide to identify AGSOC responsibilities and required documents to be used during MOS selection:

1. Determine MOS dimensions.
2. Determine minimum airfield operating surface.
3. Determine repair quality criteria.
4. Record and plot damage information.
5. Identify candidate MOSs.
6. Determine crater diameter.
7. Estimate EOD.
8. Estimate and record ADR times.
10. Brief the airfield commander or senior airfield authority (SAA) on candidate MOSs.
11. Select the MOS.

Steps 1–3 can be accomplished prior to any damage being received. Steps 4–11 are completed after an attack on the airfield has occurred.

Step 1. Determine Minimum Operating Strip Dimensions
The SAA determines the required MOS based on type, model, and/or series of aircraft, operating conditions, and environmental factors at the airfield. Once the SAA has determined a MOS length and width, the appropriate MOS template can be made for the MOS selection process. These MOS templates will be used to identify primary and secondary MOSs during the MOS selection process, as shown in figure E-1.
Step 2. Determine Minimum Airfield Operating Surface

The MOS selection team must also take into consideration the damage to the entire airfield operating surface, which could possibly impact sortie generation. This entire airfield area is commonly referred to as the minimum airfield operating surface. Simply put, the minimum airfield operating surface consists of an MOS and supporting taxiways or access routes. Table E-1 provides minimally acceptable taxiway widths for common aircraft. In addition, the MOS selection team or team leader requests data from the SAA regarding aircraft turning radius requirements and cleared area widths.

Table E-1. Minimally Accepted Repair Taxiway Width Criteria.

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Repaired Width (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-5/15/16/18/22/35</td>
<td>25</td>
</tr>
<tr>
<td>KC-130</td>
<td>30</td>
</tr>
<tr>
<td>C-17</td>
<td>50</td>
</tr>
<tr>
<td>C-5, KC-10, B-747</td>
<td>60</td>
</tr>
<tr>
<td>KC-135</td>
<td>75</td>
</tr>
</tbody>
</table>

Step 3. Determine Repair Quality Criteria

Repair quality criteria is generally assigned by the AGSOC. It gives the maximum upheaval that can remain above the undisturbed pavement and is expressed in table E-2. The objective is to get flush repairs; however, timelines and repair techniques may necessitate the use of lesser quality of repairs. Refer to AFPAM 10-219 for further information on repair quality criteria. For planning purposes the MOS selection team will utilize “C” criteria, which equates to 1.5 inches of upheaval above the undisturbed surface as the maximum surface roughness on a MOS with an objective of flush repairs.
Step 4. Record and Plot Damage Information

Using the North Atlantic Treaty Organization Pavement Reference Marking System (see example in fig. E-2), the DAT reports surface damage to the AGSOC. For examples and more detailed description of the plotting steps, refer to AFPAM 10-219. The MOS selection team records damage on the DAT Record Sheet (see table E-3) and, using the crater damage template (see fig. E-5), plots damage on the airfield map (see fig. E-3) and operating surface grid map (see fig. E-4).

<table>
<thead>
<tr>
<th>Quality</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Repair must be flush with undisturbed pavement level (longest repair time).</td>
</tr>
<tr>
<td>B</td>
<td>Repair can extend above undisturbed pavement 1 inch.</td>
</tr>
<tr>
<td>C</td>
<td>Repair can extend above undisturbed pavement 1 ½ inches.</td>
</tr>
<tr>
<td>D</td>
<td>Repair can extend above undisturbed pavement 3 inches.</td>
</tr>
<tr>
<td>E</td>
<td>Repair can extend above pavement 4 ½ inches.</td>
</tr>
</tbody>
</table>

**Table E-2. Repair Quality Criteria**

**LEGEND**
- B: bomblet
- C: crater
- L: left
- R: right
- S: spall
- X: UXO

**Figure E-2. North Atlantic Treaty Organization Pavement Reference Marking System Example.**
### Table E-3. DAT Record Sheet.

<table>
<thead>
<tr>
<th>DAT Number/Route:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crater number or spall field number</td>
</tr>
<tr>
<td>Type of damage/ordnance</td>
</tr>
<tr>
<td>Distance down pavement</td>
</tr>
<tr>
<td>Direction left/right of centerline</td>
</tr>
<tr>
<td>Distance left/right</td>
</tr>
<tr>
<td>Diameter or width</td>
</tr>
<tr>
<td>Size of crater diameter (apparent) or width of spall/bomblet field</td>
</tr>
<tr>
<td>Field identifier</td>
</tr>
<tr>
<td>Distance down pavement</td>
</tr>
<tr>
<td>Direction left/right of centerline</td>
</tr>
<tr>
<td>Distance left/right</td>
</tr>
<tr>
<td>Diameter or width</td>
</tr>
<tr>
<td>Size of width</td>
</tr>
<tr>
<td>Number identifier</td>
</tr>
<tr>
<td>Number of bomblets or spalls</td>
</tr>
</tbody>
</table>

**Figure E-3. Airfield Map.**
Figure E-4. Operating Surface Grid Map.

Figure E-5. Crater Damage Template.
Step 5. Identify Candidate Minimum Operating Strips
The MOS selection team uses the MOS template (see fig. E-6) to identify candidate MOSs and associated taxiway on the airfield map. Minimum operating strip candidate selection is based on time to repair and accessibility.

Scale: 1"=1000'

Figure E-6. MOS Template.

Step 6. Determine Crater Diameter
The MOS selection team transfers damage information from the DAT Record Sheet to the MOS selection team worksheet (see table E-4) and fills in remaining information on the worksheet. To convert apparent crater diameter to actual crater diameter, use the crater diameter conversion chart (see fig. E-7). Record information on MOS selection team worksheet.
Table E-4. Minimum Operating Strip Selection Team Worksheet.

<table>
<thead>
<tr>
<th>MOS Identification:</th>
<th>Crater Number or Spall Field Number</th>
<th>Distance Down MOS</th>
<th>Crater Diameter (apparent) or Dimensions of Spall Field</th>
<th>Distance to Next Crater</th>
<th>Repair Quality Criteria</th>
<th>Crater Diameter (actual) or Number of Spalls</th>
<th>Repair Crew Number</th>
<th>Crater/Spall Repair Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

- Total Crater/Spall Repair Time (minutes/hours) (based off greatest cumulative crew hours of one team)
- Total EOD Time (minutes/hours)
- MOS Repair Time (minutes/hours)
Note: The effects of surface roughness on the repair diameter chart converts apparent crater diameter obtained during damage assessment to actual diameter for crater repair estimates and purposes.

Figure E-7. Crater Diameter Conversion Chart.
Step 7. Estimate Explosive Ordnance Disposal
The EOD team leader will give the MOS team leader estimates of UXO safe/clearing time.

Step 8. Estimate and Record Airfield Damage Repair Times
The MOS team leader estimates ADR time and records estimated times on the MOS selection team worksheet by—

- Determining repair times for each crater, using the actual crater repair time worksheets for chemical and nonchemical environments (see tables E-5 and E-6).
- Assigning crater repairs to crater repair crews and determining total repair time using the MOS selection team worksheet.

Table E-5. Actual Crater Repair Time Worksheet for a Chemical Environment.

<table>
<thead>
<tr>
<th>MOS Identification:</th>
<th>Crater Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Repair</td>
<td>5 feet</td>
</tr>
<tr>
<td>A 0.0 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>B 1.0 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>C 1.5 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>D 3.0 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>E 4.5 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>MOS Identification:</td>
<td>Crater Diameter</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>55 feet</td>
</tr>
<tr>
<td>A 0.0 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>B 1.0 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>C 1.5 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>D 3.0 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>E 4.5 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
</tbody>
</table>

Table E-5. Actual Crater Repair Time Worksheet for a Chemical Environment—Continued.
Table E-6. Actual Crater Repair Time Worksheet for a Nonchemical Environment.

<table>
<thead>
<tr>
<th>MOS Identification:</th>
<th>Crater Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 feet</td>
</tr>
<tr>
<td>Quality Repair</td>
<td></td>
</tr>
<tr>
<td>A 0.0 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>B 1.0 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>C 1.5 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>D 3.0 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
<tr>
<td>E 4.5 inches</td>
<td>Fresh crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Old crew repair time (minutes)</td>
</tr>
<tr>
<td></td>
<td>Crater number</td>
</tr>
</tbody>
</table>
Table E-6. Actual Crater Repair Time Worksheet for a Nonchemical Environment—Continued.

<table>
<thead>
<tr>
<th>MOS Identification:</th>
<th>Crater Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Repair</td>
<td>55 feet</td>
</tr>
<tr>
<td>A 0.0 inches</td>
<td></td>
</tr>
<tr>
<td>Fresh crew repair time (minutes)</td>
<td>230</td>
</tr>
<tr>
<td>Old crew repair time (minutes)</td>
<td>495</td>
</tr>
<tr>
<td>Crater number</td>
<td></td>
</tr>
<tr>
<td>B 1.0 inches</td>
<td></td>
</tr>
<tr>
<td>Fresh crew repair time (minutes)</td>
<td>206</td>
</tr>
<tr>
<td>Old crew repair time (minutes)</td>
<td>484</td>
</tr>
<tr>
<td>Crater number</td>
<td></td>
</tr>
<tr>
<td>C 1.5 inches</td>
<td></td>
</tr>
<tr>
<td>Fresh crew repair time (minutes)</td>
<td>162</td>
</tr>
<tr>
<td>Old crew repair time (minutes)</td>
<td>437</td>
</tr>
<tr>
<td>Crater number</td>
<td></td>
</tr>
<tr>
<td>D 3.0 inches</td>
<td></td>
</tr>
<tr>
<td>Fresh crew repair time (minutes)</td>
<td>147</td>
</tr>
<tr>
<td>Old crew repair time (minutes)</td>
<td>411</td>
</tr>
<tr>
<td>Crater number</td>
<td></td>
</tr>
<tr>
<td>E 4.5 inches</td>
<td></td>
</tr>
<tr>
<td>Fresh crew repair time (minutes)</td>
<td>93</td>
</tr>
<tr>
<td>Old crew repair time (minutes)</td>
<td>306</td>
</tr>
<tr>
<td>Crater number</td>
<td></td>
</tr>
</tbody>
</table>
• Assigning spall repairs to spall repair crews and determining total repair time using the spall repair time formula (see fig. E-8). The time equation for repairing spall damage is determined by number of spalls, time to prepare each spall, time to mix and place rapid setting material for each spall, number of spall repair crews, and a human efficiency factor. The spall repair time formula assumes that a two-Marine crew is required to prepare the spalls, but only one Marine is required to repair the spalls by mixing and placing rapid setting material. It is assumed that 2 minutes are required to prepare one spall and 6.5 minutes are required to mix and place the rapid setting material into the spall. Human efficiency can deteriorate with fatigue, weather, and in a chemical environment.

\[
\text{time} = \left( \frac{(2 \text{ min}) \times (\# \text{ of spalls})}{(\# \text{ of crews}) \times (\text{human efficiency})} \right) + \left( \frac{(6.5 \text{ min}) \times (\# \text{ of spalls})}{2 \times (\# \text{ of crews}) \times (\text{human efficiency})} \right)
\]

Figure E-8. Spall Repair Time Formula.

Step 9. Tabulate Comparative Candidate MOS Recovery Times
Tabulate comparative recovery times for candidate MOSs. The MOS team leader calculates total estimated recovery times for each MOS based on EOD, crater repair times, and spall repair times.

Step 10. Brief Airfield Commander or Senior Airfield Authority on Candidate Minimum Operating Strips
The operations officer or MOS team leader briefs the candidate MOSs to the airfield commander.

Step 11. Select Minimum Operating Strip
The airfield commander selects the MOS. Once the MOS is selected, more surface roughness tests must be conducted to ensure repair quality criteria are met for each crater. Surface roughness test should be conducted along three parallel lines to the MOS centerline using an repair quality criteria gauge and string as shown in figures E-9 and E-10 on page E-14. In addition, the maximum slope at the edge of a crater that is acceptable for a MOS can be measured using a change of slope straight edge as shown in figure E-10.
Figure E-9. Surface Roughness Testing.

Note: Surface roughness test should be conducted along three lines parallel to the MOS centerline.
AIRFIELD DAMAGE REPAIR

Tables E-7 through E-11, on pages E-16 through E-20, are provided as guides to the ADR organization and the airfield recovery process.
The airfield damage repair personnel requirements chart is used to assist in determining unit ADR personnel.

### Table E-7. Airfield Damage Repair Personnel Requirements Chart.

<table>
<thead>
<tr>
<th>ADR Personnel Requirements</th>
<th>Crater</th>
<th>Precast Concrete</th>
<th>Concrete FOD Cover</th>
<th>AM2 FOD Cover</th>
<th>FRP FOD Cover</th>
<th>Hauling</th>
<th>Motor Transport Det.</th>
<th>Maintenance Det.</th>
<th>Fuels Det.</th>
<th>Spall Repair</th>
<th>Clearing and Sweeping</th>
<th>MOS Lighting and Marking</th>
<th>Support</th>
<th>M-31 Gear</th>
<th>UXO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy equipment operator</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>2</td>
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<td></td>
<td>3</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Motor transport operator</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>Utility operator</td>
<td>2</td>
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<tr>
<td>EAF specialist</td>
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<td>6</td>
<td>10</td>
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<tr>
<td>Refueler</td>
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<td></td>
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<tr>
<td>Combat engineer</td>
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<td>1</td>
<td>1</td>
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<td>2</td>
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<tr>
<td>General laborer</td>
<td>8</td>
<td>17</td>
<td>17</td>
<td>21</td>
<td>12</td>
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<td></td>
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<tr>
<td>Motor transport mechanic</td>
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<td>2</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Heavy equipment mechanic</td>
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<td>2</td>
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<tr>
<td>Utility mechanic</td>
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<td></td>
<td>2</td>
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<tr>
<td>Surveyor</td>
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<tr>
<td>Food service</td>
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<tr>
<td>Medical</td>
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<tr>
<td>CBRNE</td>
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<tr>
<td>EOD</td>
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<td>23</td>
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<td>4</td>
<td>6</td>
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<td>5</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- CBRNE: chemical, biological, radiological, nuclear, and high-yield explosives
- Det.: detachment
The ADR equipment requirements chart is used to assist in determining unit ADR equipment.

Table E-8. Airfield Damage Repair Equipment Requirements Chart.

<table>
<thead>
<tr>
<th>ADR Personnel Requirements</th>
<th>Crater</th>
<th>Precast Concrete FOD Cover</th>
<th>Rapid Set or Concrete FOD Cover</th>
<th>AM2 FOD Cover</th>
<th>Hauling</th>
<th>Motor Transport Det.</th>
<th>Maintenance Det.</th>
<th>Fuels Det.</th>
<th>Spill Repair</th>
<th>Clearing and Sweeping</th>
<th>MOS Lighting and Marking</th>
<th>Support</th>
<th>M-31 Gear</th>
<th>UXO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front-end loader</td>
<td>2</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Dozer</td>
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<tr>
<td>Grader</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Roller/ compactor</td>
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<td></td>
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</tr>
<tr>
<td>Excavator</td>
<td>1</td>
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<td>Concrete mixer</td>
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<tr>
<td>Tractor-trailer</td>
<td>1+</td>
<td>AR</td>
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<td>7-ton truck</td>
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<td>AR</td>
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<td>Utility vehicle</td>
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<td>Water truck</td>
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<td>Sweeper</td>
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<td>Fuel truck</td>
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<td>Compressor</td>
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<td>Crane</td>
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<td>Lifting beam</td>
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<td>RTCH</td>
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<tr>
<td>M-31 arresting gear</td>
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<td></td>
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<td>AR</td>
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<tr>
<td>Field maint. trucks</td>
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<td>2</td>
</tr>
</tbody>
</table>

Legend:
AR as required           FRP fiberglass reinforced panel
Det. detachment          RTCH rough terrain container/cargo handler
The ADR equipment availability matrix is used in identifying equipment shortfalls.

Table E-9. Airfield Damage Repair Equipment Availability Matrix.

<table>
<thead>
<tr>
<th>Types of Equipment</th>
<th>Organic Assets</th>
<th>Station</th>
<th>Augmented Assets</th>
<th>ADR Requirements</th>
<th>Shortfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front-end loader</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Dozers</td>
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<td></td>
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</tr>
<tr>
<td>Graders</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Rollers</td>
<td></td>
<td></td>
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<tr>
<td>Excavator (multipurpose)</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Concrete mixer</td>
<td></td>
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<td></td>
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<tr>
<td>Dump trucks</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tractor-trailers</td>
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<tr>
<td>LVSR</td>
<td></td>
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<tr>
<td>MTVR</td>
<td></td>
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<tr>
<td>Water trucks</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Sweepers</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Fuel truck</td>
<td></td>
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<tr>
<td>Flood lights</td>
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<td></td>
</tr>
<tr>
<td>Compressors</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Forklifts</td>
<td></td>
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<tr>
<td>Pumps</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Concrete saws</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cranes</td>
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</tr>
<tr>
<td>RTCH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADR kits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Utility vehicles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:
RTCH rough terrain container/cargo handler
The material availability matrix is used in identifying equipment and material resources and shortfalls.

### Table E-10. Material Availability Matrix.

<table>
<thead>
<tr>
<th>Date:</th>
<th>Type of Material</th>
<th>Onsite Inventory</th>
<th>Material Required</th>
<th>Shortfall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fill Material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ballast rock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crushed rock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FOD Cover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>fiberglass reinforced panels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Precast concrete</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preheated asphalt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crushed stone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spall Repair</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Silica</td>
<td>Mix</td>
<td>Pea gravel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Magnesium phosphate</td>
<td>Mix</td>
<td>Pea gravel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Penatron (polymer)</td>
<td>Mix</td>
<td>Pea gravel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spall and FOD Cover</td>
<td>Rapid set concrete</td>
<td>Portland cement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>¾ inch aggregate</td>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Optional Materials</td>
<td>Sand grids</td>
<td>Geotextile seals</td>
<td></td>
</tr>
</tbody>
</table>
Material estimate planning formulas help determine the material requirements.

### Table E-11. Material Estimate Planning Formulas.

#### Formulas for Estimating Fill Material (crushed stone, ballast rock, and sand) in Feet

<table>
<thead>
<tr>
<th>Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of a square/rectangle</td>
<td>( L \times W = \text{ft}^2 )</td>
</tr>
<tr>
<td>Area of a cylinder</td>
<td>( 3.1416 \times R^2 = \text{ft}^2 ) [or] ( 0.7854 \times D^2 = \text{ft}^2 )</td>
</tr>
<tr>
<td>Volume of a square/rectangle</td>
<td>( L \times W \times H = \text{cu ft} )</td>
</tr>
<tr>
<td>Volume of a cylinder</td>
<td>( 3.1416 \times R^2 \times H = \text{cu ft} ) [or] ( 0.7854 \times D^2 \times H = \text{cu ft} )</td>
</tr>
<tr>
<td>Conversion: cu ft to cu yd</td>
<td>( \text{Cu ft} + 27 = \text{cu yds} )</td>
</tr>
</tbody>
</table>

#### Formulas for Estimating Foreign Object Damage Cover Requirements in Feet

<table>
<thead>
<tr>
<th>Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM-2</td>
<td>( (L + 4) \times (W + 4) = \text{ft}^2 \text{ matting} )</td>
</tr>
<tr>
<td>Fiberglass reinforced polyester</td>
<td>Kit = (4) 34 2/3 ft × 32 ft or (1) 69 1/3 ft × 62 ft-panels</td>
</tr>
<tr>
<td></td>
<td>Craters &lt;20 ft diameter require 5 ft overhang</td>
</tr>
<tr>
<td></td>
<td>Craters &gt;20 ft diameter require 10 ft overhang</td>
</tr>
<tr>
<td>Precast concrete slabs</td>
<td>Slab = 2 × 2 meters (meter = 3.2808 ft)</td>
</tr>
<tr>
<td></td>
<td>( Y = L / 6.5616 ) (round up to whole number)</td>
</tr>
<tr>
<td></td>
<td>( Z = W / 6.5616 ) (round up to whole number)</td>
</tr>
<tr>
<td></td>
<td>( Y \times Z = \text{number of slabs required} )</td>
</tr>
<tr>
<td>Rapid set concrete</td>
<td>Volume of repair (square/rectangle/cylinder)</td>
</tr>
<tr>
<td>Portland cement</td>
<td>8 bags per cu yd concrete</td>
</tr>
<tr>
<td>¾-inch aggregate</td>
<td>1 cu yd per cu yd concrete</td>
</tr>
<tr>
<td>Sand</td>
<td>1 cu yd per cu yd concrete</td>
</tr>
<tr>
<td>Water</td>
<td>To be determined by sump required</td>
</tr>
</tbody>
</table>

Legend:
- cu ft: cubic feet
- cu yd: cubic yard
- D: diameter
- ft²: feet squared
- H: height/depth
- L: length
- R: radium
- W: width

\(<\) less than
\(>\) greater than
DAMAGE ASSESSMENT AND RESPONSE TEAM

Following an attack on a FOB, a DART is dispatched in order to identify, report, and fix damage to facilities on the base other than the airfield. Figure E-11 illustrates the 8-line report is used by the DART to report damage to the AGSOC. Further guidance will then be provided by the AGSOC on repair priorities.

1. Building number and grid:

2. Is the building on fire or is other emergency medical response required?

3. Structural damage:

4. Electrical damage:

5. Water damage:

6. Casualties

7. UXO

8. Overall assessment of facility:

Figure E-11. DART Report.
GLOSSARY

Section I. Abbreviations and Acronyms

ACE ........................................................................................................... aviation combat element
ADR ............................................................................................................... airfield damage repair
AGS ........................................................................................................... aviation ground support
AGSOC ...................................................................................................... aviation ground support operations center
BDOC ......................................................................................................... base defense operations center
BRAAT ..................................................................................................... base recovery after attack
CAS ................................................................................................................ close air support
CBR ............................................................................................................. California bearing ratio
CBRN .......................................................................................................... chemical, biological, radiological, and nuclear
CSS .............................................................................................................. combat service support
DAT ........................................................................................................... damage assessment team
DART ......................................................................................................... damage assessment and response team
EAF ................................................................................................................. expeditionary airfield
EFR .............................................................................................................. expeditionary firefighting and rescue
EOD ..................................................................................................... explosive ordnance disposal
FARP ......................................................................................................... forward arming and refueling point
FOB ............................................................................................................... forward operating base
FOD ............................................................................................................... foreign object damage
G-2 ............................................................................................................. intelligence staff section
G-3 ............................................................................................................... operations staff section
GCE ............................................................................................................. ground combat element
HERS ........................................................................................................... helicopter expedient refueling system
JP ........................................................................................................................ joint publication
JSA ................................................................................................................ joint security area
LAAD .......................................................................................................... low altitude air defense
LCE ............................................................................................................. logistics combat element
LVSR ................................................................. Logistics Vehicle System Replacement
LZ ........................................................................................................ landing zone

MACG .................................................................................. Marine air control group
MAG ............................................................................................. Marine aircraft group
MAGTF ................................................................................ Marine air-ground task force
MALS ..................................................................................... Marine aviation logistics squadron
MATC ........................................................................................ Marine air traffic control
MAW ............................................................................................. Marine aircraft wing
MCDP .................................................................................. Marine Corps doctrinal publication
MCO ............................................................................................. Marine Corps order
MCRP ..................................................................................... Marine Corps reference publication
MCTP ..................................................................................... Marine Corps tactical publication
MCWP ..................................................................................... Marine Corps warfighting publication
METT-T ........................................................................ mission, enemy, terrain and weather, troops and support available—time available

MOPP .................................................................................. mission-oriented protective posture
MOS ............................................................................................. minimum operating strip
MTVR ..................................................................................... medium tactical vehicle replacement
MWSS ................................................................................ Marine wing support squadron

NATOPS ........................................................... Naval Air Training and Operating Procedures Standardization
NAVAIR .............................................................. Naval Air Systems Command
NCF ............................................................................................. naval construction force
NIMS ..................................................................................... National Incident Management System
NVG ............................................................................................. night vision goggle

OIC ................................................................................................ officer in charge

POL .............................................................................................. petroleum, oils, and lubricants

RAOC .......................................................................................... rear area operations center

S-1 ................................................................................................ personnel office
S-2 ................................................................................................ intelligence office
S-3 ................................................................................................ operations office
S-4 ................................................................................................ logistics office
S-5 ................................................................................................ plans office
S-6 ................................................................................................ communications staff office
SAA ............................................................................................. senior airfield authority
SIXCON ................................................................................ six containers together

TACC ........................................................................................ tactical air command center (USMC)
TAFDS ................................................................................ tactical airfield fuel dispensing system
TCF .......................................................................................... tactical combat force
UHF ................................................................. ultrahigh frequency
US ................................................................. United States
UXO ............................................................... unexploded ordnance
VHF ................................................................. very high frequency
Section II. Terms and Definitions

**air boss**—The single point of contact at an air facility, responsible to the aviation combat element G-3, who coordinates all activities at an air facility and is the primary interface with the tactical air command center. The air boss is responsible for synchronizing the operations of fuel, ordnance, maintenance, and ground support activities to execute the missions tasked in the daily air tasking order (ATO). Additionally, the air boss is responsible for recommending changes to the ATO based on changes in the status of operations at the air facility and adjusting the operations at the air facility to meet changes in the ATO. (MCRP 1-10.2)

**aviation combat element**—The core element of a Marine air-ground task force (MAGTF) that is task-organized to conduct aviation operations. The aviation combat element (ACE) provides all or a portion of the six functions of Marine aviation necessary to accomplish the MAGTF’s mission. These functions are antiair warfare, offensive air support, assault support, electronic warfare, air reconnaissance, and control of aircraft and missiles. The ACE is usually composed of an aviation unit headquarters and various other aviation units or their detachments. It can vary in size from a small aviation detachment of specifically required aircraft to one or more Marine aircraft wings. In a joint or multinational environment, the ACE may contain other Service or multinational forces assigned or attached to the MAGTF. The ACE itself is not a formal command. Also called ACE. (MCRP 1-10.2)

**base defense operations center**—A command and control facility established by the base commander to serve as the focal point for base security and defense. Also called BDOC. (DOD Dictionary)

**closed-circuit refueling**—Nozzle and receptacle system used on US Army helicopters. (NAVAIR 00-80T-109)

**expeditionary airfield**—A prefabricated and fully portable airfield. The effort and assets (e.g., materiel, engineer support, operational guidance, security) required for the installation/operation of an expeditionary airfield can require the participation/support of all elements of the Marine air-ground task force. Also called EAF. (MCRP 1-10.2)

**explosive ordnance**—All munitions and improvised or clandestine explosive devices, containing explosives, propellants, nuclear fission or fusion materials, and biological and chemical agents. (DOD Dictionary)

**explosive ordnance disposal**—1. The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded explosive ordnance. 2. The organizations engaged in such activities. Also called EOD. (DOD Dictionary)

**foreign object damage**—Rags, pieces of paper, line, articles of clothing, nuts, bolts, or tools that, when misplaced or caught by air currents normally found around aircraft operations (jet blast, rotor or prop wash, engine intake), cause damage to aircraft systems or weapons or injury to personnel. Also called FOD. (DOD Dictionary)
**forward arming and refueling point**—A temporary facility, organized, equipped, and deployed to provide fuel and ammunition necessary for the employment of aviation maneuver units in combat. Also called **FARP**. (DOD Dictionary)

**forward operating base**—An airfield used to support tactical operations without establishing full support facilities. Also called **FOB**. (DOD Dictionary)

**Fresnel Lens Optical Landing System**—An electro-optical aviator landing aid. (NAVAIR 00-80T-104)

**laager point**—A secure location on the ground designated by aviation units utilized for the rendezvous, marshalling, or positioning of flights of aircraft between missions or awaiting completion or activation of an assigned mission. Other than communications, no other support should be required. The site may be isolated and independent or it may be adjacent to an airfield, a facility, or a forward arming and refueling point. (MCRP 1-10.2)

**rear area security**—The measures taken before, during and/or after an enemy airborne attack, sabotage action, infiltration, guerrilla action, and/or initiation of psychological or propaganda warfare to minimize the effects thereof. Also called **RAS**. (MCRP 1-10.2)

**senior airfield authority**—An individual designated by the joint force commander to be responsible for the control, operation, and maintenance of an airfield to include the runways, associated taxiways, parking ramps, land, and facilities whose proximity directly affects airfield operations. Also called **SAA**. (DOD Dictionary)

**single-point pressure refueling**—Pressure refueling an aircraft through a single connection. (NAVAIR 00-80T-109)

**site commander**—A group or squadron commanding officer or detachment officer in charge designated by the aviation combat element commander directly accountable to the aviation combat element commander for everything that takes place within the air base. The site commander’s authority and responsibilities are not restricted to rear area operations but include all operational functions supporting the base including force closure and deployment to and from the site and must be intimately involved in the detailed planning of all units to ensure the aviation combat element commander’s assigned mission timelines are met. (MCRP 1-10.2)

**spall**—Spalls are pavement damage that do not penetrate through the pavement surface to the underlying soil layers. A spall damage area could be up to 1.5 meters (5 feet) in diameter. (UFC 3-270-07)

**tactical airfield fuel dispensing system**—A tactical aircraft refueling system deployed by a Marine air-ground task force in support of air operations at an expeditionary airfield or a forward arming and refueling point. This expeditionary system provides bulk fuel storage and dispensing facilities at airfields not having permanently installed fuel systems and supports fuel dispensing at established airfields. Also called **TAFDS**. (MCRP 1-10.2)
Section III. Nomenclature

A-10 ................................................................. close air support aircraft (Thunderbolt II, Warthog)
AH-1W............................................................................................. attack helicopter (SuperCobra)
AH-1Z...............................................................attack helicopter (Viper; SuperCobra replacement)
AM-2........................................................................................................aluminum airfield matting
AV-8B................................................................................attack vertical take-off/short take-off and landing aircraft (Super Harrier)

B-747 ..........................................................................................jet airliner and cargo aircraft

C-130 ...................................................................................................military transport aircraft (Hercules)
C-141 ................................................................................................. strategic airlifter (Starlifter)
C-17 ....................................................................................long-haul military transport aircraft (Globemaster III)
C-5 ...........................................................................................................military transport aircraft (Galaxy) other variants include C-5A, C-5B, C-5C, and C-5M Super Galaxy

CH-53E ..........................................................heavy-lift assault support helicopter (Super Stallion)

DC-8......................................................................................... narrow-body, long-range jet airliner
DC-10.............................................................................................. wide-body, medium- to long-haul jet airliner

F-15 ................................................................................................................tactical fighter aircraft
F-16..........................................................................................supersonic, multirole fighter aircraft
F-35B ................................short takeoff/vertical-landing, supersonic stealth aircraft (Lightning II)
F-111 ........................................................... supersonic, interdictor tactical attack aircraft (Aardvark)

Halon 1211 extinguisher ....................................... hand-portable, clean agent extinguisher suitable for Class A, B, and C hazards
Halotron extinguisher ...................................150-pound wheeled clean agent extinguisher suitable for Class A, B, and C hazards

KC-130.............................................................. multirole, multimission tactical tanker/transport (Hercules)

M-31.................................................................................................... arresting gear
M32A-60...................................................................................... aircraft ground power unit
MA-1A..............................................................................................high velocity air start cart for jet engines
MD-3........................................................................................................aircraft ground power unit
MK-970................................................................................... 5,000-gallon aircraft refueler
MV-22B.......................................................................................... multimission tiltrotor aircraft (Osprey)

UH-1Y .................................................................utility helicopter (Venom, Super Huey)
REFERENCES AND RELATED PUBLICATIONS

Presidential Directive


Unified Facilities Criteria (UFC)

3-270-07 O&M: Airfield Damage Repair
3-260-01 Airfield and Heliport Planning and Design

Joint Issuances

Joint Publications (JPs)
3-10 Joint Security Operations in Theater
4-02 Health Service Support

Miscellaneous
DOD Dictionary of Military and Associated Terms

Navy and Marine Corps Departmental Publication (NAVMC)

3500.117 Marine Wing Support Squadron Training and Readiness Manual
3500.66_ Explosive Ordnance Disposal Training and Readiness Manual, with change 1

United States Army

Training Circular (TC)
5-340 Air Base Damage Repair (Pavement Repair)

United States Marine Corps

Marine Corps Warfighting Publications (MCWPs)
3-20 Aviation Operations
3-34 Engineering Operations
Marine Corps Reference Publications (MCRPs)
1-10.1 Organization of the United States Marine Corps
1-10.2 Marine Corps Supplement to DOD Dictionary of Military and Associated Terms
3-30C.1 MAGTF Rear Area Security
3-40D.13 Base Camps
3-40G.1 Marine Corps Field Feeding Program
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Marine Corps Tactical Publications (MCTPs)
3-20A Aviation Logistics
3-30C Rear Area Operations
3-34D Seabee Operations in the Marine Air-Ground Task Force (MAGTF)
3-40A Health Service Support Operations
3-40B Tactical-Level Logistics
3-40F Distribution and Transportation Operations
10-10D MAGTF Explosive Ordnance Disposal

Marine Corps Orders (MCOs)
1553.3 Unit Training Management (UTM) Program
3500.109 Marine Corps Aviation Weapons and Tactics Training Program
3571.2 Explosive Ordnance Disposal (EOD) Program

United States Navy

Naval Air Systems Command (NAVAIR)
00-80R-14 NATOPS U.S. Navy Aircraft Firefighting and Rescue Manual
00-80R-14-1 NATOPS U.S. Navy Aircraft Emergency Rescue Information Manual
00-80R-20 NATOPS U.S. Navy Aircraft Salvage Operations Manual (Ashore)
00-80T-103 NATOPS Conventional Weapons Handling Procedures Manual (Ashore)
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Naval Medical Command Publication (NAVMED-P-)
5010-9 Manual of Naval Medicine: Chapter 9, Preventive Medicine for Ground Forces

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Air Force Instruction (AFI)
13-217 Drop Zone and Landing Zone Operations

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10-219 Airfield Damage Repair Operations, volume 4
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