# Joint Publication 3-34

# Joint Engineer Operations

30 June 2011

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# PREFACE

## 1. Scope

This publication provides doctrine for the planning, command and control, execution, and assessment of joint engineer operations.

## 2. Purpose

This publication has been prepared under the direction of the Chairman of the Joint Chiefs of Staff. It sets forth joint doctrine to govern the activities and performance of the Armed Forces of the United States in operations and provides the doctrinal basis for interagency coordination and for US military involvement in multinational operations. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders (JFCs) and prescribes joint doctrine for operations and training. It provides military guidance for use by the Armed Forces in preparing their appropriate plans. It is not the intent of this publication to restrict the authority of the JFC from organizing the force and executing the mission in a manner the JFC deems most appropriate to ensure unity of effort in the accomplishment of the overall objective.

## 3. Application

a. Joint doctrine established in this publication applies to the commanders of combatant commands, subunified commands, joint task forces, subordinate components of these commands, and the Services.

b. The guidance in this publication is authoritative; as such, this doctrine will be followed except when, in the judgment of the commander, exceptional circumstances dictate otherwise. If conflicts arise between the contents of this publication and the contents of Service publications, this publication will take precedence unless the Chairman of the Joint Chiefs of Staff, normally in coordination with the other members of the Joint Chiefs of Staff, has provided more current and specific guidance. Commanders of forces operating as part of a multinational (alliance or coalition) military command should follow multinational doctrine and procedures ratified by the United States. For doctrine and procedures not ratified by the United States, commanders should evaluate and follow the multinational command's doctrine and procedures, where applicable and consistent with US law, regulations, and doctrine.

For the Chairman of the Joint Chiefs of Staff:

WILLIAM E. GORTNEY
VADM, USN
Director, Joint Staff

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# SUMMARY OF CHANGES
## REVISION OF JOINT PUBLICATION 3-34
## DATED 12 FEBRUARY 2007

- **Adds a discussion on engineer support to stability operations to include a discussion on the Department of State Civilian Response Corps and Interagency Management System.**

- **Clarifies engineer considerations in planning to be consistent with Joint Publication 5-0, *Joint Operation Planning*.**

- **Expands definition of combat engineering.**

- **Updates the capabilities and functions of the Service engineer forces.**

- **Adds/updates capability discussions for United States Army Corps of Engineers and the Air Force Center for Engineering and the Environment.**

- **Provides greater depth on typical funding and command and control (C2) relationships. Also adds a discussion on engineer C2 alternatives.**

- **Updates the Service Engineer Capability matrix.**

- **Adds definitions of route classification, relocatable building, operation and maintenance, mobile mine, explosive ordnance disposal, explosive ordnance disposal unit, base development plan, apron, and advanced base.**

- **Updates references and acronyms.**

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- **Describes the Engineer Functions of Combat Engineering, General Engineering, and Geospatial Engineering**

### Joint Engineering Fundamentals

***Role of Engineer Support in Joint Operations.***

Engineer capabilities are a significant force multiplier in joint operations, **facilitating the freedom of action necessary for the joint force commander (JFC) to meet mission objectives.** Engineer operations modify, maintain, provide understanding of, and protect the physical environment.

***Engineer Operations and the Principles of Joint Operations.***

Joint doctrine for engineer operations is built upon, and consistent with, the principles of joint operations described in Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States,* and JP 3-0, *Joint Operations.* Engineer operations enhance the ability of the JFC to successfully apply these principles to joint operations.

***Engineer Support Throughout the Range of Military Operations.***

Major operations and campaigns frequently require ground combat (or the possibility of ground combat), as do crisis response and contingency operations. Such operations will require engineers who can integrate their activities with the fires and maneuver of ground combat forces to assure the mobility of friendly forces, alter the mobility of adversaries, and enhance the protection of friendly forces. Some activities require engineer capabilities as an inherent part of a mission to provide support outside the joint force. Engineer support is inherent in the tasks of stability operations to restore or provide essential services, such as water, power, and transportation, and to repair critical infrastructure.

***Engineer Functions.***

Engineer functions are categories of related engineer capabilities and activities grouped together to help JFCs integrate, synchronize, and direct engineer operations.

These functions fall into three basic groups.

**Combat engineering** consists of those engineer capabilities and activities that support the maneuver of land combat forces and requires close support to those forces.

**General engineering** consists of those engineer capabilities and activities, other than combat engineering, that modify, maintain, or protect the physical environment.

**Geospatial engineering** consists of those engineer capabilities and activities that portray and refine data pertaining to the geographic location and characteristics of natural and constructed features and boundaries in order to provide engineering services to commanders and staffs.

***United States Military Engineering Capabilities Overview.***

Services often use the engineer functions to categorize forces and assets based on their primary function (i.e., combat engineers, general engineers, and geospatial engineers). Forces can sometimes perform some tasks from other functions, but **engineer forces and assets are not interchangeable.**

***Planners must be careful to accurately identify the capabilities required for an operation and the forces that have those capabilities.***

The **US Army** maintains engineer forces that have the capability to perform most combat, general, and geospatial engineering operations. They provide the JFC with significant engineering capabilities at each echelon within the command.

**Navy** engineers, organized under the First Naval Construction Division or the naval beach groups are commonly known as the naval construction force. They have rapidly deployable units of various sizes and configurations, tailored to provide responsiveness and flexibility. Navy engineers also provide engineering support to the Marines at various levels to include, depending on the scope and level of support provided, functioning as a major subordinate command to a Marine air-ground task force (MAGTF).

**Marine Corps** engineers' have both combat and limited general engineering that primarily support MAGTFs. MAGTF engineers are employed in a way that requires the close support and integration noted above for embedded combat engineers. Combat engineer battalions provide mobility, countermobility, and survivability to the ground combat element of the MAGTF while engineer support

battalions provide general engineering support to the MAGTF.

**Air Force** engineers are organized as Prime Base Engineer Emergency Force [Prime BEEF] and Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer [RED HORSE] units to provide a broad array of general and geospatial engineering capabilities. The primary tasking for Air Force engineers is to enable rapid global mobility for airlift, bombers, fighters, and to support other manned and unmanned aerial weapon systems.

In addition to US military engineer forces, multinational partner military engineers can provide valuable capabilities. Host nation (HN), multinational, and US Government agencies, and civilian contractors, in addition to providing labor, material, infrastructure, and services, may possess certain engineering capabilities specifically adapted to the local environment.

## Command and Control

***Responsibilities.***

The engineer staff of a joint force assists the JFC by furnishing engineer advice and recommendations to the commander and other staff officers; preparing those portions of plans, estimates, and orders that pertain to engineering; participating on boards and working groups, as necessary; and coordinating and supervising specific engineer activities for which the engineer staff division is responsible.

**Command Engineer Staff.** The engineer staff assists the geographic combatant commander (GCC) by performing a variety of functions to synchronize engineer operations in the area of responsibility (AOR).

**Subordinate Joint Force Engineer Staff.** The joint force engineer serves as the principal advisor to the JFC for matters pertaining to the planning and execution of joint engineering support operations.

***Authority and Control.***

**Combatant commanders (CCDRs)** have broad authority and control over subordinate commands and forces. Particularly pertinent to engineer operations are:

- The directive authority for logistics that CCDRs have and their authority to delegate directive authority for

common support capabilities, which includes engineering support.

- The authority to employ mines, which originates with the President.

A **subordinate JFC** normally exercises operational control (OPCON) over assigned or attached forces and is responsible for the employment of their capabilities to accomplish the assigned mission or objective. Additionally, the JFC ensures that cross-Service support is provided and that all engineering forces operate as an effective, mutually supporting team.

***Command and Control Options.***

***Most often, joint forces are organized with a combination of Service and functional component commands.***

**Service Component Command.** Service component commanders maintain OPCON over their Service engineer forces under this organizational option. This structure maintains traditional command relationships and is best used when the JFC chooses to conduct operations through Service component commanders and when engineer forces are used in direct support of Service component missions. A Service component command may be delegated OPCON or tactical control of engineer forces from another Service to accomplish the assigned mission or tasks.

**Functional Component Command.** The JFC may also organize using one or more functional component commands. Under this organizational option, the JFC establishes command relationships for engineer forces based on the requirement for engineer missions. The JFC is responsible for establishing the appropriate relationships between components to accomplish the required tasks.

**Subordinate Joint Task Force (JTF).** Some operations, such as civil support, mitigating the consequences of an incident, or foreign humanitarian assistance (FHA), are extremely engineer-intensive. In such cases, the JFC may opt to establish a subordinate JTF to control extensive engineer operations and missions.

***Command and Control Considerations.***

Service engineering forces must be flexible to allow the JFC to organize them in the most effective manner. A CCDR may delegate responsibility for engineering support to the Service component having a preponderance of forces and expertise. In addition to or coinciding with component missions specified by the CCDR or subordinate JFC, each Service component may provide engineering support to the

other components or multinational partners, as required or directed.

Supporting engineer forces with an effective communications system for command and control is an essential consideration for the JFC and the joint force engineer. Engineer forces have organic communications capabilities within Service channels up to the component headquarters (HQ). When operating in a joint environment, engineer units retain organic communications capabilities, but may also require additional communications system support from the Service component, other Service components, or the joint force.

***Engineer Organization Considerations.***

The JFC should establish an engineer staff for engineering matters. When a functional component command employs forces from more than one Service, the staff should reflect each Service represented.

The CCDR and subordinate JFC will organize their staffs to carry out their respective assigned duties and responsibilities. Based on mission specific requirements, the engineer staff may be placed within the operations directorate of a joint staff, logistics directorate of a joint staff, or organized as a separate staff to the JFC.

***Engineer Boards, Bureaus, Centers, Cells, and Working Groups.***

A JFC may establish engineer boards or cells to manage engineer-intensive activities and to ensure an effective use of resources to meet mission requirements. **Engineer boards** establish policies, procedures, priorities, and oversight to coordinate efficient use of engineer resources. Engineer boards serve as the forum to address issues outside of daily operations and to ensure coordination at the leadership level and across staff directorates. **Working groups** conduct staff coordination at the action officer level and prepare materials for decisions to be made at a board. **Cells** within the JTF are a group of personnel with specific skills who are listed together on the HQ joint manning document to accomplish key functions.

***Interorganizational Coordination.***

Because engineers are likely to operate with the other government agencies, foreign governments, nongovernmental organizations, and intergovernmental organizations in a variety of circumstances, their participation in the JFC's interagency coordination is critical. Two methods for facilitating such coordination are the civil-military operations center and the joint interagency coordination group.

## Engineering Planning

***Strategic, Operational, and Tactical Planning.***

The engineer staff must be involved in the planning of strategic, operational, and tactical operations from the initial stage of the process. The omission of engineer considerations in any phase of an operation may adversely impact the entire plan. Engineer planning activities at the **strategic level** include force planning, engineer policy and doctrine development, and the execution of campaigns and operations, focusing primarily on the means and capabilities to generate, mount, sustain, and recover forces. The GCC's engineer planning **[operational level]** concepts for the AOR focus on the impact of geography and force-projection infrastructure on the concept of operations. Engineer planning activities at the **tactical level** focus on support to the ordered arrangement and maneuver of combat elements in relationship to each other and to the enemy that are required to achieve combat objectives.

***The challenges of planning successful engineer operations within diverse theaters are vast and varied.***

***Planning Process.***

The joint operation planning process underpins planning at all levels and for missions across the full range of military operations. Engineering considerations are similar for both contingency planning and crisis action planning.

***Step 1 (Initiation).***

During these activities, the joint force engineer assembles the resources required to support course of action (COA) development and begins the initial engineer staff estimate.

***Step 2 (Mission Analysis).***

Engineer considerations during this step of planning include, but are not limited to:

- Terrain and related weather analysis in support of operational area (OA)/environment visualization.
- HN infrastructure and facilities assessment.
- Assessment of multinational and HN engineer capabilities.
- Additional digital mapping requirements for projected missions.
- Capabilities of assigned engineer forces.
- Threat engineer capabilities.

- Environmentally sensitive areas and other environmental considerations.
- Historic and cultural resources.
- Beddown requirements for the supported friendly force.
- Lines of communications (LOCs) and aerial port of debarkation (APOD) and seaport of debarkation (SPOD) supportability.

***Step 3 (Course of Action [COA] Development).*** The engineer assesses all available information derived from the mission analysis process to provide the commander with input required to develop the initial COAs.

***Steps 4 and 5 (COA Analysis and COA Comparison).*** The engineer participates in wargaming, analyzing, and comparing available COAs to produce a commander's estimate to support a COA comparison matrix.

***Step 6 (COA Approval).*** The engineer ensures that all requirements developed during the mission analysis and staff estimate processes are accounted for in the COA and supportable from an engineering perspective.

***Step 7 (Plan or Order Development).*** The engineer prepares several annexes and appendices, provides significant input to others, and must review still others due to their possible significant impact on engineer operations.

***Development of Time-Phased Force and Deployment Data.*** Engineer participation in developing the time-phased force and deployment data (TPFDD) is critical to ensure that:

- Critical engineer reconnaissance capabilities are positioned early in the TPFDD.
- Engineer capabilities (units) arrive in the OA in a manner that supports the desired preparation of the OA/environment.
- Facilities required to support force projection and joint reception, staging, onward movement, and integration are in place and available to deploying units.

Construction materials, equipment, and resources are available when required, including those required to

achieve the CCDR's standards for base camp beddown.

***General Planning Considerations.***

In tailoring the engineer support to operations, the joint force engineer should address a number of general considerations for engineer planning, including speed, economy, flexibility, decentralization of authority, and establishment of priorities.

**Assured Mobility.** Assured mobility is the framework of processes, actions, and capabilities, that assures the ability of the joint force to deploy and maneuver where and when desired, without interruption or delay, to achieve the mission.

**Joint Intelligence Preparation of the Operational Environment (JIPOE).** Engineers play a major role in the JIPOE process by anticipating and providing terrain analysis products of likely contingency areas.

**Engineer Reconnaissance.** Organization of engineer reconnaissance capabilities (mix of engineer specialties, expertise, and equipment) and required supporting assets (environmental, preventive medicine, or other specialties and force protection elements) is a critical planning consideration to ensure an accurate and sufficient reconnaissance.

**Logistics.** The engineer support planning effort focuses on supporting the mobilization, deployment, employment, sustainment, and redeployment of the joint force.

**Joint Engineer Planning and Execution System (JEPES).** JEPES is a tool used to support quantitative aspects of engineering support planning and execution. It provides the general requirements for the engineer support plan and provides a common automated system for the joint force engineer planners to determine the appropriate amount of engineer assets and capabilities to support the selected COA.

***Functional Planning Considerations.***

Each engineer function has unique planning considerations. Some of those that are most significant to the joint force engineer's planning activities include:

**Combat Engineering.** Emplacing barriers and obstacles, and countering their use by adversaries are often

significant requirements for engineers.

**General Engineering.** One of the challenges joint force engineers face in planning general engineering is access to specialized technical expertise. Much of this expertise resides within the Services, and can greatly assist joint force engineers.

**Geospatial Engineering.** The geospatial engineer products are also extremely useful in the engineer planning process as a means of identification and feasibility determination for beddown and staging areas, possible resource (gravel, sand, etc.) locations, and capability of LOCs.

***Detailed Planning Considerations.***

**Transitions.** Engineering planning for operational phase transition is essential to ensuring uninterrupted support to the joint force. Engineers, together with logisticians, must anticipate the JFC's phase transition decisive points in order to ensure adequate resources are available for the next phase of the campaign.

**Force Protection.** Engineers have unique equipment and personnel capabilities that can be used to support force protection efforts. Engineers construct protective facilities, bunkers, emplacements, vehicle barriers, fences, environmental and sanitation systems, and other structures.

**Explosive Ordnance Disposal (EOD).** EOD augmentation to the engineer force is not only essential, but critical. The speed and efficiency with which unexploded ordnance hazards, weapons caches, and improvised explosive devices are eliminated directly impacts overall mission success, both militarily and politically.

**Real Estate Requirements.** Joint force engineers must plan for the acquisition of uncontaminated land and facilities, and their management and ultimate disposal to support joint operations.

**Construction Planning.** The joint force engineer and Service component engineers must ensure that facilities are available to support the joint force. This will often require new construction, but where possible, it is important to maximize the use of existing facilities.

**Construction Contracting Support.** Joint engineers must consider the capabilities of all Services when addressing how to support contingency contracting requirements.

**Environmental Considerations.** Successful planning and execution of joint engineering operations requires ever-increasing attention to environmental considerations.

**Host-Nation Support (HNS).** Since then, deployments have become increasingly expeditionary, with greater dependency on HNS and a greater engineering effort to develop secure ports and forward operating bases.

**Multinational Support.** Coalition or alliance forces will require a multinational force (MNF) commander and may require an MNF engineer and staff to plan and coordinate engineer efforts. In multinational operations, the MNF engineer is responsible for coordinating all engineering operations that affect the MNF.

**Foreign Assistance.** While all elements of the joint force are focused on providing immediate FHA to avert the loss of life, the engineering contribution is focused on logistic support, securing an area to allow relief efforts directed by other agencies to proceed, and projects that open LOCs and provide shelter, water, and the infrastructure to relieve human suffering and support life.

## Engineering Functions

***Combat Engineering.***

Combat engineering activities are focused on the tactical level of war, though they can also contribute directly to the achievement of strategic and operational objectives. There are **three types of combat engineering capabilities and activities:** mobility, countermobility, and survivability.

**Mobility.** Combat engineering mobility capabilities and activities assure the ability of land combat forces to maneuver. They only include tasks that meet the definition of combat engineering, and they typically include tasks associated with conducting combined arms breaching operations, clearing operations, and gap crossing operations; constructing and maintaining combat roads and trails; and performing forward aviation combat engineering.

**Countermobility.** Combat engineering countermobility capabilities and activities reinforce terrain to delay, disrupt, and destroy the enemy. Their primary purpose is to slow or divert the enemy, to increase time for target acquisition and fires, and to increase weapons' effectiveness.

**Survivability.** Combat engineering survivability capabilities and activities enhance the protection of land combat forces. They only include tasks that meet the definition of combat engineering, and they typically include tasks associated with the construction of fighting and protective positions, recovery after attack actions, and tactical camouflage, concealment, and deception.

***General Engineering.*** General engineering is a very diverse function often involving horizontal and vertical construction, but also encompassing numerous specialized capabilities. Examples of general engineering **facilities construction** include: shelter, warehouses, terminals, hospitals, water and electric power facilities, sanitation and environmental facilities, fuel storage and distribution facilities, and APOD and SPOD facilities. **Specialized support** examples include: fire and emergency services; explosive hazard disposal; engineering support contracting, and engineering; technical support; facilities engineering and management; water well drilling; concrete and asphalt production and quarry operations; power generation and distribution support; environmental support operations; airfield damage repair; support to joint logistics over-the-shore; and disaster preparation and chemical, biological, radiological, and nuclear response.

***Geospatial Engineering.*** Geospatial engineering provides the JFC with terrain analysis and visualization of the operational environment through the utilization and display of accurate terrain and other geospatially referenced information and derived actionable advice that is referenced to precise locations on the earth's surface.

## CONCLUSION

This publication provides doctrine for the planning, command and control, execution, and assessment of joint engineer operations.

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# CHAPTER I
## JOINT ENGINEER FUNDAMENTALS

*"I've on many occasions wondered what it would be like to be a real soldier…if only I was an engineer."*

**General George S. Patton**

### 1. Role of Engineer Support in Joint Operations

Engineer capabilities are a significant force multiplier in joint operations, **facilitating the freedom of action necessary for the joint force commander (JFC) to meet mission objectives.** Engineer operations modify, maintain, provide understanding of, and protect the physical environment. In doing so they assure the mobility of friendly forces, alter the mobility of others, enhance the protection and enable the sustainment of friendly forces, contribute to a clear understanding of the physical environment, and provide support to civilians, other nations, and civilian authorities and agencies.

### 2. Engineer Operations and the Principles of Joint Operations

Joint doctrine for engineer operations is built upon, and consistent with, the principles of joint operations described in Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States,* and JP 3-0, *Joint Operations.* Engineer operations enhance the ability of the JFC to successfully apply these principles to joint operations.

### 3. Engineer Support Throughout the Range of Military Operations

a. Engineer operations occur throughout the range of military operations.

b. Joint forces conducting almost any activity will benefit from a clear understanding of the physical environment. Therefore geospatial engineering capabilities are almost always needed.

c. Major operations and campaigns frequently require large numbers of forces in theater, as do crisis response and contingency operations. Military engagement, security cooperation, and deterrence activities sometimes require large numbers of forces. These forces will need infrastructure, lines of communications (LOCs), and bases to support their sustainment. Even in areas with well-developed existing infrastructure, significant engineer effort will often be required to plan, design, construct, acquire, operate, maintain, integrate with, or repair infrastructure in order to support operations in theater. Such an effort will require engineers on the ground.

d. Major operations and campaigns frequently require ground combat (or the possibility of ground combat), as do crisis response and contingency operations. Such operations will require engineers who can integrate their activities with the fires and maneuver of ground combat forces to assure the mobility of friendly forces, alter the mobility of adversaries, and

enhance the protection of friendly forces. This will often require a significant number of engineers on the ground.

e. Some activities require engineer capabilities as an inherent part of a mission to provide support outside the joint force. For instance, many crisis response operations include the provision of essential governmental services, humanitarian relief, and emergency infrastructure reconstruction, such as humanitarian assistance and civil support (CS). Military engagement, security cooperation, and deterrence include nation assistance and Department of Defense (DOD) support to counterdrug operations. Such activities will often require engineers on the ground.

f. Stability operations encompass various military missions conducted outside the United States in coordination with other instruments of national power to maintain or reestablish a safe and secure environment, provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief. Department of Defense Instruction (DODI) 3000.05, *Stability Operations*, establishes stability operations as a core mission of the US military and requires proficiency equivalent with combat operations. Engineer support is inherent in the tasks of stability operations to restore or provide essential services, such as water, power, and transportation, and to repair critical infrastructure. Although DOD provides this initial capability, transition planning in stability operations is a key engineer task requiring coordination with other departments and agencies to ensure unity of effort.

*For further details, refer to JP 3-06,* Joint Urban Operations, *and JP 3-07,* Stability Operations.

## 4. Engineer Functions

a. **Engineer functions** are categories of related engineer capabilities and activities grouped together to help JFCs integrate, synchronize, and direct engineer operations. These functions fall into three basic groups—combat engineering, general engineering, and geospatial engineering (see Figure I-1).

(1) **Combat engineering** consists of those engineer capabilities and activities that support the maneuver of land combat forces and requires close support to those forces. Combat engineering consists of three types of capabilities and activities: mobility, countermobility, and survivability. Examples include combined arms breaching operations, gap crossing operations, and constructing and maintaining combat roads and trails; development of barriers, obstacles, and minefields; and construction of fighting and protective positions.

(2) **General engineering** consists of those engineer capabilities and activities, other than combat engineering, that modify, maintain, or protect the physical environment. Examples include the construction, repair, and maintenance of infrastructure, Class III/V storage area requirements, LOCs, and bases; protection of natural and cultural resources; terrain modification and repair; and selected explosive hazard (EH) activities.

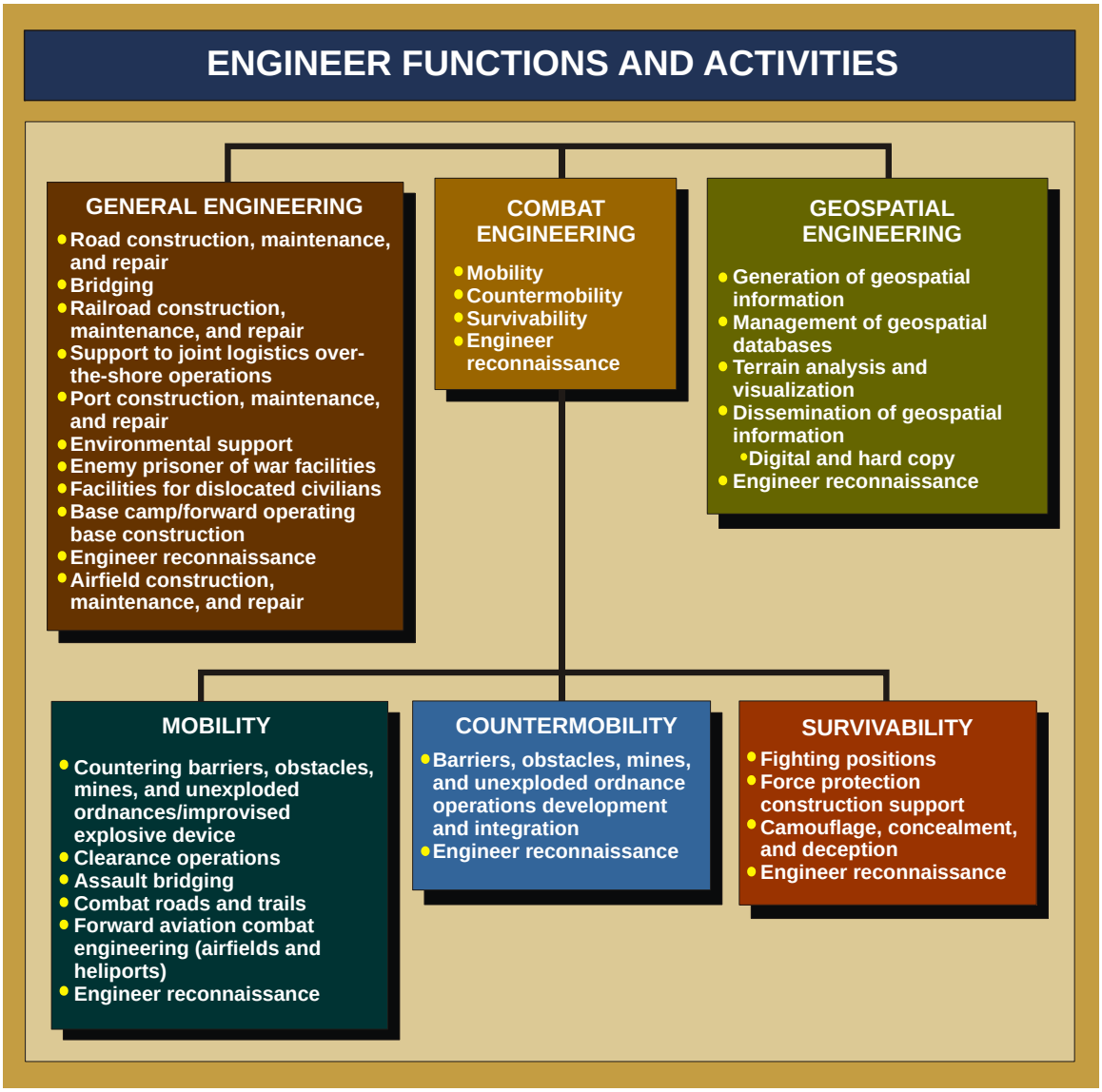


**Figure I-1. Engineer Functions and Activities**

(3) **Geospatial engineering** consists of those engineer capabilities and activities that portray and refine data pertaining to the geographic location and characteristics of natural and constructed features and boundaries in order to provide engineering services to commanders and staffs. Examples include: terrain analysis, terrain visualization, digitized terrain products, nonstandard tailored map products, precision survey, geospatial data management, baseline survey data, identification of significant cultural sites and natural resources, facility support, and force beddown analysis.

b. **Engineer reconnaissance,** though not a separate engineer function, is a critical part of each one. Timely and effective engineer reconnaissance is essential to effective planning and execution of engineer tasks, and can often provide information that allows the JFC to avoid or reduce the need for engineer activities. While engineer reconnaissance capabilities exist in many forms and capabilities, there are few engineer reconnaissance organizations

permanently assigned, organized, and designed specifically for the reconnaissance mission. Most engineer reconnaissance planned by the joint engineer will be in support of general engineer tasks, as planning for engineer reconnaissance in support of combat engineering is typically conducted at lower levels.

c. The engineer functions help JFCs integrate the actions of the joint force in a coherent manner. The operation plan/order describes the way that the engineer functions are used in the operation.

d. **Levels of war and the engineer functions.** The engineer functions are not categorized according to the levels of war because all three functions can contribute directly to the achievement of tactical, operational, and strategic objectives. However, the nature of the activities within each engineer function causes some functions to be more closely associated with certain levels of war than with others. Since combat engineering is conducted in close support of land combat forces, its focus is on the tactical level. General engineering is most closely associated with the operational and strategic levels. Geospatial engineering is equally associated with all three levels of war.

e. **Joint functions and engineer functions.** There is not a one-to-one relationship between engineer functions and the joint functions. Each engineer function is associated with multiple joint functions, but is more closely associated with some than with others. Figure I-2 illustrates the association between some typical engineer functions and their corresponding joint function.

*For additional information on joint functions, refer to JP 3-0,* Joint Operations.

f. Distinction between combat and general engineering.

(1) The primary differences between combat and general engineering result from combat engineering's requirement for **close support to land combat forces.** Inherent in close support is a requirement for detailed integration or coordination with the fires, movement, or other actions of those forces. This requirement:

(a) Results in significantly different types of tasks; shorter time requirements to accomplish those tasks; and, a much higher probability that those tasks will have to be performed in close combat conditions. However, combat engineering must not be confused with "engineering under combat conditions." This could apply to general and geospatial engineering activities, but only activities requiring close support to land combat forces are combat engineering activities.

(b) Results in different performance measures for tasks that may seem to be the same. Thus, a task to reduce an obstacle as part of a combined arms breaching operation has different performance measures than a similar task to reduce the same obstacle where the requirement for detailed integration does not exist (for example, such a situation might occur as part of a road construction effort). The former is a combat engineering task while the latter is a general engineering task.

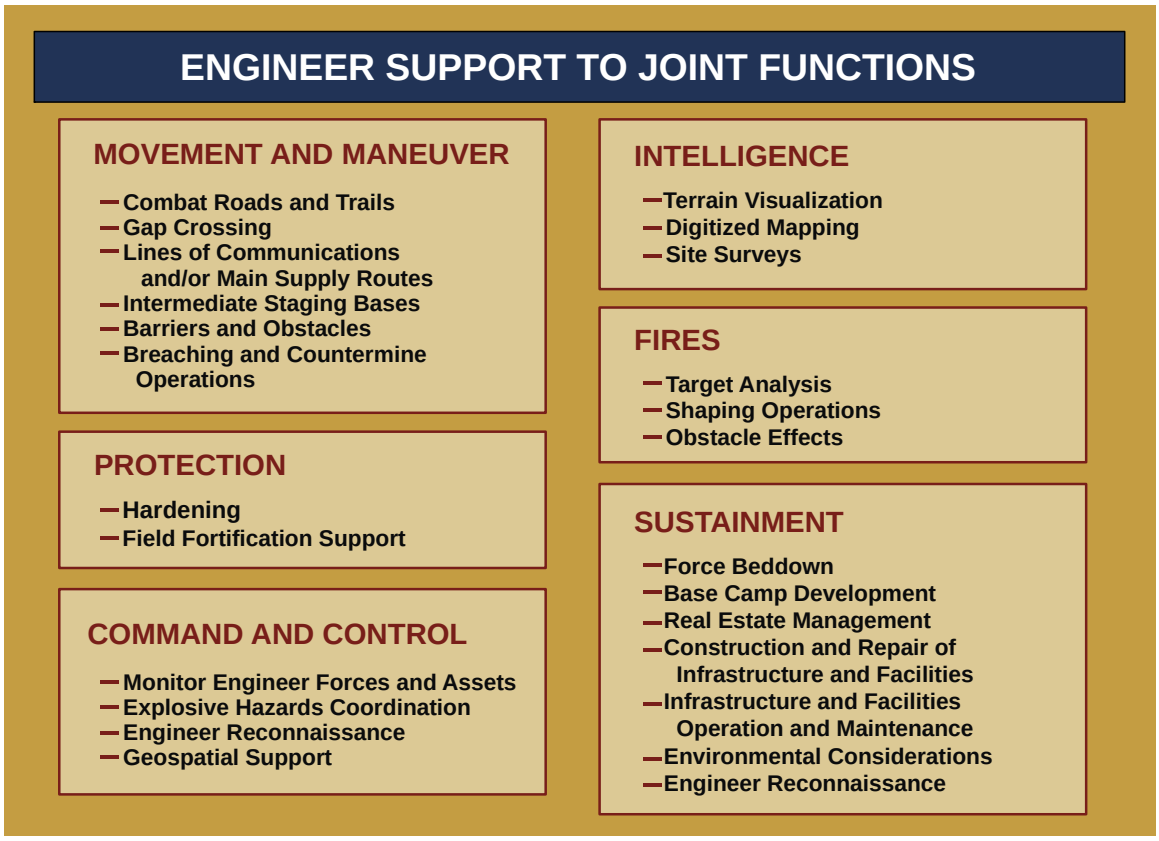


**Figure I-2. Engineer Support to Joint Functions**

(c) Is established by the commander responsible for the operational area (OA) in which engineering activities are conducted.

(2) Although general engineering activities do not require the detailed integration inherent in close support that combat engineering activities require, they still must be coordinated with the supported unit and the unit responsible for the OA in which the activities are conducted.

g. Combat engineering is almost always conducted in support of military forces. General engineering is also conducted in support of military forces, but is also frequently employed in support of others (e.g., civilians, other nations, civilian authorities, civilian agencies) as a critical element of civil-military operations (CMO). Likewise, geospatial engineering is often employed in support of military forces and in support of others. For additional CMO information, see JP 3-57, *Civil-Military Operations.*

h. Combat engineering and general engineering often require significant logistic support with long lead times to obtain and deliver equipment and supplies. Combat engineering typically requires large quantities of barrier materials and explosives. General engineering often requires very large amounts and many varieties of construction materials. These supplies may not be readily available in the OA, and this can be a significant factor which limits the application of engineer capabilities and the options available to the JFC.

## 5. United States Military Engineering Capabilities Overview

a. Services often use the engineer functions to categorize forces and assets based on their primary function (i.e., combat engineers, general engineers, and geospatial engineers). Forces can sometimes perform some tasks from other functions, but **engineer forces and assets are not interchangeable.** Planners must be careful to accurately identify the capabilities required for an operation and the forces that have those capabilities.

(1) **Combat engineering** requires forces with the capability to integrate their engineering activities with, or operate as part of, a combined arms team of ground forces. Usually this requires combat engineers, which are organic to most ground combat forces at the brigade or regimental level or lower. Only combat engineers are organized, trained, and equipped to perform the range of combat engineering tasks required by land combat forces; to integrate their activities with the fires and maneuver of those forces; and to operate as part of a combined arms team in close combat. Some general engineers (or even non-engineers) may be able to perform some combat engineering tasks, but their capabilities to perform such tasks are very limited. JFCs should be cautious about using general engineers to perform combat engineering tasks.

(2) **General engineering** often can be performed by civilians and contractors, but the nature of some tasks, or the conditions under which they must be performed, often demands that military engineers perform them. The general engineering requirements for an operation will often exceed the capabilities of available military engineers, so JFCs will need to employ a combination of military engineers, civilians, contractors, and multinational and host nation (HN) capabilities to fulfill these requirements. Most combat engineers are able to perform some general engineering tasks, but their capabilities to do so are often limited by their training and equipment. JFCs should be cautious about using combat engineers to perform general engineering tasks without appropriate augmentation and training. Even with such augmentation and training, the use of combat engineers to perform general engineering tasks can create significant risk if it reduces the combat engineering capabilities available to land combat forces.

(3) **Geospatial engineering** tasks require highly technical and specialized capabilities. These may include processing data from disparate sources such as remote sensed imagery, field reconnaissance, digital data, intelligence data, existing topographic products, and other collateral data. Geospatial engineers also perform digital manipulation of topographic, hydrographic, and aeronautical information by querying, viewing, evaluating, and downloading digital data. They support operational needs such as the production of tactical decision aids or temporal and special analysis to support the JFC's decision cycle. They can assist in predictive analysis of the impact that terrain and weather may have on transportation, communications, and intelligence systems. Fusion of geospatial engineers and intelligence personnel leverage data accessibility, exploitation, visualization, and distribution.

b. Each Service has core engineering units and capabilities that stem from their traditional roles and associations to meet specific operational needs and to support accomplishing a variety of mission requirements in any environment. An understanding of

the Services' combat, general, and geospatial engineering capabilities allows the JFC and the joint force engineer to tailor the engineer force to effectively and efficiently accomplish the mission. The JFC should understand multinational, interagency, nongovernmental organization (NGO), and intergovernmental organization (IGO) engineer capabilities to better coordinate coherent activity, develop viable courses of action (COAs) and, when appropriate, to properly integrate them into the joint operation. The joint force engineer is responsible for providing comprehensive recommendations to the JFC on the effective employment of all engineer capabilities in support of joint operations. The JFC, with the assistance of the joint force engineer, analyzes mission requirements to tailor optimal engineer force packages. The engineering capabilities of each Service component may provide engineering support to the other components to meet joint force requirements.

c. **Army Engineers.** The US Army maintains engineer forces that have the capability to perform most combat, general, and geospatial engineering operations. They provide the JFC with significant engineering capabilities at each echelon within the command. Generally, engineer units at the brigade combat team (BCT) level and below focus on combat engineering. Engineers at levels above the BCT reinforce the engineering capability within the BCT and possess various combat and general engineering capabilities. Army engineer command and control (C2) units are designed to provide C2 of additional forces added at the brigade and echelons above brigade levels. The size and scope of the engineer requirement will drive the selection of the appropriate C2 capability (i.e., engineer battalion, brigade, theater engineer command [TEC]). Geospatial engineering capabilities exist at brigade level and higher staffs. Some capabilities that are categorized as engineering by other Services reside in other branches of the Army (e.g., explosive ordnance disposal [EOD] and chemical, biological, radiological, and nuclear [CBRN] capabilities). The US Army Corps of Engineers (USACE) is the Army's direct reporting unit assigned responsibility to execute Army and DOD military construction (MILCON), real estate acquisition, environmental management, and development of the nation's infrastructure through the civil works program. Field forces assigned to the operational Army include forward engineer support teams (FESTs) and the 249th Engineer Battalion (Prime Power). Other services include wetlands and waterway management and disaster relief support operations (USACE has primary responsibility to execute Emergency Support Function #3, Public Works and Engineering, for DOD). USACE also provides technical assistance and contract support to joint forces deployed worldwide.

d. **Navy Engineers.** Navy engineers, organized under the First Naval Construction Division (1NCD) or the naval beach groups (NBGs) are commonly known as the naval construction force (NCF). They have rapidly deployable units of various sizes and configurations, tailored to provide responsiveness and flexibility. NCFs provide advanced general engineering to include airfields, LOCs, upgrade and maintenance, battle damage repair, underwater and amphibious construction, and logistic facilities construction. Navy engineers also provide engineering support to the Marines at various levels to include, depending on the scope and level of support provided, functioning as a major subordinate command to a Marine air-ground task force (MAGTF). The Naval Facilities Engineering Command (NAVFAC) also provides engineering planning, design engineering, project management, environmental engineering support, construction contracting, and operations

and maintenance for shore-based and ocean facilities. NAVFAC also maintains a reachback capability for forward engineer units.

e. **Marine Corps Engineers.** Marine Corps engineers' have both combat and limited general engineering that primarily support MAGTFs. MAGTF engineers are employed in a way that requires the close support and integration noted above for embedded combat engineers. Combat engineer battalions (CEBs) provide mobility, countermobility, and survivability to the ground combat element (GCE) of the MAGTF while engineer support battalions (ESBs) provide general engineering support to the MAGTF. Additionally, Marine wing support squadrons (MWSSs) provide limited combat engineering to the aviation combat element (ACE), but provide a more robust general engineering capability, especially in terms of airfield damage repair (ADR). The Marine Corps has limited geospatial engineering capabilities, with one topographic platoon supporting each Marine expeditionary force (MEF).

f. **Air Force Engineers.** Air Force engineers are organized as Prime Base Engineer Emergency Force (Prime BEEF) and Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer (RED HORSE) units to provide a broad array of general and geospatial engineering capabilities. The primary tasking for Air Force engineers is to enable rapid global mobility for airlift, bombers, fighters, and to support other manned and unmanned aerial weapon systems. Air Force engineers are trained and equipped with organic capabilities to support all aspects of airfield operations where heavy strategic airlift, bombers, or fighters will operate on a daily or frequent basis. The Air Force has the capability to rapidly deploy general engineer units organized as part of an air and space expeditionary task force (AETF) to open, establish, and maintain airbase power projection platforms. These same units can deploy as detached units operating in support of specific missions and operational tasks such as airfield pavement evaluations (APEs); crash and fire rescue; EOD; emergency management (EM) response; ADR; facility construction and maintenance; and utility systems construction and maintenance; aircraft arresting system installation and maintenance; and airfield lighting, marking, and installation of navigation aids. The Air Force Center for Engineering and the Environment (AFCEE) provides environmental engineering support, construction contracting, and project management, and maintains a reachback capability for forward engineer units.

*A more extensive description of Service engineer capabilities is provided in Appendix B, "Service Engineer Organizations and Capabilities."*

g. **Other Engineering Capabilities.** In addition to US military engineer forces, multinational partner military engineers can provide valuable capabilities. HN, multinational, and US Government (USG) agencies, and civilian contractors, in addition to providing labor, material, infrastructure, and services, may possess certain engineering capabilities specifically adapted to the local environment. There are other benefits to the use of multinational, HN, and US contractors, but these need to be weighed against their potential limitations. This mixture of capabilities may change during the phases of an operation and may require management across Service lines to ensure that the JFC has appropriate forces in place.

(1) **Department of Defense Construction Agents.** The Secretary of Defense (SecDef) has designated the USACE and the NAVFAC as construction agents for the design and construction execution of US military facilities worldwide. AFCEE is the designated DOD construction agent for MILCON in the British Isles. The USACE, NAVFAC, and AFCEE provide a significant engineering capability to be leveraged in joint operations. Both USACE and NAVFAC have the capability to support general engineering operations with technical assistance and contract support to joint forces deployed worldwide. They also maintain in-depth expertise in engineering research and development. Inherent in their mission support capabilities is a planning and engineering capability for advanced base and infrastructure development. Combatant commanders (CCDRs) may use USACE, NAVFAC, and AFCEE to provide technical engineering assistance for design and award of construction contracts to civilian companies in support of military operations.

*Specific information on the responsibilities of DOD construction agents is contained in Appendix C, "Contract Construction Agents," and in Department of Defense Directive (DODD) 4270.5,* Military Construction.

(2) **Standing Contingency Contracts.** Civil augmentation programs, such as the Army's logistics civil augmentation program (LOGCAP), the Navy's global contingency construction contract (GCCC) and global contingency service contract (GCSC) program, and the Air Force contract augmentation program (AFCAP), also play a significant role in mission accomplishment by providing the JFC and joint force engineer with additional options and flexibility in general engineering and logistic support.

*For further guidance on service civil augmentation programs, refer to JP 4-10,* Operational Contract Support.

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# CHAPTER II
## COMMAND AND CONTROL

*"Engineers, both Army and Seabees, were under Commander Construction Troops who, in turn, was under the Island Commander, Major General Fred C. Wallace, USMC. Airfield construction and supply roads had priority; other base developments could wait until the island was secured. The face of the island was changed more than it had been for thousands of years by multi-lane roads, traffic circles, water points, Quonset villages, tank farms, storage dumps, and hospitals."*

**Okinawa Secured, Victory in the Pacific**
**Samuel Eliot Morrison**
**History of US Naval Operations in World War II**

### 1. Responsibilities

a. The responsibilities and functions of CCDRs and their subordinate JFCs are specified and described in the Unified Command Plan and JP 1, *Doctrine for the Armed Forces of the United States*. The engineer staff of a joint force assists the JFC by furnishing engineer advice and recommendations to the commander and other staff officers; preparing those portions of plans, estimates, and orders that pertain to engineering; participating on boards and working groups, as necessary; and coordinating and supervising specific engineer activities for which the engineer staff division is responsible.

b. **Command Engineer Staff.** The engineer staff assists the geographic combatant commander (GCC) by performing a variety of functions to synchronize engineer operations in the area of responsibility (AOR). These include:

(1) Planning and coordinating theater engineering support.

(2) Providing recommendations to the GCC on the assignment of engineering missions to subordinate commanders. Recommendations may include which subordinate commander (Service/functional component, subordinate joint task force [JTF], or subunified commander) will be assigned the mission, the scope of the project, and which commanders will be placed in a supporting role.

(3) Furnishing recommendations on the tasking of components for theater engineering missions, tasks, or projects.

(4) Recommending policies and priorities for construction and real estate acquisition, and for Class IV supplies (construction materials).

(5) Furnishing advice on the impact of joint operations on the environment in accordance with (IAW) applicable US, international, and HN laws and agreements.

(6) Recommending construction standards.

(7) Identifying engineering support requirements that exceed component funding authorizations and organized engineer capabilities.

(8) Furnishing advice on the assessment of the risk to mission accomplishment of engineering support shortfalls.

(9) Furnishing advice on the feasibility, acceptability, and suitability of component engineering plans.

(10) Preparing, as part of the joint operation planning process (JOPP), the engineer parts of operation plans (OPLANs) and operation orders (OPORDs), see Figure III-3.

(11) Reviewing all engineer-related annexes/appendices (see Chapter III, "Engineer Planning") of OPLANs and OPORDs.

(12) Providing input to the theater campaign plan. Develop humanitarian civil assistance and exercise related construction programs to support building partner capacity.

(13) Developing training and exercise programs to evaluate and improve preparedness for engineering missions.

(14) Planning and coordinating the procurement and distribution of required materiel based on established priorities. Service components are responsible for procurement and distribution of their Class IV requirements.

(15) Coordinating with DOD construction agents and other engineer support agencies.

c. **Subordinate Joint Force Engineer Staff.** The joint force engineer serves as the principal advisor to the JFC for matters pertaining to the planning and execution of joint engineering support operations. The joint force engineer manages several engineering functions to include the following:

(1) Planning for and coordinating the conduct of operational mobility, countermobility, and survivability tasks.

(2) Construction and maintenance of required facilities and LOCs.

(3) Coordination of materiel requirements.

(4) Environmental management.

(5) Geospatial support in conjunction with the geospatial information and services (GI&S) officer.

(6) Real estate acquisition and management.

(7) Other specialized engineering support functions.

(8) Emergency repair of war damage to facilities and infrastructure.

## 2. Authority and Control

a. **Commander of a Combatant Command.** CCDRs have broad authority and control over subordinate commands and forces. Particularly pertinent to engineer operations are:

(1) The directive authority for logistics that CCDRs have and their authority to delegate directive authority for common support capabilities, which includes engineering support.

*For more information about directive authority for logistics and directive authority for common support capabilities, see JP 1,* Doctrine for the Armed Forces of the United States.

(2) The authority to employ mines, which originates with the President.

*For more information on mine employment authority, see JP 3-15,* Barriers, Obstacles, and Mine Warfare for Joint Operations.

b. **Subordinate Joint Force Commander.** A subordinate JFC normally exercises operational control (OPCON) over assigned or attached forces and is responsible for the employment of their capabilities to accomplish the assigned mission or objective. Additionally, the JFC ensures that cross-Service support is provided and that all engineering forces operate as an effective, mutually supporting team. The JFC assigns engineering tasks to subordinate commanders.

*For further guidance on joint C2, refer to JP 1,* Doctrine for the Armed Forces of the United States; *JP 3-31,* Command and Control for Land Operations; *and JP 3-30,* Command and Control for Joint Air Operations.

## 3. Command and Control Options

a. Simplicity and clarity of command relationships are paramount to the effective and efficient use of engineer forces due to the varied nature of engineer tasks, units, and capabilities. Engineering forces are extremely adaptable and can be tailored to any joint force organizational structure. In addition, the structure that is developed needs to be flexible enough to change as the situation warrants. Transitions between offensive, defensive, and stability operations will have a significant effect on the frequency and type of missions performed and therefore the type of engineer support required. The different authority and control options presented in this chapter are designed to take advantage of this flexibility. Most often, joint forces are organized with a combination of Service and functional component commands.

b. **Service Component Command.** Service component commanders maintain OPCON over their Service engineer forces under this organizational option (see Figure II-1). This structure maintains traditional command relationships and is best used when the JFC chooses

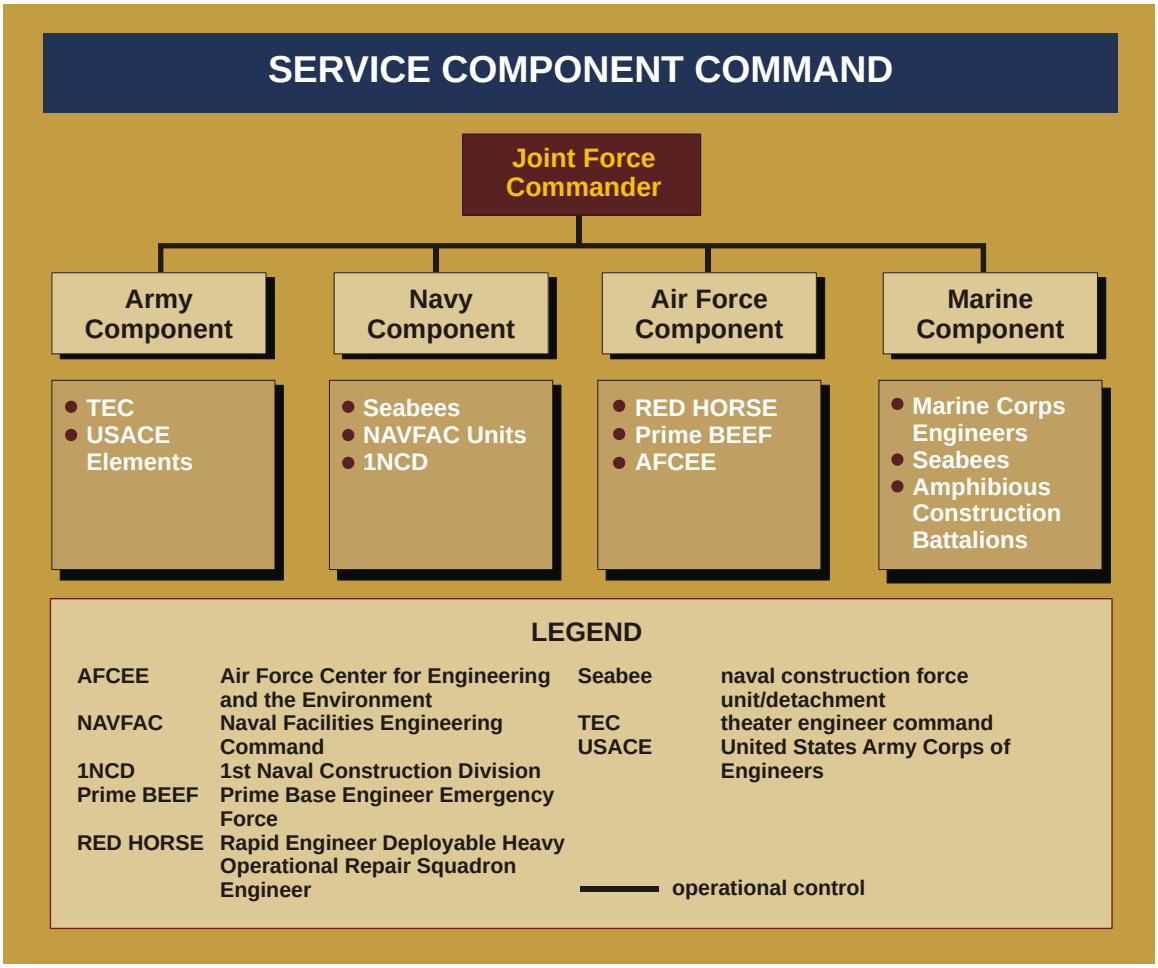



**Figure II-1. Service Component Command**

to conduct operations through Service component commanders and when engineer forces are used in direct support of Service component missions. A Service component command may be delegated OPCON or tactical control (TACON) of engineer forces from another Service to accomplish the assigned mission or tasks. For example, Navy engineer forces may be placed under OPCON or TACON of the Marine component commander for general engineering support. In addition, the JFC may also establish support relationships between subordinate commanders to aid, protect, complement, or sustain another force.

c. **Functional Component Command.** The JFC may also organize using one or more functional component commands (see Figure II-2). Under this organizational option, the JFC establishes command relationships for engineer forces based on the requirement for engineer missions. The JFC is responsible for establishing the appropriate relationships between components to accomplish the required tasks. For example, Air Force or Navy engineers may be placed TACON to the joint force land component commander (JFLCC). Use of engineering forces either in direct support of or attached to a functional component commander is a viable option when providing capabilities tied directly to the functional component's mission. The functional component command will not normally be responsible for providing common logistic support (e.g., beddown construction) to the joint force. When

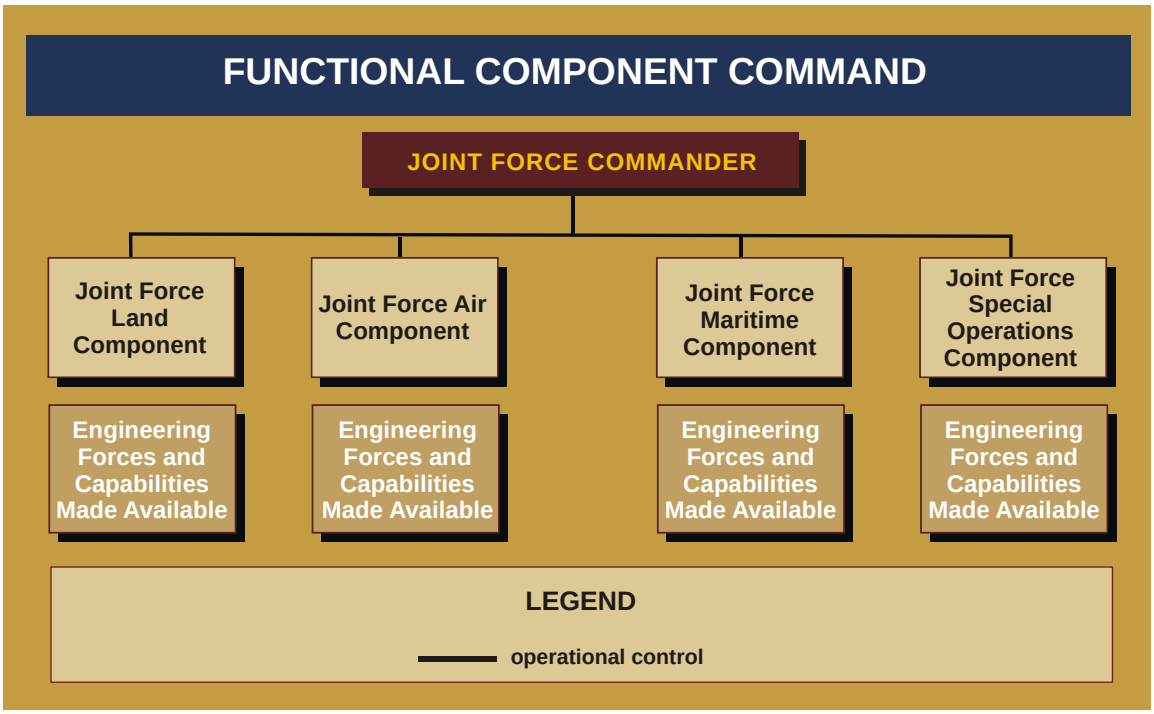



**Figure II-2. Functional Component Command**

a joint force component commander does not have adequate engineer forces assigned, the component commander will coordinate engineering support requirements through the JFC to obtain the support from other components of the JTF. There are numerous variations in organizing engineer forces under this command structure that provide significant flexibility to the joint force. The key advantage of this option is that it provides the JFC with the ability to tailor the engineer capabilities within the joint force by crossing Service component lines to best achieve mission requirements.

d. **Subordinate Joint Task Force.** Some operations, such as CS, mitigating the consequences of an incident, or foreign humanitarian assistance (FHA), are extremely engineer-intensive. In such cases, the JFC may opt to establish a subordinate JTF to control extensive engineer operations and missions. Such a JTF may be formed around an existing TEC, naval construction regiment (NCR), or RED HORSE squadron. The JFC designates the military engineer capabilities that will be made available for tasking and the appropriate command relationships. Engineer forces could be placed under OPCON, TACON, or in a supporting role, depending on the degree of control that the JFC desires to delegate to the subordinate JTF. The engineer assets attached to the subordinate JTF will normally be made up of a mix of engineer assets drawn from the entire force's engineer resources. If the subordinate JTF is to provide a common support capability, it will require a specific delegation of directive authority from the CCDR for the common support capability that is to be provided.

*For further guidance on the organization of joint forces, refer to JP 3-0,* Joint Operations.

## 4. Command and Control Considerations

a. **Service Engineer Considerations.** Service engineering forces must be flexible to allow the JFC to organize them in the most effective manner. A CCDR may delegate responsibility for engineering support to the Service component having a preponderance of forces and expertise. In addition to or coinciding with component missions specified by the CCDR or subordinate JFC, each Service component may provide engineering support to the other components or multinational partners, as required or directed. While deployed, engineers from all Services may use reachback from the field to USACE, NAVFAC, AFCEE, and Air Force Civil Engineer Support Agency (AFCESA) for technical support, assistance in planning and designing infrastructure, environmental assistance, real estate acquisition, geospatial engineering, and contract construction. Prior coordination with these organizations to establish support procedures is critical.

*A description of Service engineer organization and capabilities is provided in Appendix B, "Service Engineer Organizations and Capabilities."*

b. **Establishment of a Joint Task Force**

(1) **Deliberate Planning.** The delegation of functions from the CCDR to a subordinate JFC is a requirement that is critical to the success of joint operations. The subordinate JFC should have the benefit of any deliberate planning conducted by the CCDR's staff and associated planning elements for the conduct of contemplated operations. The requisite information and expertise should be embedded within the JTF staff as early as possible so that the JFC can plan and execute mission requirements, including engineering support operations that will serve to prepare the joint operations area (JOA).

(2) **Crisis Action Planning (CAP).** When CAP is initiated for an operation, effective interaction between the combatant command (CCMD) and the JTF staff is essential to optimize information flow and coordinate planning activities. To enhance the planning process, the JFC may form a planning group that will include members of the CCDR's staff, members of the JTF staff, and representatives of associated planning and advisory elements. Composition of the group will depend on the activities being conducted and will include engineer participation as required.

*For further guidance on the CAP process, refer to JP 5-0,* Joint Operation Planning.

(3) **Joint Enabling Capabilities Command (JECC).** The JECC consists of capability modules that can be tailored to specific needs. It includes seven deployable modules of joint functional area expertise including operations, plans, knowledge management and information superiority, and logistics. The command is responsible for the current employment, management, and development of existing joint enabling capabilities as well as identifying new requirements and developing new capabilities for joint force commanders worldwide.

(4) **The Deployable Joint Task Force Augmentation Cell (DJTFAC).** The DJTFAC is another planning and C2 augmentation capability that the CCDR may establish. The DJTFAC is a multi-Service, multi-disciplined augmentation cell comprised of members

of the CCDR's staff and components' staff. Members can assist the JTF headquarters (HQ) in planning and organizing for a contingency, particularly in the early stages of crisis response. Composition of the DJTFAC will include engineer participation, as required, to enhance the planning and execution support activities of the JTF engineer staff. As the full JTF staff is formed and becomes operational, the CCDR's staff, through the DJTFAC, may transfer applicable functions to the JTF staff that are necessary for fulfillment of operational requirements.

c. **Communications System Support for Engineer Forces.** Supporting engineer forces with an effective communications system for C2 is an essential consideration for the JFC and the joint force engineer. Engineer forces have organic communications capabilities within Service channels up to the component HQ. When operating in a joint environment, engineer units retain organic communications capabilities, but may also require additional communications system support from the Service component, other Service components, or the joint force. Specific requirements will depend on the C2 arrangement of the engineer forces within the joint force, mission tasking, and geographic location in the JOA. Tactical communications can be a challenge between the Services, and options must be considered by the joint engineer initially during the planning phase. The following description of capabilities may be helpful in developing the communications for engineer forces supporting the joint force:

(1) **Army.** Army engineers have sufficient capabilities to perform internal communications to communicate to higher, subordinate, and adjacent HQ, as part of a Service component command. Army engineers at the BCT level employ secure voice systems over frequency modulation, ultrahigh frequency (UHF), very high frequency (VHF), and tactical satellite, and can communicate by Nonsecure Internet Protocol Router Network (NIPRNET) and SECRET Internet Protocol Router Network (SIPRNET) (including Voice over Internet Protocol) using systems organic to the BCT. In addition to those capabilities, the Army Battle Command System is used at the tactical level for extended range of communications and commanders' situational awareness. When employed with an intermediate tactical or higher HQ, such as a Corps or Service Component HQ, Army engineers can access the Global Command and Control System (GCCS) and the Global Combat Support System (GCSS) for access to the Joint Operation Planning and Execution System (JOPES), joint engineer planning and execution system (JEPES), and other information management tools. Many Army Engineer units possess the TeleEngineering Toolkit (TETK), a secure video teleconferencing communications device with a valuable suite of analysis tools, to reach back to the USACE Reachback Operations Center to leverage technical engineering capabilities across USACE.

(2) **Navy.** 1NCD has sufficient combat information systems resources to satisfy internal requirements. Its communications detachment is responsible for the installation, operation, and maintenance of single- and multi-channel radio, tactical telephone, and satellite systems. However, access is required to pertinent supported unit local area networks and wide area networks. Access is also required to the GCCS, Joint Worldwide Intelligence Communications System, SIPRNET, and NIPRNET for all operations. The NCR has adequate organic communications capabilities to install, operate, and maintain communications systems for internal and limited external communications requirements,

including secure tactical voice, video, and data links using high frequency (HF), VHF, super-high frequency (SHF), UHF, and military and commercial satellite, telephone, wire, wireless, and fiber optic connectivity. The unit requires bandwidth allocation by the supported unit to use satellite communications (SATCOM) equipment. Communications support is provided by a small permanent staff of information system technicians (ITs), electronics technicians (ETs), and construction electricians.

(a) The naval mobile construction battalion (NMCB) possesses sufficient organic communications capabilities to install, operate, and maintain communications systems for internal and limited external communications requirements including secure tactical voice, video, and data links using HF, VHF, SHF, and UHF, and military and commercial satellite, telephone, wire, wireless, and fiber optic connectivity. The unit requires bandwidth allocation by the supported unit to use SATCOM equipment. Communications support is provided by a small permanent staff of ITs, ETs, and construction electricians. A communications platoon organized with trained personnel from across the battalion is a secondary function that is stood up as required to establish the communications infrastructure and to meet mission requirements. Other unit capabilities are degraded when the communications platoon stands up.

(b) The construction battalion maintenance unit (CBMU) possesses sufficient organic communications capabilities to install, operate, and maintain communications systems for internal and limited external communications requirements including secure tactical voice and limited data links using HF, VHF, telephone, and wire assets. The CBMU requires tactical data network (TDN) support from its parent NCR or supported command. Communications support is provided by the communications officer and a small permanent staff of ITs, ETs, and construction electricians. CBMU detachments only have sufficient organic communications capability to provide internal and external communications including tactical, secure voice, and limited data systems.

(c) The underwater construction team (UCT) has both conventional and underwater communications systems capabilities in order to support diving operations. It possesses sufficient organic communications capabilities to install, operate, and maintain communications systems for internal and limited external reachback communications requirements, including secure voice and data links through HF, VHF, and UHF using military and commercial satellite, telephone, wire, wireless, and fiber optic connectivity. The unit requires bandwidth location by the supported unit to use SATCOM equipment. Detachments have limited TDN capability at the workgroup level without pulling network services from a third party. The UCT does not have stand alone TDN assets. Communications support is provided by a small permanent staff of ITs, ETs, and construction electricians. UCT members are only trained as basic communications equipment operators and support technicians. Each detachment has an IT petty officer assigned to it that operates the detachment's communications equipment.

(d) The amphibious construction battalion (PHIBCB) possesses sufficient organic communications capabilities to install, operate, and maintain communications systems for internal and limited external communications requirements. These requirements include voice, video, and data links using HF, VHF, SHF, UHF, and military and

commercial satellite, telephone, wire, wireless, and fiber optic connectivity. The unit requires bandwidth allocation by the supported unit to use SATCOM equipment. Communications support is provided by a small permanent staff of ITs, ETs, and construction electricians. A communications platoon organized with trained personnel from across the battalion is a secondary function that is stood up as required to establish the communications infrastructure and to meet mission requirements. Other unit capabilities are degraded when the communications platoon stands up.

(3) **Marine Corps.** Marine Corps engineers have the minimum required capability to perform internal communications operations and to communicate with subordinate, adjacent, and higher HQ at the division, Marine logistics group, Marine aircraft wing, and below when in a non-contingency or contingency status. Marine Corps engineer units may rely on higher HQ capabilities or request additional C2 assets during operations, particularly when subordinate units support multiple task-organized units. With appropriate augmentation, Marine Corps engineer units can maintain voice communications with subordinate units and higher authority by secure telephone, VHF, HF, and limited UHF and transmit data and achieve limited NIPRNET and SIPRNET access via UHF satellite communications. When employed as part of a MEF or a MEF-sized MAGTF, engineer units have access to GCCS-Marine Corps via the MEF operations section. When operating in a joint force, Marine Corps engineers rely on organic communications capability but also require additional support.

(4) **Air Force.** Air Force engineer forces' communications requirements beyond unit level capability are provided by deployed installation communications elements. These communications elements are embedded in the base information infrastructure (BII). Developed as part of the Air Force's expeditionary air and space expeditionary force concept, BII packages are scalable, modular communications support packages that offer deployed personnel access to such standard services as secure and unsecured telephones and facsimiles, NIPRNET, SIPRNET, and land mobile radio repeaters. When operating out of an Air Force, joint, or combined operations center, Air Force engineer forces can gain access to a wide range of mission support systems. These systems provide linkage to the GCCS, JOPES, GCSS (JEPES), and other intelligence, surveillance, and reconnaissance (ISR) systems necessary for mission planning.

## 5. Engineer Organization Considerations

a. **Engineer Staff Organization.** The JFC should establish an engineer staff for engineering matters. When a functional component command employs forces from more than one Service, the staff should reflect each Service represented. A notional engineer staff is depicted in Figure II-3, and key engineer staff functions are noted in Figure II-4.

(1) **Plans.** The engineer staff participates in the planning process through representation on the joint planning staff (e.g., plans directorate). The engineer staff addresses all potential engineer requirements during the planning process.

(2) **Operations.** The engineer staff monitors the deployment, employment, mission, and redeployment status of major subordinate Service component engineer forces.

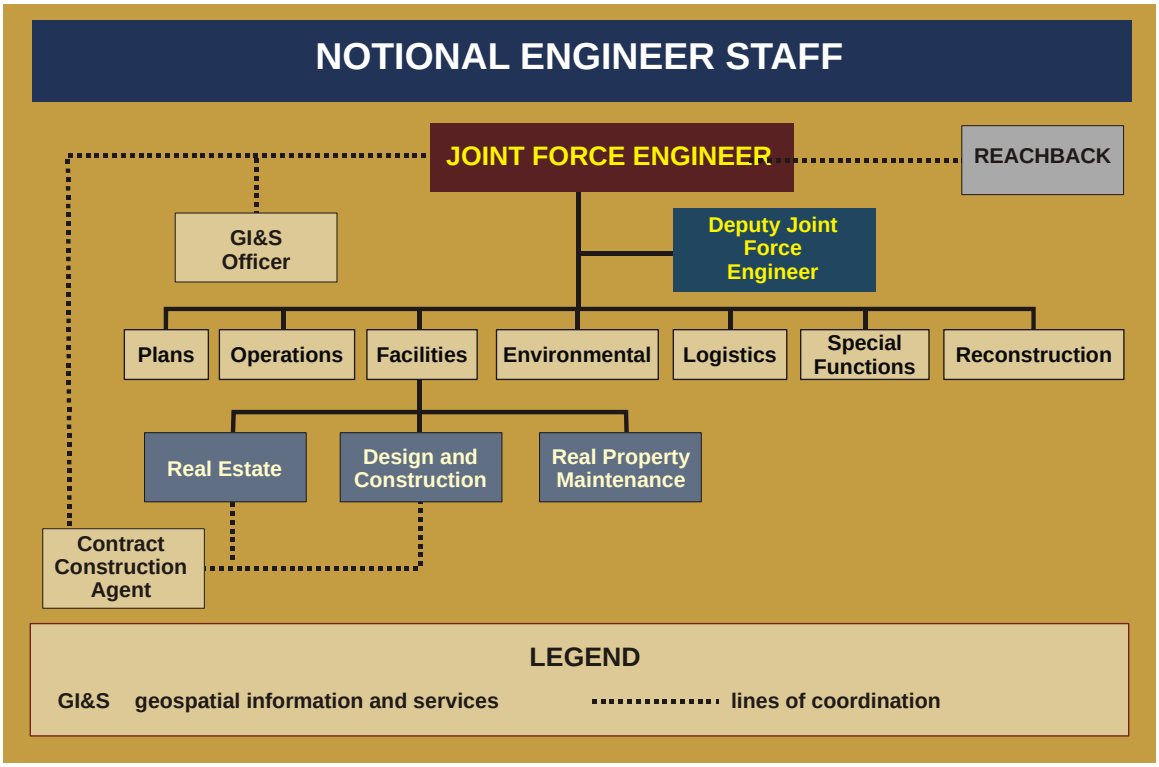



**Figure II-3. Notional Engineer Staff**

The engineer staff works directly with the operations staff (e.g., representation in the joint operations center [JOC]). It provides engineer representation on the joint targeting coordination board (JTCB) to prevent destruction of key infrastructure essential to future operations, integrates environmental considerations, and provides guidance on emplacing obstacles, barriers, and mines. The engineer staff is also represented on numerous other boards, bureaus, centers, cells, and working groups as determined by the joint force's standard operating procedure (SOP).

*For further guidance on the organization of the JFC's staff, see JP 3-0,* Joint Operations; *JP 3-33,* Joint Task Force Headquarters; *and JP 3-31,* Command and Control for Land Operations.

(3) **Facilities.** The section has the responsibility for oversight of base establishment and development, real estate contracting and management, facility construction, and operation and maintenance (O&M). Key considerations should include: guidance on base master planning, construction policies, priorities, and standards, setting repair or replace policy for real property, and maintenance support contracts.

(4) **Environmental.** Key tasks should include providing advice on applicable laws and actions, mitigation and actions for mishaps, coordination for completion of all environmental baseline surveys (EBSs), and providing input to annexes and appendices with significant environmental considerations.

## ENGINEER STAFF FUNCTIONS

- **Develops and coordinates combat engineering, general engineering, and geospatial engineering requirements for the joint force.**
- **Acts as the intermediary, facilitator, and coordinator between joint task force elements, including nonmilitary elements, requesting engineering services. Receives guidance and reports actions to joint civil-military engineering board (JCMEB) if established.**
- **Develops and coordinates tasks for component engineer forces.**
- **Coordinates and facilitates the joint facilities utilization board (JFUB), JCMEB, and joint environmental management board. Integrates actions from these boards, assigns tasking based on board recommendations, and monitors completion.**
- **Screens, validates, and prioritizes all engineering projects and mission assignments.**
- **Plans, programs, and controls facility utilization. Receives guidance and reports actions to JFUB if established.**
- **Prepares logistic reports on engineer resources using the Joint Operation Planning and Execution System.**
- **Develops the engineer support plan.**
- **Plans and coordinates the distribution of construction and barrier materials and engineer munitions based on established priorities.**
- **Functions as the primary interface between the joint force, host nation, and contingency contractors, and other theater construction organizations.**
- **Establishes the statement of work, development of contracts, and employment of services.**
- **Plans and provides guidance for environmental considerations that impact joint operations.**
- **Serves as the program manager for all engineer-related functions.**

**Figure II-4. Engineer Staff Functions**

(5) **Logistics.** Key tasks of the section should include monitoring Class IV materials and Class V ammunition and the coordination of service support via LOGCAP, GCSC program, and AFCAP. Oversight of operational needs statements and distribution of engineer equipment also is executed by the logistics section.

(6) **Reconstruction.** If this section is established, it is responsible for coordination and integration of outside the wire construction projects. It also serves as executive secretary of the joint civil-military engineering board (JCMEB) and acts as the key engineer linkage to the assessment working groups/boards.

(7) **Special Functions.** The joint force engineer may have staff responsibility for the following areas dependent on Service capabilities. These following functions reside within the engineer capability of at least one Service:

(a) Geospatial engineering support.

(b) Intelligence. Throughout the intelligence process, the engineer staff assists the intelligence directorate of a joint staff (J-2) in coordinating intelligence requirements and providing geospatial products and services to support operations. The engineer staff provides technical assistance in identifying, prioritizing, and validating engineer intelligence needs and assists in coordinating collection of engineer information. The joint force engineer, joint force J-2, GI&S officer, and joint force legal staffs should coordinate for the use of intelligence from both classified and open sources in addressing environmental considerations and considering potential collateral damage associated with targeting.

(c) EOD.

(d) Fire and emergency services.

(e) Support to CBRN and monitoring, reporting, decontamination, and recovery operations within Service limitations.

b. **Joint Manning Document (JMD).** The joint engineer staff JMD should reflect representation from each Service. When possible, a memorandum of understanding or equivalent should be developed to ensure effective wartime augmentation with Service and Reserve Component (RC) organizations. Staff engineers should work closely with civilian and multinational partner organizations to develop wartime organization augmentation manning. The JMD should be built based on analysis of the mission and the engineer staff capabilities required to support the operation.

c. **Staff Engineer Training.** The Services and CCMDs should ensure engineer personnel augmenting the JFC's staff are qualified to fill JFC staff billets, trained in joint operations, or with multi-Service deployment experience. The joint force engineer must clearly identify his personnel requirements and closely coordinate with the manpower and personnel directorate of the joint force to ensure that qualified personnel are requested. Several opportunities also exist for individual augmentee training to help prepare personnel for assignment to the JTF.

d. **Engineer Assignment.** Careful planning for the assignment of engineers to the joint force engineer allows the joint force engineer to more effectively matrix limited engineer assets throughout directorates and to boards, bureaus, centers, cells, and working groups. Other advantages of centralized engineer assignment include:

(1) Better situational awareness for the joint force engineer.

(2) More efficient utilization of engineer resources.

(3) Better engineers focus on engineer issues.

(4) Best engineer skills aligned with engineer tasks irrespective of Service affiliation.

e. **Engineer Placement Options.** The CCDR and subordinate JFC will organize their staffs to carry out their respective assigned duties and responsibilities. Based on mission-specific requirements, the engineer staff may be placed within the operations directorate of a joint staff (J-3), logistics directorate of a joint staff (J-4), or organized as a separate staff to the JFC. The JFC may choose to organize geospatial engineers or geospatial intelligence (GEOINT) officers within the J-2. Regardless of the option or combination of options utilized, the requirement for the staff engineer remains, as well as the need for constant communication, liaison, and coordination throughout the entire staff.

(1) **Operations Directorate Staff.** When the focus of engineer effort predominantly supports operational movement and maneuver, fires, and force protection, the JFC should consider placing the engineer staff as a cell within the J-3. This option will provide the fastest exchange of information during CAP and optimize the use of supporting capabilities.

(2) **Logistics Directorate Staff.** When the engineer effort predominantly supports sustainment of the joint force, the JFC should consider placing the engineer staff as a cell within the J-4. This option facilitates planning and coordination among engineers and logisticians for construction and repair of LOCs, main supply routes (MSRs), airfields, other logistic facilities, and infrastructure in general.

(3) **Separate Engineer Staff.** When the engineer effort is a significant focus or a key element of the joint operation, or where the engineer effort is primarily combat support and combat service support (CSS) operations, the JFC should consider establishing a separate engineer staff element that reports directly to the JFC. This option provides the greatest flexibility in orchestrating diverse engineer operations. The joint force commander's vision of the integration of engineer capabilities into the campaign drives the choice between a Joint Engineer Command versus a Joint Engineer Staff.

(4) **Separate Engineer Command.** (Engineer commander could be dual-hatted as the JFC staff engineer). When the engineer effort is a significant focus or a key element of the joint operation, and there are a significant number of theater level engineer requirements which can only be accomplished with high-demand engineer assets, the JFC may consider establishing a separate engineer command that reports directly to the JFC. Establishment of this command will require GCC approval based on the command relationship the JFC has with the other Service forces. This option provides maximum flexibility in synchronizing diverse engineer operations and provides the greatest unity of effort through visibility of engineer capabilities, requirements, and responsibilities throughout the staff. Figure II-5 shows the Joint Force Engineer Command option referred to in the vignette.

**The Joint Force Engineer Command (JFEC) was established in Afghanistan in October 2009. The JFEC integrates and synchronizes engineering, planning, and operations across the wide range of engineer operations within the Combined Joint Area of Operations Afghanistan for commander, US Forces–Afghanistan (USFOR-A) in coordination with and in support of USFOR-A to ensure engineer forces are trained, equipped, and ready to perform their mission. The JFEC commander is dual-hatted as the USFOR-A staff engineer.**

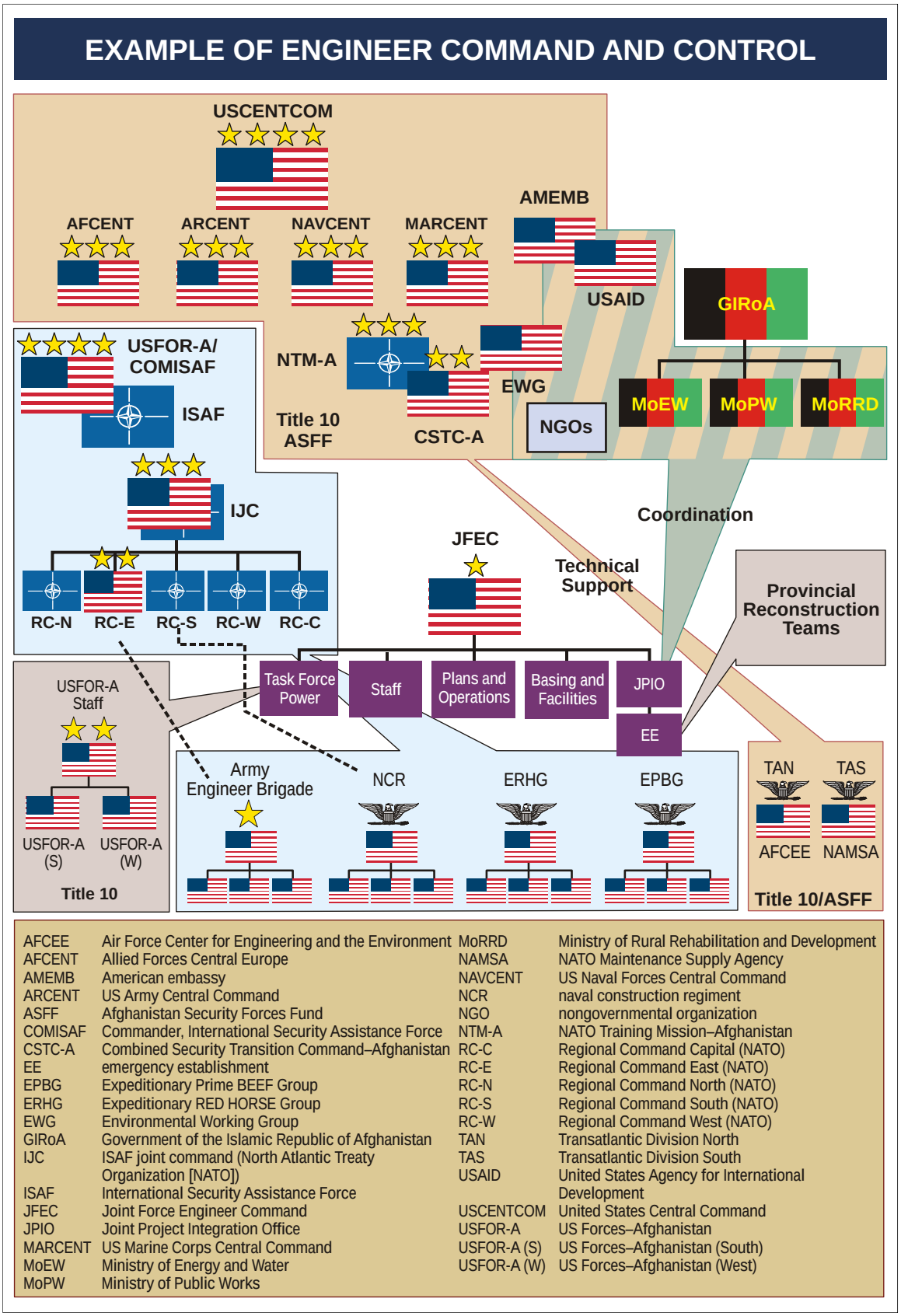
## 6. Engineer Boards, Bureaus, Centers, Cells, and Working Groups

a. **Engineer Specific Boards and Cells.** A JFC may establish engineer boards or cells to manage engineer-intensive activities and to ensure an effective use of resources to meet mission requirements. Engineer boards establish policies, procedures, priorities, and oversight to coordinate efficient use of engineer resources. Engineer boards serve as the forum to address issues outside of daily operations and to ensure coordination at the leadership level and across staff directorates. The joint force engineer and staff will carry out responsibilities of the engineer-specific boards until the boards are formed. An important distinction between a board and a working group is that a board is usually a decision-making body. Working groups conduct staff coordination at the action officer level and prepare materials for decisions to be made at a board. Cells within the JTF are a group of personnel with specific skills who are listed together on the HQ JMD to accomplish key functions. It is important for the Services and components to be represented on the engineer boards to facilitate vertical and horizontal integration that will allow the joint force engineer to capitalize on the advantages of joint capabilities. Collaborative tools allow components to participate in boards without having to physically be present at the joint force HQ. The joint force engineer is responsible for the following boards:

(1) **Joint Civil-Military Engineer Board.** The JCMEB provides overall direction for civil-military construction and engineering requirements in the theater or JOA. The JCMEB is a temporary board, activated by the GCC or subordinate JFC and staffed by personnel from the components and agencies or activities. It recommends policies, procedures, priorities, and overall direction for civil-military construction and engineering requirements in the theater or JOA. The JCMEB evaluates and prioritizes engineer resource utilization to ensure the JFC's operational requirements are supported. The JCMEB is an integral link to the civil-military coordination board (CMCB); the CMCB consists of JTF staff representation to coordinate CMO support. Figure II-6 depicts some typical inputs and outputs for the board as well as primary membership and outside stakeholders.

*For further details on CMCBs, refer to JP 3-08,* Interorganizational Coordination During Joint Operations.

(2) **Joint Facilities Utilization Board (JFUB).** The JFC may establish a JFUB to assist in managing Service component use of real estate and existing facilities. The JFUB is a temporary board chaired by the CCMD or subordinate joint force engineer, with members from the joint force staff, components, and any other required special activities (e.g., legal,




| | | | |
|---|---|---|---|
| AFCEE | Air Force Center for Engineering and the Environment | MoRRD | Ministry of Rural Rehabilitation and Development |
| AFCENT | Allied Forces Central Europe | NAMSA | NATO Maintenance Supply Agency |
| AMEMB | American embassy | NAVCENT | US Naval Forces Central Command |
| ARCENT | US Army Central Command | NCR | naval construction regiment |
| ASFF | Afghanistan Security Forces Fund | NGO | nongovernmental organization |
| COMISAF | Commander, International Security Assistance Force | NTM-A | NATO Training Mission–Afghanistan |
| CSTC-A | Combined Security Transition Command–Afghanistan | RC-C | Regional Command Capital (NATO) |
| EE | emergency establishment | RC-E | Regional Command East (NATO) |
| EPBG | Expeditionary Prime BEEF Group | RC-N | Regional Command North (NATO) |
| ERHG | Expeditionary RED HORSE Group | RC-S | Regional Command South (NATO) |
| EWG | Environmental Working Group | RC-W | Regional Command West (NATO) |
| GIRoA | Government of the Islamic Republic of Afghanistan | TAN | Transatlantic Division North |
| IJC | ISAF joint command (North Atlantic Treaty Organization [NATO]) | TAS | Transatlantic Division South |
| ISAF | International Security Assistance Force | USAID | United States Agency for International Development |
| JFEC | Joint Force Engineer Command | USCENTCOM | United States Central Command |
| JPIO | Joint Project Integration Office | USFOR-A | US Forces–Afghanistan |
| MARCENT | US Marine Corps Central Command | USFOR-A (S) | US Forces–Afghanistan (South) |
| MoEW | Ministry of Energy and Water | USFOR-A (W) | US Forces–Afghanistan (West) |
| MoPW | Ministry of Public Works | | |

**Figure II-5. Example of Engineer Command and Control**

**During Operation ENDURING FREEDOM, the joint civil-military engineering board (JCMEB) has played a key role. The United States Central Command (USCENTCOM) JCMEB is chaired by USCENTCOM J4-Engineer and includes voting members from J5-Security Cooperation, J5-Civil Military Operations, J3-Development Support Division, J3-P-CASA, J2-JIC, J4-Plans, J4-Contracting, J8-FM, and the staff judge advocate. Attendees include US Army Corps of Engineers liaison officer, CCJS [Combatant Command Joint Security], CCPA [Combatant Command Public Affairs], political advisor, and United States liaison officer/Office of Military Cooperation. It provides a critical node in the command and control architecture of engineering forces by facilitating the prioritization of construction projects and provides the joint force commander the ability to match limited contract execution resources to requirements in the execution of the whole of government strategy for Afghanistan. The JCMEB allows for the dovetailing of interagency priorities with the operational commander's priorities and requirements. This results in the optimal concentration of engineering capabilities in a complex multi-player environment to achieve the unity of effort necessary for mission success.**

**Various Sources**

force protection, comptroller, contracting, and civil affairs [CA]). If the JFC decides that all engineer-related decisions will be made at the JCMEB, then the JFUB functions as a working group to forward recommendations for decision to the JCMEB. The JFUB evaluates and reconciles component requests for real estate, use of existing facilities, inter-Service support, and construction to ensure compliance with priorities established by the JFC. It serves as the primary coordination body within the JTF for approving construction projects within the wire to support troop beddown and mission requirements. For long-standing JTFs, the JFUB may issue master planning guidance and develop the JTF MILCON program to support enduring base operations. The joint force engineer handles most of the JFUB's work with assistance from other selected board members. Unresolved issues may be forwarded to the JCMEB.

(3) **Joint Environmental Management Board (JEMB).** The CCDR or subordinate JFC may establish a JEMB to assist in managing environmental requirements. The JEMB is a temporary board, chaired by the CCMD or subordinate joint force engineer, with members from the joint force staff, components, and any other required special activities (e.g., legal, medical, and CA). The board establishes policies, procedures, priorities, and the overall direction for environmental management requirements in a JOA. The JEMB will coordinate its activities with the CCMD or subordinate joint force engineering staff. The JEMB also provides guidance on development of annex L (Environmental Considerations) of the OPLAN, and, if appropriate, assumes responsibility for preparation and appropriate updates of this annex.

*For additional information on environmental considerations, refer to Appendix D, "Environmental Considerations."*

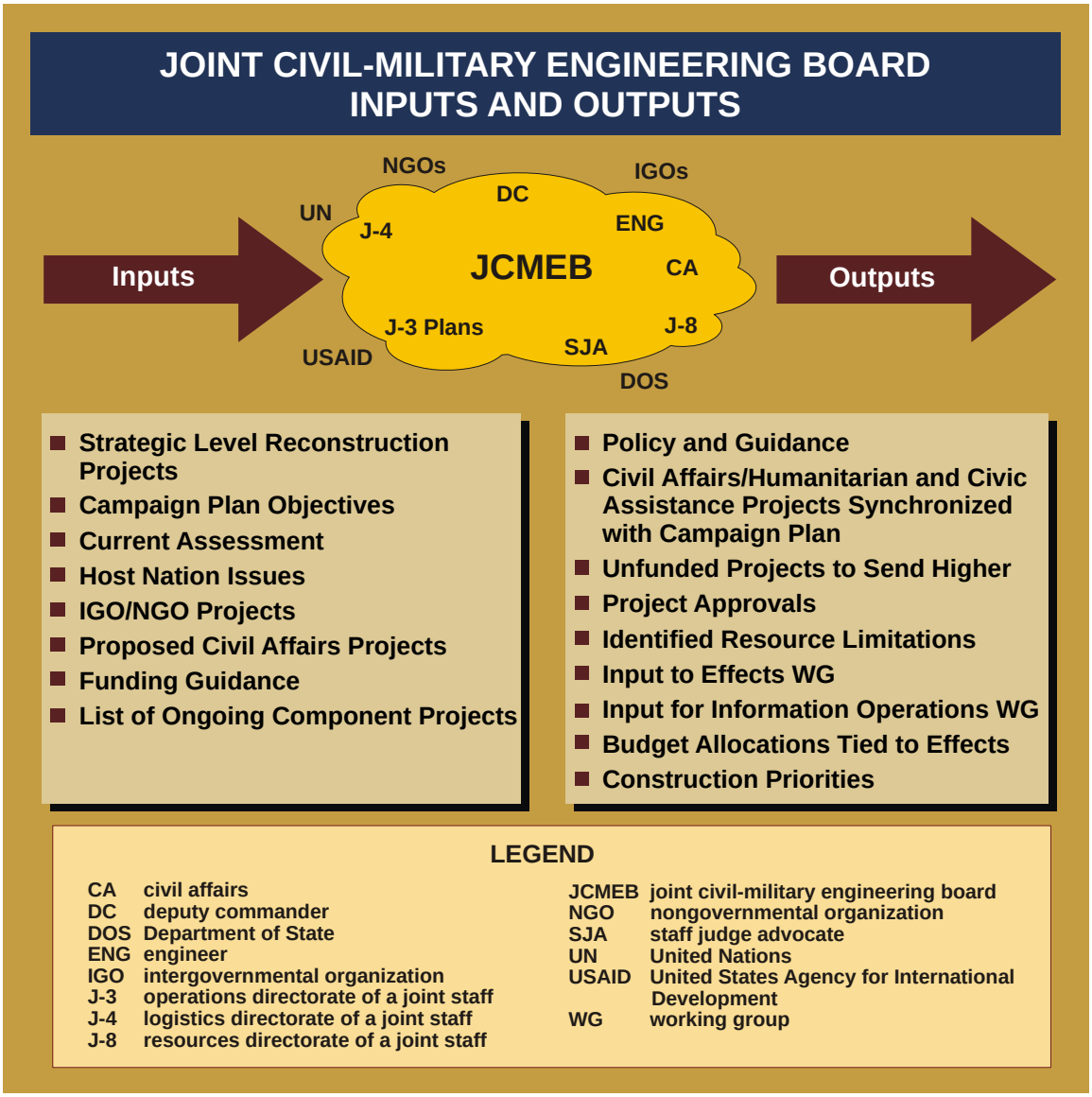



**Figure II-6. Joint Civil-Military Engineering Board Inputs and Outputs**

(4) **Explosive Hazards Coordination Cell (EHCC).** The JFC may establish the EHCC to predict, track, distribute information on, and mitigate EHs within the theater that affect force application, focused logistics, protection, and awareness of the operational environment. The EHCC should establish and maintain an EH database, conduct pattern analysis, investigate mine and improvised explosive device (IED) strikes, and track unexploded ordnance (UXO) hazard areas. The cell provides technical advice on the mitigation of EHs, including the development of tactics, techniques, and procedures (TTP), and provides training updates to field units. The EHCC coordinates EH teams. Key capabilities of the EHCC include:

(a) Establishing, maintaining, and sharing the EH tracking database within the joint force.

(b) Ensuring accuracy of EH information.

(c) Coordinating site evaluations or strike incident investigations.

(d) Conducting unit EH training.

(e) Assisting ISR planners with EH pattern analysis and intelligence collection management.

(f) Providing updated TTP and guidance for route and area clearance operations.

b. **Other Boards, Bureaus, Centers, Cells, and Working Groups.** Engineer participation in a number of other boards, bureaus, centers, cells, and working groups is essential to joint mission accomplishment. Compared to the formal, non-standing nature of the boards, centers are standing organizations typically operating 24 hours, and cells are functionally oriented groups meeting on a regular basis. Engineer staff participation and support to these organizations will be significant, but the resultant exchange of relevant information is vital in maintaining situational awareness and facilitating the horizontal staff integration of the joint force engineer. Joint force engineer participation in the following boards, centers, and cells include:

(1) **Planning Groups.** Engineers are represented on the planning group to enhance the formulation of joint force plans. The engineer planner ensures joint force plans are supportable from an engineer perspective. Support by the rest of the joint force engineer cell with products facilitates engineer input and impact into the planning cycle. The engineer planner should leverage the rest of the engineer staff to provide products throughout the planning process. The key for the engineer is to ensure representation and establish hand-off procedures for products developed within all three planning horizons within the joint force—future plans, future operations, and current operations.

(2) **Joint Intelligence Preparation of the Operational Environment (JIPOE) Coordination Cell.** Representation in the JIPOE coordination cell provides engineers with access to military intelligence related to infrastructure, hydrography, and other geospatial engineering and GEOINT topics. It also provides a venue in which engineers can directly support the JIPOE effort.

(3) **Joint Operations Center.** The JOC plans, monitors, and guides the execution of the JFC's decisions. The joint force engineer maintains a presence in or close contact with this center. This is the engineer's link to current operations, and the engineer watch officer is responsible for keeping the rest of the engineer staff situationally aware.

(4) **Joint Targeting Coordination Board.** On the JTCB, the joint force engineer contributes to the planning and integration of minefields into the barrier plan and participates in target coordination to ensure critical infrastructure preservation. The joint force engineer should assure that implications on stability operations are considered during the targeting process for decisive operations. Engineer expertise can enable the JFC to achieve objectives

**ENGINEER BRIGADE IN OPERATION IRAQI FREEDOM**

**Since the liberation of Iraq and end of major combat operations, the 130th Engineer Brigade has contributed to Operation IRAQI FREEDOM by completing more than 3,000 missions in support of Combined Joint Task Force (CJTF)-7, major subordinate commands, Coalition Provincial Authority (CPA), and the Iraqis, including the following highlights:**

- **Provided combat, construction, topographic, design, prime power, infrastructure assessment, bridging, riverine, firefighting, and diving support throughout Iraq.**
- **Executed the original Task Force Neighborhood missions in Baghdad.**
- **Organized and stood up the C-7 for CJTF-7.**
- **Developed the prisoner holding areas, interrogation facilities, helipad, and coalition base camp for the Baghdad Central Confinement Facility.**
- **Constructed the largest CJTF-7 base camp (Logistics Support Area Anaconda) and repaired the heavily damaged airfield by placing more than 8,000 cubic meters of concrete.**
- **Provided construction support to both the Office for Reconstruction and Humanitarian Assistance for Iraq and CPA.**
- **Installed a 20-megawatt power plant at the Basara oil refinery.**
- **Worked with Iraqis to repair high-tension electrical power lines in support of CPA.**
- **Upgraded a 100-kilometer stretch of Highway 1 in southern Iraq.**
- **Reduced hundreds of kilometers of berms and fighting positions.**
- **Hauled tons of captured enemy ammunition to secure sites for destruction.**
- **Secured and destroyed dozens of surface-to-air missiles.**
- **Executed more than 100 humanitarian and civic action projects throughout Iraq, to include the renovation of schools, health clinics, playgrounds, and sports facilities.**
- **Managed nearly $900 million worth of contractor or contractor-equivalent construction.**
- **Trained forces on the South African Interim Vehicle-Mounted Mine-Detection System (IVMMDS).**
- **Developed Task Force Right of Way, using the IVMMDS, sappers, and earthmoving equipment to detect and neutralize improvised explosive devices along main supply routes.**
- **Trained forces for the new Iraqi Civil Defense Corps.**

**SOURCE: *Engineer,* October-December 2003**

with minimal long-term infrastructure damage and protection of significant cultural and natural resources in the OA.

(5) **Information Operations Cell.** In the information operations cell, the joint force engineer coordinates with other staff elements on the preservation of critical adversary facilities and infrastructure. During stability operations, engineer reconstruction efforts focused on the HN can help support the commander's strategic communication plan.

(6) **Civil-Military Operations Center (CMOC).** The CMOC provides the joint force engineer a meeting place to coordinate nonmilitary activities with other agencies, departments, organizations, and the HN. If formed, the CMOC is the focal point where engineers coordinate any support provided by the joint force to IGOs and NGOs. Outputs from the CMOC (e.g., lists of IGO and NGO projects) are useful input into the JCMEB and help facilitate unity of effort.

(7) **Joint Logistics Operations Center (JLOC).** Engineers are represented at JLOC to respond to information received from supporting command, Service components, and external sources for presentation to the CCDR.

(8) **Operational Protection Working Group (PWG).** The PWG will often generate engineer requirements as they develop or modify JTF force protection policy and guidance. Examples include hardening of key facilities and modifications to entry control points.

(9) **Special Purpose Boards, Centers, Working Groups, and Cells.** Through necessity, new boards, centers, and cells may be formed and require engineer participation. For example, an IED working group may be required as a central clearinghouse for developing solutions to an IED problem within the JOA. The engineer should also have representation at the protection and assessment working groups/boards, if established. Engineer construction efforts, whether inside or outside the wire, are closely tied to the issues addressed at these two working groups/boards.

c. **Contingency Engineering Management Organizations**

(1) **Augmenting the Joint Force Staff.** Experience in contingency operations has emphasized the importance of timely planning and preparation in providing essential engineer support requirements to the joint force. The JFC may form a contingency engineering management organization as an option to augment the joint force staff with additional Service engineering expertise to support both deliberate planning and CAP and provide construction management in contingency and wartime operations. When established, the contingency engineering management organization is led by the joint force engineer and coordinates daily operations to ensure the delivery of engineering services to the joint force. The contingency engineering management organization also functions as a clearinghouse for engineering plans, reports, and external coordination. The contingency engineering management organization directly interfaces with component engineer staffs and the JFC.

(2) **Contingency Engineering Management Cells.** The CCDR may form a theater contingency engineering management (TCEM) cell and similar organizations, such as regional contingency engineering management (RCEM) cells or joint task force contingency engineering management (JTFCEM) cells, may be formed at subordinate levels of command. Standing organizations that may logically become the base for the creation of a TCEM are the TEC or NCR. These contingency engineering management cells should be staffed with Service component engineer personnel with expertise across the engineer functions. The TCEM, RCEM, and JTFCEM organizations support OPLAN development and the

management of contingency engineering operations. These organizations provide additional engineering capability to include planning, construction management, regional or country expertise, or specific technical support. Service components with operational forces supporting a contingency operation and DOD construction agents may provide liaison officers (LNOs) to the TCEM or RCEM organizations to enhance coordination. The TCEM and RCEM organizations can assist in plan development during peacetime and in the management of contingencies by completing the following:

(a) Analyzing the JFC's intentions for joint operations across the range of military operations, assisting in preparation of OPLANs, and formulating engineer support and a construction program based on the commander's priorities.

(b) Identifying potential shortfalls in construction capabilities, assessing associated risks, and developing related options.

(c) Developing construction policies, including construction standards, project approval procedures, recommendations for resource allocation, and reporting requirements.

(d) Reviewing and monitoring host-nation support (HNS) agreements as they pertain to the general engineering effort. This includes tracking HN construction, infrastructure, facility support capabilities, and the status of projects accomplished by HN forces or agencies.

(e) Monitoring and recommending the use of construction assets based on operational requirements and tasking for general engineering assets.

(f) Monitoring the operational status of engineering forces and influencing engineering, construction, and logistic support issues for those forces.

(g) Monitoring and influencing the management of funds for the construction effort.

(h) Advising on environmental management requirements.

## 7. Interorganizational Coordination

a. Because engineers are likely to operate with the other government agencies, foreign governments, NGOs, and IGOs in a variety of circumstances, their participation in the JFC's interagency coordination is critical. Several organizations, including the United States Agency for International Development (USAID) and USACE, work together to establish civil security and civil control, restore essential services, repair critical infrastructure, and provide humanitarian relief. Two methods for facilitating such coordination are the CMOC and the joint interagency coordination group (JIACG).

b. The Department of State (DOS) has developed the Civilian Response Corps and the Interagency Management System whose mission is to lead, coordinate, and institutionalize USG civilian capacity to prevent or prepare for post-conflict situations, and to help stabilize

**BUILDING AN UNDERSTANDING IS NECESSARY**

**"Not only do United Nations, international organizations, and nongovernmental and private voluntary organizations not understand the military organization, we likewise do not understand them. They often have exaggerated impressions as to our capabilities, and little or no understanding of our limitations and restrictions. On the other hand, the US military personnel did not realize that those organizations do not have a real chain of command as we are used to—we simply never had any idea who to listen to…and they lacked one voice that could speak for all subordinates."**

**SOURCE: Operation SUPPORT HOPE After Action Review, Headquarters, United States European Command**

and reconstruct societies in transition from conflict or civil strife so they can reach a sustainable path toward peace, democracy, and a market economy.

(1) The Civilian Response Corps consists of a Washington, DC-based interagency decision-making body, supported by a full-time interagency secretariat that performs planning and operations functions and mobilizes resources. The Civilian Response Corps is co-chaired by the regional assistant Secretary of State for the country in question, the Coordinator for Reconstruction and Stabilization, and the appropriate National Security Council senior director. It is a group of civilian federal employees who are specially trained and equipped to deploy rapidly to provide reconstruction and stabilization assistance to countries in crisis or emerging from conflict. An innovative partnership, the Civilian Response Corps leverages the necessary range of expertise and experience from eight federal departments and agencies to accomplish the USG's various reconstruction and stabilization objectives.

(2) The Interagency Management System for Reconstruction and Stabilization is designed to provide policymakers in Washington, DC, chiefs of mission, and military commanders with flexible tools to achieve:

(a) Integrated planning processes for unified USG strategic and implementation plans, including funding requests;

(b) Joint interagency field deployments; and

(c) A joint civilian operations capability including shared communications and information management.

*For further guidance on interagency coordination and support to the JTF engineering forces, refer to Chapter IV, "Engineer Functions," and JP 3-08,* Interorganizational Coordination During Joint Operations.

# CHAPTER III
## ENGINEER PLANNING

*"Planning is everything—plans are nothing."*

**Field Marshall Helmuth Graf von Moltke (1800–1891)**

### 1. Strategic, Operational, and Tactical Planning

The challenges of planning successful engineer operations within diverse theaters are vast and varied (see Figure III-1). The engineer staff must be involved in the planning of strategic, operational, and tactical operations from the initial stage of the process. Understanding how engineer actions affect air, land, and maritime operations equips the planner with the background to form a comprehensive plan of engineer actions. The omission of engineer considerations in any phase of an operation may adversely impact the entire plan.

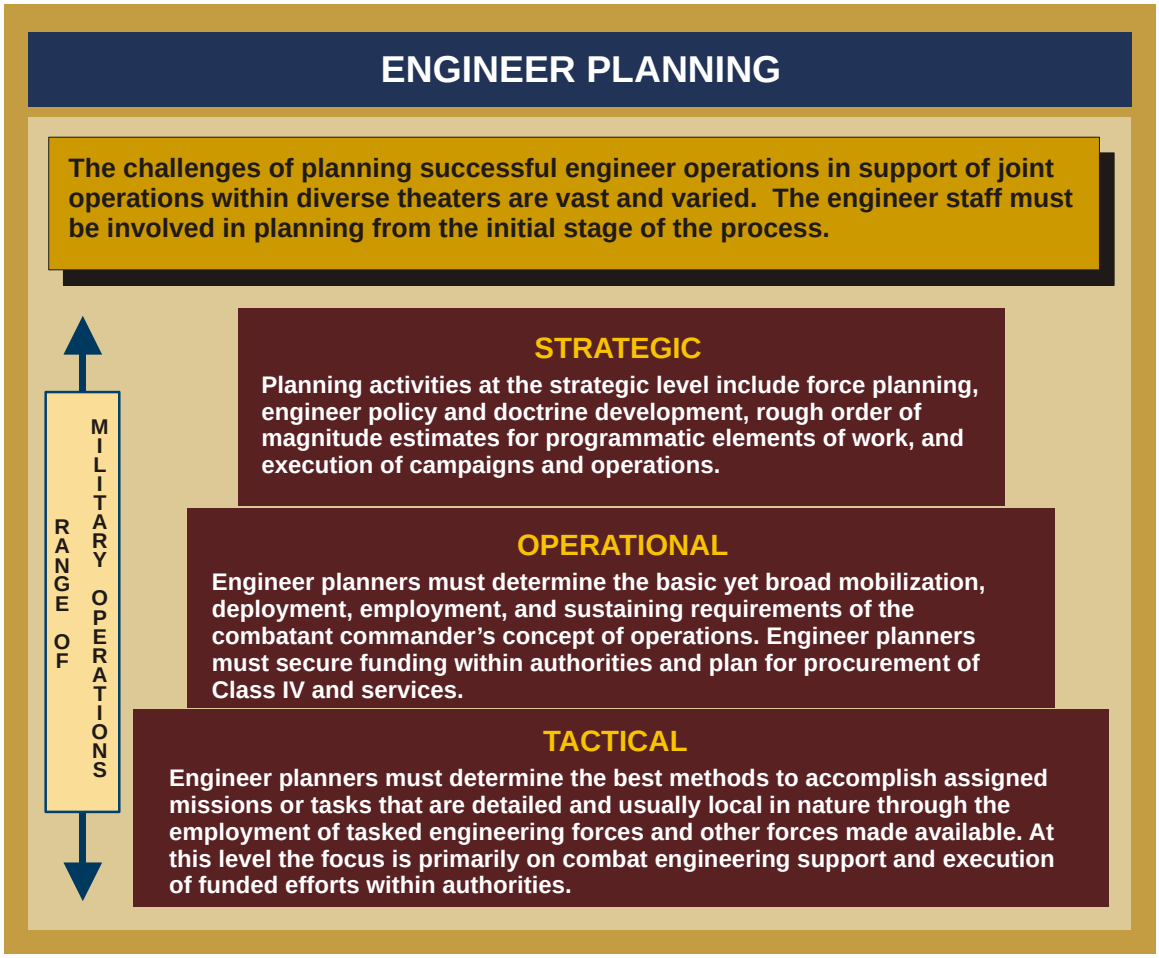



**Figure III-1. Engineer Planning**

a. **Strategic Planning.** Engineer planning activities at the strategic level include force planning, engineer policy and doctrine development, and the execution of campaigns and operations, focusing primarily on the means and capabilities to generate, mount, sustain, and recover forces. Additionally, infrastructure development is a critical aspect of enabling and sustaining force deployments and places a heavy demand on engineer requirements. Engineers at the strategic level advise on terrain, infrastructure (to include seaports of debarkation [SPODs] and aerial ports of debarkation [APODs]), force generation, priorities of engineer support, LOCs, air base and airfield operations, base camp placement and design, Class III and Class V storage considerations, joint targeting, FHA, environmental considerations, engineer interoperability, input to the rules of engagement, rules for the use of force (RUF), and force protection. Environmental issues can have strategic implications and affect mission success and end states if not recognized early and incorporated into planning and operations. Natural resources protection can be a key strategic mission objective, important to HN reconstruction. Failure to recognize environmental threats can result in significant health risks to the JTF, adversely impacting readiness. If not appropriately addressed, environmental issues have the potential to negatively impact local community relations, affect insurgent activities, and create diplomatic problems for the JTF.

b. **Operational Planning.** The GCC's engineer planning concepts for the AOR focus on the impact of geography and force-projection infrastructure on the concept of operations (CONOPS). Engineer planners must determine the basic yet broad mobilization, deployment, employment, and sustaining requirements of the CCDR's CONOPS. Operational planning merges the OPLAN/OPORD of the joint force, specific engineer missions assigned, and available engineer forces to achieve success. JFC engineer planners also need to understand the limitations of Service engineer forces in both capacity and force strength. Many of the engineer planning activities conducted for strategic operations are also performed at the operational level. At the operational level, engineers prioritize limited assets and mitigate risks. Engineers conduct OA/environment assessments and work with intelligence officers to analyze the threat during the JIPOE. Engineers seek ways to contribute to decisive, shaping, and sustaining operations by setting the conditions for success and facilitating the JFC's objectives. Engineers anticipate requirements and request capabilities to meet them. They develop geospatial products and services and make recommendations on joint fires and protecting the force. As the link to tactical engineer integration, operational planning ensures adequate engineer capabilities are provided to accomplish combat engineering support requirements.

c. **Tactical Planning.** Engineer planning activities at the tactical level focus on support to the ordered arrangement and maneuver of combat elements in relationship to each other and to the enemy that are required to achieve combat objectives. While tactical planning is conducted by each of the Services, in the context of engineer operations this translates to a focus on combat engineering tasks and planning done within tactical organizations. Operational planners set the conditions for success at the tactical level by anticipating requirements and ensuring capabilities are available. Engineer tactical planning is typically focused on support to combat maneuver and support of the JFLCC, but also supports amphibious operations and some aspects of both air operations and air base planning. Engineer planners at the tactical level use the engineer assets provided by operational planners to support the tactical mission tasks assigned to those combat maneuver units they

support. With the support of the engineer, the subordinate JFC ensures that engineer capabilities are effectively integrated into the scheme of maneuver and the performance of assigned tasks. Tactical missions are complex, and planning must consider both symmetric and asymmetric threat capabilities. Special consideration includes performing terrain analysis with an understanding of these threat capabilities. Engineer reconnaissance (both tactical and technical) is a critical capability to the combat maneuver commander at the tactical level. Threat information must be very specific. Engineers must discern and identify patterns and plan specific detection strategies based on the threat. The proliferation of mines and IEDs requires engineers to continuously develop new counter procedures. The tactical integration of EOD capabilities has become an increasing requirement.

## 2. Planning Process

The JOPP underpins planning at all levels and for missions across the full range of military operations. This planning process applies to deliberate planning and CAP within the context of the responsibilities specified by the Chairman of the Joint Chiefs of Staff Manual (CJCSM) 3122 series (JOPES). Engineering considerations are similar for both contingency planning and CAP. This section illustrates some of the engineer planning activities during each phase of JOPP. Figure III-2 shows some additional planning activities specific to engineering.

*For additional information about the deliberate planning and CAP processes, see CJCSM 3122.01A,* Joint Operation Planning and Execution System (JOPES), Volume I (Planning, Policies, and Procedures), *and JP 5-0,* Joint Operation Planning.

a. **Step 1 (Initiation).** During these activities, the joint force engineer assembles the resources required to support COA development and begins the initial engineer staff estimate. The joint engineer also develops request for information required for mission analysis and prepares engineer experts for a JOA survey team to gather reception, staging, onward movement, and integration (RSOI) planning data. Initial expectations for geospatial support are also forwarded to allow the lead time necessary for focusing geospatial assets and beginning the production of required geospatial products and services to support the planning process.

b. **Step 2 (Mission Analysis).** The end product of the mission analysis process is a restated mission statement and the development, preparation, and issuance of planning guidance to the staff and subordinate commands in correlation to the plan. Development of an end state and a clear understanding throughout the chain of command contribute to mission accomplishment and achieving the desired objectives. Engineer considerations during this step of planning include, but are not limited to:

(1) Terrain and related weather analysis in support of OA/environment visualization.

(2) HN infrastructure and facilities assessment.

(3) Assessment of multinational and HN engineer capabilities.

| ENGINEER CONSIDERATIONS DURING THE JOINT OPERATION PLANNING PROCESS | |
|---|---|
| **Planning Process** | **Engineering** |
| **Step 1, Initiation**<br>1. CCDR receives planning task from Chairman of the Joint Chiefs of Staff (CJCS)<br>2. Major forces available for planning | • Review joint orders, particularly Appendix 6 (Engineer Support Plan), Annex D (Logistics), Appendix 15 (Force Protection), Annex C (Operations), Annex G (Civil Affairs), Annex L (Environmental Considerations).<br>• Receive higher HQ construction directive(s). |
| **Step 2, Mission Analysis**<br>1. Mission statement is deduced<br>2. Subordinate tasks are derived<br>3. CCDR's strategic concept is developed<br><br>**Product: Concept of Operations** | • Determine availability of construction materials.<br>• Review availability of construction assets to include Service, joint, multinational, host nation, and contract.<br>• Determine/review theater construction standards and base camp master planning documentation (if required).<br>• Review unified facilities criteria as required.<br>• Conduct site reconnaissance, request geospatial products and services, environmental baseline surveys, environmental health site assessments, and determine the threat (to include mine, UXO, IED, and environmental hazards).<br>• Obtain necessary geological, hydrologic, climatic data.<br>• Determine the level of interagency cooperation required.<br>• Determine funding sources as required. |
| **Step 3, Course of Action (COA) Development**<br>1. Forces selected and time-phased<br>2. Support requirements computed<br>3. Strategic deployments simulated/analyzed<br>4. Shortfalls identified and resolved<br>5. Operation plan (OPLAN) completed<br><br>**Product: Complete OPLAN** | • Produce different options that meet the commander's intent.<br>• Determine alternate construction location, methods, means, materials, and timelines in order to give the commander options. (Utilize JEPES to supplement this action.)<br>• Determine real property and real estate requirements.<br>• Utilize the Critical Path Method to determine length of different COAs and their ability to crash the project.<br>• Determine the most feasible, acceptable, and suitable methods of completing the engineering effort in terms of cost, time, and assets available.<br>• Determine and compare risks of each engineering COA.<br>• Gain approval or assist others in gaining approval construction management plan, safety plan, security plan, logistic plan, and environmental plan as required. |

**Figure III-2. Engineer Considerations During the Joint Operation Planning Process**

| ENGINEER CONSIDERATIONS DURING THE JOINT OPERATION PLANNING PROCESS | |
|---|---|
| **Planning Process** | **Engineering** |
| **Step 4, COA Analysis**<br>1. OPLAN/CONPLAN reviewed and approved by CJCS<br>2. CCDR revises plan IAW review comments<br><br>**Product: Approved Plan** | • Produce construction directives as required.<br>• Provide input to the appropriate plans and orders.<br>• Ensure all resources are properly allocated.<br>• Conduct construction pre-briefings.<br>• Conduct pre-inspections and construction meetings.<br>• Synchronize construction plan with local and adjacent units.<br>• Maintain as-built and red line drawings.<br>• Project turnover activities. |
| **Step 5, COA Comparison**<br>1. Supporting plans prepared | • Provide input to supporting plans. |
| **Step 6, COA Approval** | |
| **Step 7, COA Plan or Order Development** | |

**Legend**

| | | | |
|---|---|---|---|
| CCDR | combatant commander | IED | improvised explosive device |
| COA | course of action | JEPES | joint engineer planning and execution system |
| CONPLAN | concept plan | UXO | unexploded ordnance |
| HQ | headquarters | | |
| IAW | in accordance with | | |

**Figure III-2. Engineer Considerations During the Joint Operation Planning Process**

(4) Additional digital mapping requirements for projected missions.

(5) Capabilities of assigned engineer forces.

(6) Threat engineer capabilities.

(7) Environmentally sensitive areas and other environmental considerations.

(8) Historic and cultural resources.

(9) Beddown requirements for the supported friendly force.

(10) LOCs and APOD and SPOD supportability.

c. **Step 3 (COA Development).** The engineer assesses all available information derived from the mission analysis process to provide the commander with input required to develop the initial COAs. The joint force engineer uses this combined assessment to identify the resources required to support each COA, to make recommendations based upon available time and resources, and to recommend force tailoring to best support the CCDR's intent. This assessment is the linchpin of successful engineer integration into operations. As part of the staff, engineers conduct parallel planning and analysis and prepare the engineer staff estimates to ensure that the engineer effort will support the COA. During COA development, the engineer may consider the following:

(1) Options for joint force operational movement and maneuver, force protection, and the ramifications for engineer support to tactical operations.

(2) Recommendations on intermediate staging bases (ISBs), forward operating bases, beddown sites, forward logistic support sites, munitions storage areas, and avenues of approach.

(3) MSRs and available APODs/SPODs and railway stations to facilitate effective joint reception, staging, onward movement, and integration (JRSOI).

(4) Construction standards given planned disposition of JTF constructed or modified infrastructure upon redeployment.

(5) **Staff Estimates.** As part of staff estimates, the engineer develops a detailed engineer assessment of each COA and its supportability from an engineer perspective. At this point in planning, the engineer considers the following:

(a) Specific engineer tasks necessary to support each COA.

(b) Identify and address any engineer factors that may influence or affect force deployment.

(c) Availability of engineer assets to meet requirements. Use of engineer planning factors (e.g., equipment, personnel, and unit capabilities) is essential in determining engineer support for each COA.

(d) Engineer logistics requirements to support each COA.

(e) Construction requirements to support each COA.

(f) Force protection.

(g) Engineer actions and capabilities, plus the resources needed during transition from sustained combat operations to termination of joint operations.

(h) Identification and planning for engineer transition points.

d. **Steps 4 and 5 (COA Analysis and COA Comparison).** The engineer participates in wargaming, analyzing, and comparing available COAs to produce a commander's estimate to support a COA comparison matrix. At a minimum, the engineer evaluates the following:

(1) Criteria for risk assessment (includes environmental risk).

(2) Resource requirements.

(3) Resources available.

(4) Advantages and disadvantages of each COA for each engineer function.

e. **Step 6 (COA Approval).** The engineer ensures that all requirements developed during the mission analysis and staff estimate processes are accounted for in the COA and supportable from an engineering perspective.

f. **Step 7 (Plan or Order Development)**

(1) The engineer prepares several annexes and appendices, provides significant input to others, and must review still others due to their possible significant impact on engineer operations as shown in Figure III-3. Some considerations for their development and review include:

(a) **Annex A (Task Organization).** Engineers provide significant input to annex A (Task Organization) to ensure there is sufficient engineer capability to meet identified requirements and that command relationships are clear and appropriate. Additionally, planners provide input to the flow of the engineer force and materials as detailed on the time-phased force and deployment data (TPFDD).

(b) **Annex B (Intelligence).** As part of the JIPOE process, engineers evaluate impacts on engineer operations and integrate engineer intelligence requirements.

(c) **Annex C (Operations).** Engineers review and participate in the writing of annex C (Operations). Their participation is, or may be, required in many of the subordinate appendices as well. Each of the following appendices require special engineering considerations:

| **OPERATION PLAN ANNEXES** | | | |
|---|---|---|---|
| **Subject** | **Annex** | **Subject** | **Annex** |
| **Task Organization** | **A** | Personnel | E |
| Intelligence | B | Public Affairs | F |
| **Operations** | **C** | **Civil Affairs** | **G** |
| App 4, Special Operations | | Meteorological | H |
| **App 10, Air Base Operability** | | Command Relationships | J |
| App 13, Explosive Ordnance Disposal | | Communications System | K |
| | | *Environmental Considerations* | *L* |
| **App 14, Amphibious Operations** | | **Geospatial Information and Services** | **M** |
| **App 15, Force Protection** | | Space Operations | N |
| **App 16, Critical Infrastructure Protection** | | Host-Nation Support | P |
| | | Medical Services | Q |
| **Logistics** | **D** | Special Technical Operations | S |
| **App 5, Mobility and Transportation** | | **Contingency Contracting** | W |
| | | Execution Checklist | X |
| *App 6, Engineer Support Plan* | | Distribution | Z |
| The joint force engineer:<br>• Prepares *italicized annex and appendix.*<br>• Provides significant input for the development of **bolded annexes and appendices.**<br>• Reviews all other annexes and appendices due to their possible significant impact on engineer operations and provides input as appropriate. | | | |

**Figure III-3. Operation Plan Annexes**

1. **Annex C (Operations), Appendix 10 (Air Base Operability).** Engineer input to this appendix focuses on engineer support to airfield operations, including the five basic functions: to defend (installations), survive (provide expedient force protection), recover (assess damage, make repairs), generate (work-around for damaged systems), and support (the recovery effort).

2. **Annex C (Operations), Appendix 12 (Counterattack).** Engineer input to this appendix should focus on the employment of those engineering capabilities that are critical to a successful counterattack. Mobility and countermobility are key considerations to ensure freedom of maneuver for the force.

3. **Annex C (Operations), Appendix 13 (EOD).** Engineer input to this appendix must ensure that it is integrated with engineer operations to defeat explosive hazards (including operations of the military mine action center [MMAC] and/or the EHCC).

4. **Annex C (Operations), Appendix 14, (Amphibious Operations).** Engineer input to this appendix should focus on those engineering capabilities that are critical to amphibious operations (breaching, clearing, gap crossing, improving ground trafficability, and beach to support ship-to-shore maneuver/movement improving survivability of critical supplies/infrastructure).

5. **Annex C (Operations), Appendix 15 (Force Protection).** Engineer input to this appendix focuses on engineer support to force protection, including the following: facility hardening, revetments, berms, and installation security improvements (barriers, perimeter fencing, monitors, and cameras). This appendix does not typically include those force protection actions associated with close combat such as the development of fighting and protective positions.

6. **Annex C (Operations), Appendix 16 (Critical Infrastructure Protection).** This appendix supports the critical infrastructure protection plan with input provided by the joint force engineer.

(d) **Annex D (Logistics).** The engineer planner should review all of annex D (Logistics) for engineer inputs, which will likely be required throughout.

1. **Annex D (Logistics), Appendix 5 (Mobility and Transportation).** Engineer input to this appendix will be general or geospatial engineering-related and will include LOCs/MSRs and staging areas.

2. **Annex D (Logistics), Appendix 6 (Engineer Support Plan).** The engineer support plan (ESP) is the principal engineer document in a joint plan and is written by the engineer. It addresses essential engineer support requirements, and its development ensures that essential engineering capabilities, to include those for combat, general, and geospatial engineering, are identified and will be provided as required to support the JFC's plan. The ESP establishes theater-level requirements for facilities, facility support, projected construction, Class IV construction materials, and engineering capability in support of joint forces. The ESP should identify the overall facility requirements and summarize the existing US assets, HNS and multinational assets, and construction needed to satisfy those

requirements. It should include consideration of the apportionment and allocation of engineering forces under existing plans, TPFDD (or other force flow model), and Service-specific capabilities. It should include the requirements for HN, contract, multinational, and US engineering forces and identify the engineering capability available for accomplishing construction, as well as essential combat engineering; emergency war damage repairs; maintenance of LOCs and MSRs; troop beddown; base camp construction (and associated standards); arms, ammunition, and explosives storage and maintenance facilities; construction support to force protection; and acquisition of construction and engineering support. The ESP should summarize shortfalls in terms of unsatisfied requirements.

*For further guidance on the ESP, refer to Appendix 6 to Annex D of CJCSM 3122.03C,* Joint Operation Planning and Execution System, Volume II, Planning Formats.

(e) **Annex G (Civil Affairs).** Engineer input to this annex focuses on engineer plans for assistance to dislocated civilians, humanitarian and civic assistance (HCA), humanitarian demining operations (HDO), government stability, and the reconstruction of civilian utilities and infrastructure. A thorough understanding of CA plans, and interface with NGOs and IGOs, is essential for success.

(f) **Annex L (Environmental Considerations).** Engineers write this annex, receiving significant support from medical service personnel and other members of the staff.

(g) **Annex M (Geospatial Information and Services).** This annex identifies the geospatial engineering forces assigned or attached, their manner of employment, and the required geospatial products and services. Engineers assist the CCDR in identifying geospatial assets available to support the plan. Engineers should review available geospatial products and services for adequacy and recommend additional geospatial support.

*For additional information about OPLAN annexes, see CJCSM 3122.03C,* Joint Operation Planning and Execution System, Volume II, Planning Formats.

### 3. Development of Time-Phased Force and Deployment Data

Additionally, engineers should be involved in the development of the TPFDD, one of the most time-consuming and intensely managed aspects of plan development. The use of JEPES can help facilitate this action. Engineer participation in developing the TPFDD is critical to ensure that:

a. Critical engineer reconnaissance capabilities are positioned early in the TPFDD.

b. Engineer capabilities (units) arrive in the OA in a manner that supports the desired preparation of the OA/environment.

c. Facilities required to support force projection and JRSOI are in place and available to deploying units.

d. Construction materials, equipment, and resources are available when required, including those required to achieve the CCDR's standards for base camp beddown.

## 4. General Planning Considerations

a. In tailoring the engineer support to operations, the joint force engineer should address a number of general considerations for engineer planning, including speed, economy, flexibility, decentralization of authority, and establishment of priorities (see Figure III-4).

b. **Assured Mobility.** Assured mobility is the framework of processes, actions, and capabilities that assures the ability of the joint force to deploy and maneuver where and when desired, without interruption or delay, to achieve the mission. This construct is one means of enabling a joint force to achieve the commander's intent. Assured mobility emphasizes proactive mobility and countermobility actions and integrates all of the engineer functions in accomplishing this. Assured mobility should not be confused with the limited application of the mobility function. While focused primarily on the joint function of movement and maneuver, it has linkages to each of the joint functions and both enables and is enabled by those functions. While the engineer has the primary staff role in assured mobility, other staff members support its integration and have critical roles to play. Ultimately assured mobility is the commander's responsibility. The fundamentals of assured mobility include:

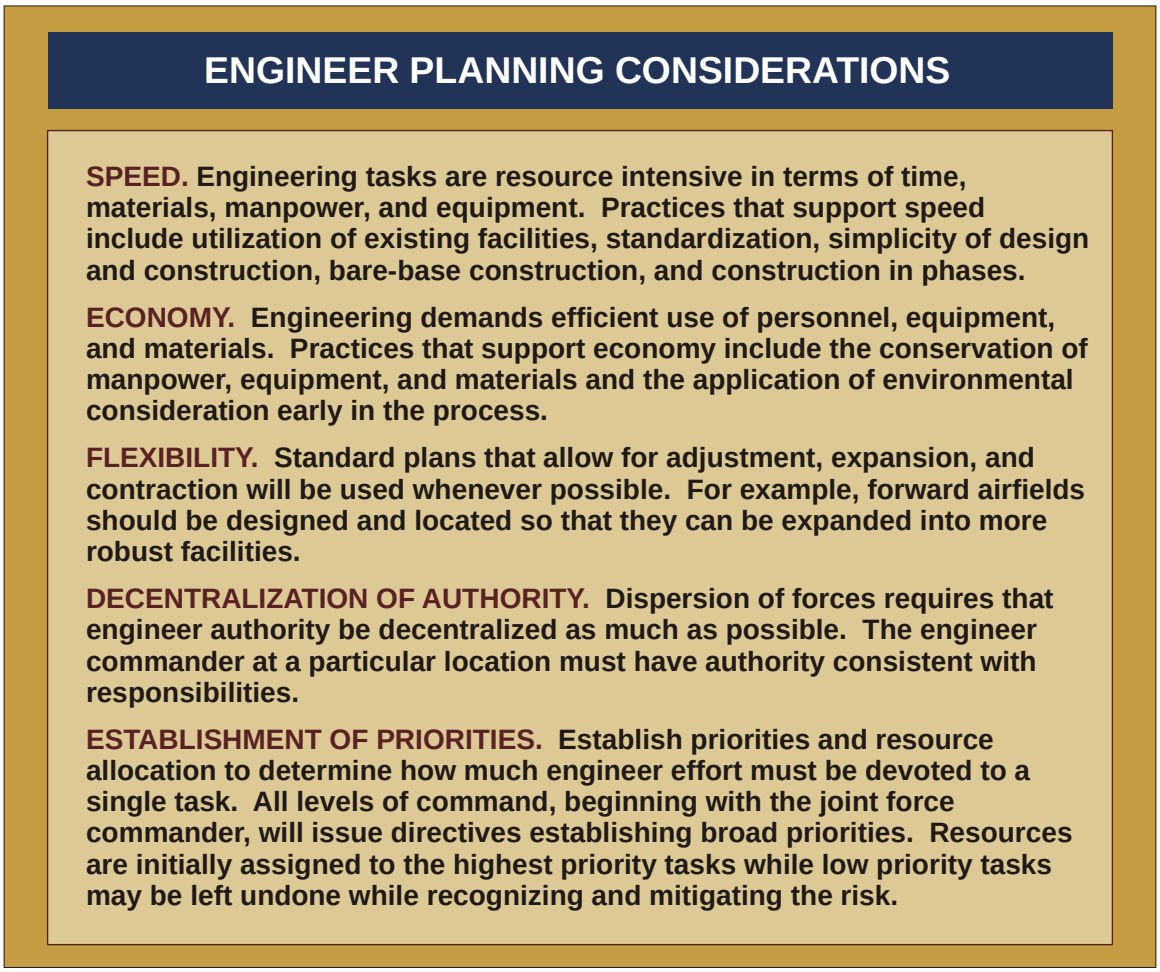



**Figure III-4. Engineer Planning Considerations**

(1) **Predict.** Engineers and other planners must accurately predict potential enemy impediments to joint force mobility by analyzing the enemy's TTP, capability, and evolution. Prediction requires a constantly updated understanding of the operational environment.

(2) **Detect.** Using ISR assets, engineers and other planners identify the location of natural and man-made obstacles, preparations to create/emplace obstacles, and potential means for obstacle creation. They identify both actual and potential obstacles and propose solutions and alternate COAs to minimize or eliminate their potential impact.

(3) **Prevent.** Engineers and other planners apply this fundamental by denying the enemy's ability to influence mobility. This is accomplished by forces acting proactively before the obstacles are emplaced or activated. This may include aggressive action to destroy enemy assets/capabilities before they can be used to create obstacles.

(4) **Avoid.** If prevention fails, the commander will maneuver forces to avoid impediments to mobility, if this is viable within the scheme of maneuver.

(5) **Neutralize.** Engineers and other planners plan to neutralize, reduce, or overcome obstacles/impediments as soon as possible to allow unrestricted movement of forces. The breaching tenets and fundamentals apply to the fundamental of "neutralize."

(6) **Protection.** Engineers and other elements plan and implement protection measures that will deny the enemy the ability to inflict damage as joint forces maneuver. This may include countermobility missions to deny the enemy maneuver and provide protection to friendly maneuvering forces.

c. **JIPOE.** Engineers play a major role in the JIPOE process by anticipating and providing terrain analysis products of likely contingency areas. Engineer reconnaissance and geospatial operations assist in describing the operational environment's effects on adversary and friendly capabilities and broad COAs. Examples of geospatial information useful for planning purposes are shown in Figure III-5. Many data management, analysis, and visualization tools are available to assist in the geospatial planning effort. For further information on JIPOE, see JP 2-01.3, *Joint Intelligence Preparation of the Operational Environment,* and JP 2-03, *Geospatial Intelligence Support to Joint Operations.*

d. **Engineer Reconnaissance**

(1) The joint force engineer must identify requirements for engineer reconnaissance and see that they are met. These requirements will occur throughout an operation, and the timing of reconnaissance missions is critical. While engineer reconnaissance capabilities exist in many forms, few engineer reconnaissance organizations are permanently organized and designed specifically for the engineer reconnaissance mission. Organization of engineer reconnaissance capabilities (mix of engineer specialties, expertise, and equipment) and required supporting assets (environmental, preventive medicine, or other specialties and force protection elements) is a critical planning consideration to ensure an accurate and sufficient reconnaissance. Most engineer reconnaissance planned by the joint engineer will be in support of general engineering tasks as planning for engineer reconnaissance in support

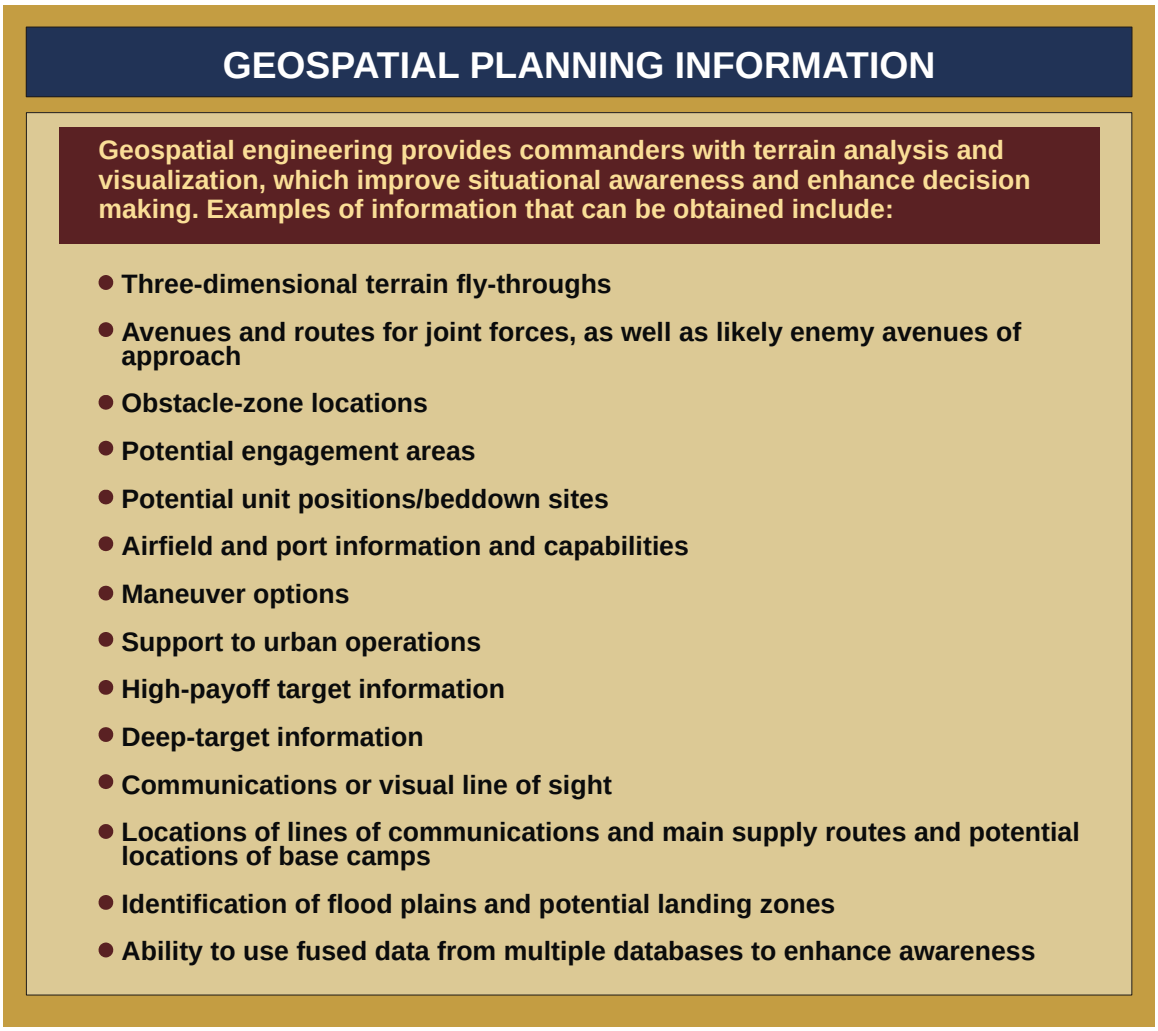



**Figure III-5. Geospatial Planning Information**

of combat engineering is typically conducted at lower levels. The range of engineer reconnaissance and its basic relationship to the engineer functions is shown in Figure III-6.

(2) One critical engineer reconnaissance mission highlighted here is the infrastructure reconnaissance. The assessment and the survey are two types/levels of infrastructure reconnaissance used to gather necessary infrastructure information. The purpose of the assessment is to provide immediate feedback concerning the status of the basic services necessary to sustain the local population. The basic services or categories evaluated depend on the situation, mission, and commander's intent. While the assessment is typically performed by, or under the leadership of, engineers, other specialties can become important participants in infrastructure reconnaissance. The basic assessment may even be accomplished by others when an engineer is not available, depending on the expertise available and the type and quality of information required. If available, leaders should also consult military and NGOs in the area to determine if there are extenuating circumstances that may influence the outcome of the assessment. Typically, engineer and other planners

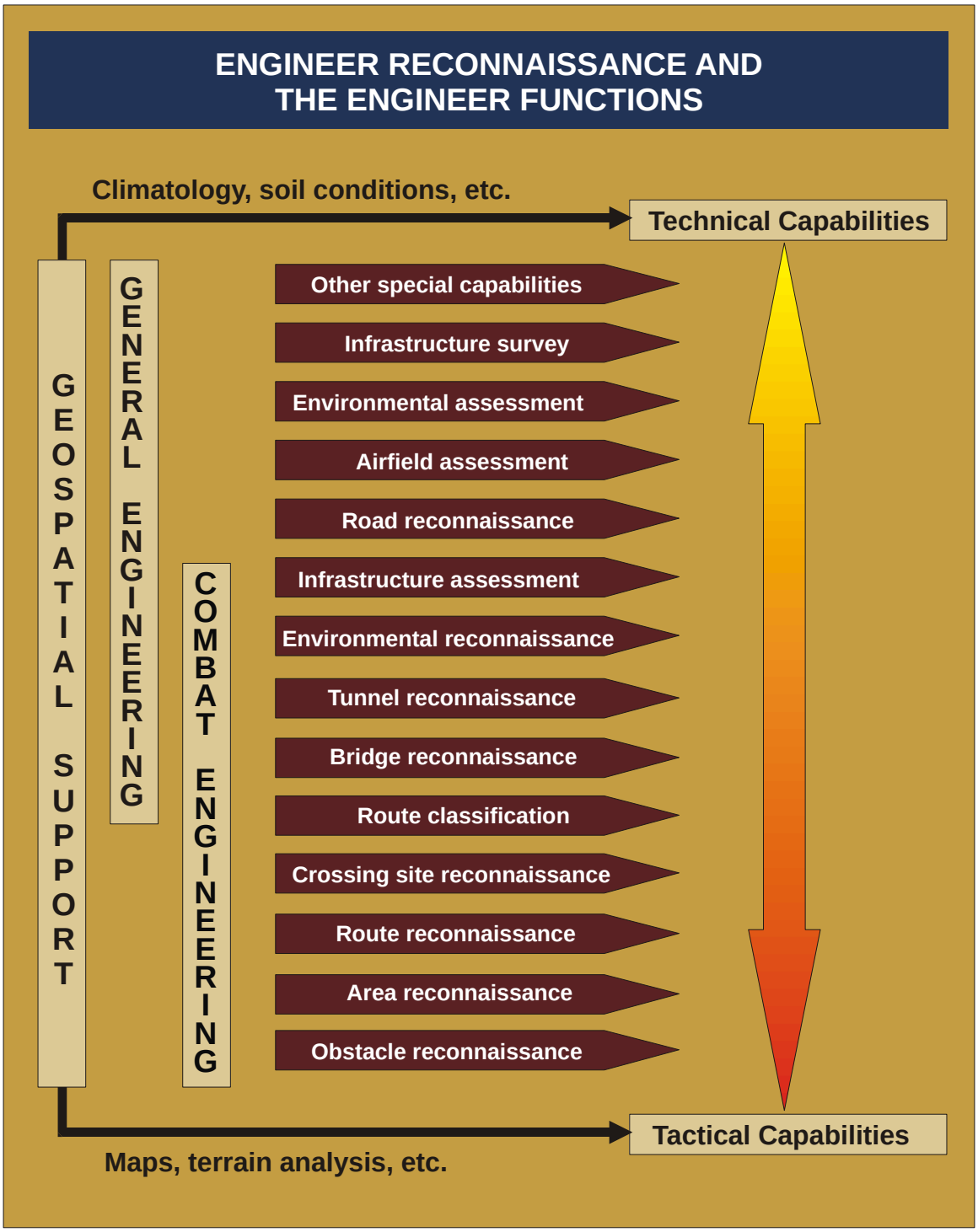



**Figure III-6. Engineer Reconnaissance and the Engineer Functions**

use this information to define immediate needs and determine priorities of work. Leaders must continue to expand and refine the assessment as time and specific expertise become available.

(3) As follow-on to the assessment, the infrastructure survey provides a very detailed description of the condition of specific major services. Both the assessment and survey should pursue available documentation to identify environmental hazards and sensitive natural and cultural resources and sites. The primary difference between the assessment and the survey is the degree of technical information and the expertise required. They are not always clearly distinguishable from each other. See Figure III-7 for a visual representation of the infrastructure assessment and survey model. The model contains seven areas to assess: sewage, water, electricity, academics, trash, medical, security, and other considerations; the acronym SWEAT-MSO is used as a memory aid for these infrastructure and assessment areas. The survey is normally conducted by a core of engineering specialties that will integrate necessary engineer specialties, expertise, and equipment with other technical specialties (e.g., medical, CA, military police) to enhance the quality and completeness of the survey.

e. **Logistics.** The JFC's concept of logistics helps synchronize joint operations. The engineer support planning effort focuses on supporting the mobilization, deployment, employment, sustainment, and redeployment of the joint force. Since engineering requirements are often unique and situation-specific, logistics and engineering support

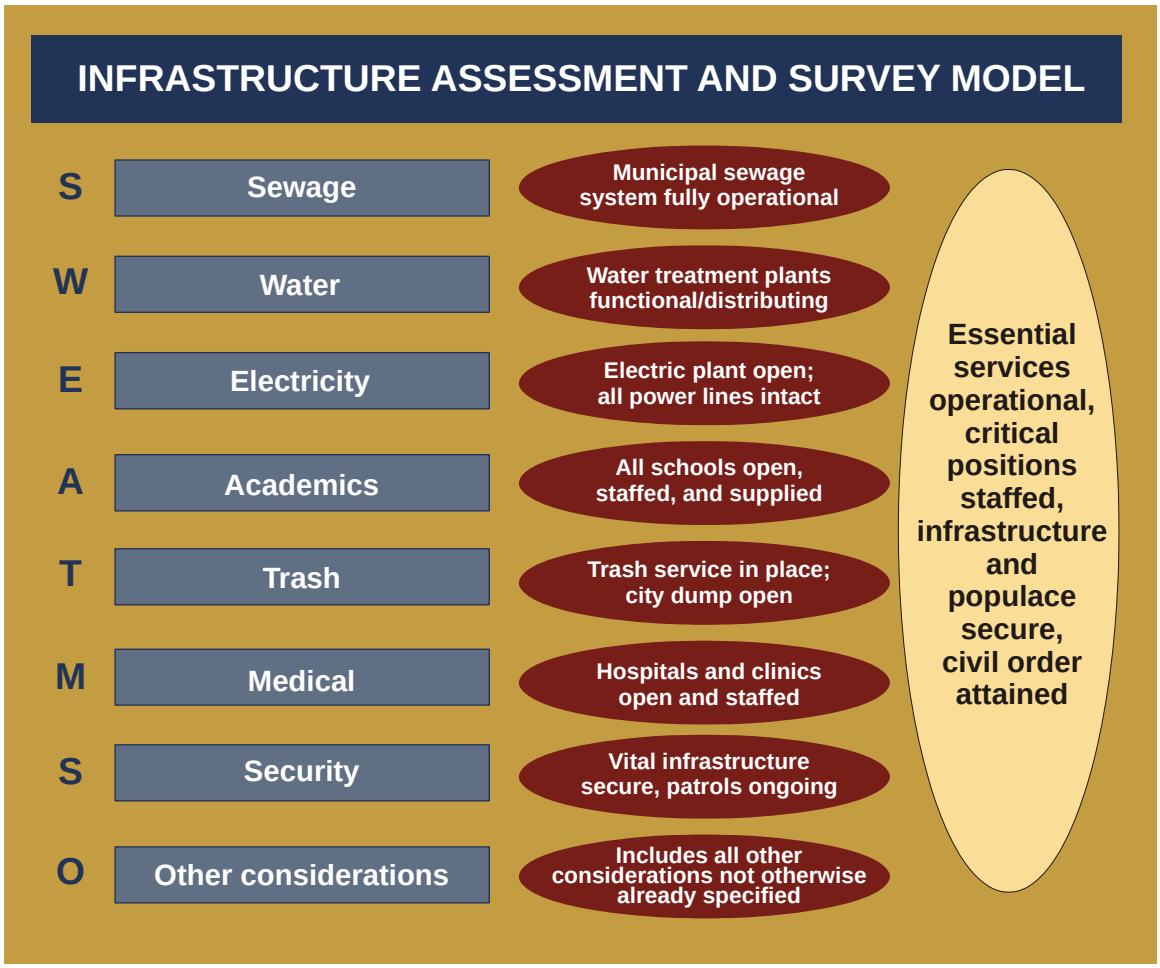



**Figure III-7. Infrastructure Assessment and Survey Model**

planning should be conducted in concert with each other to accurately forecast requirements (e.g., Class IV equipment and construction materials requirements; hazardous materials [HAZMAT] and waste management requirements). Logistics requirements, including general engineering support, will affect the flow of forces into the OA by necessitating the early deployment of support units to enlarge the force reception throughput.

f. **JEPES.** JEPES is a tool used to support quantitative aspects of engineering support planning and execution. It provides the general requirements for the ESP and provides a common automated system for the joint force engineer planners to determine the appropriate amount of engineer assets and capabilities to support the selected COA. JEPES assists the engineer planners in determining the correct engineer capability for the proper location, timed correctly to support the CONOPS. Further, it is used to:

(1) Generate time-phased facility requirements based on the OPLAN.

(2) Analyze and assess engineering support by comparing facility requirements to in-theater facility assets and HN, contract, and troop engineering capability.

(3) Provide facility feasibility assessment, manpower, equipment, and construction materials, and nonunit cargo requirements for other processes.

(4) Provide infrastructure data to assist in mission analysis and COA development.

(5) Provide real-time monitoring capability needed to track plan execution.

## 5. Functional Planning Considerations

Each engineer function has unique planning considerations, many of which are addressed in Chapter IV, "Engineer Functions." Some of those that are most significant to the joint force engineer's planning activities include:

a. **Combat Engineering.** Emplacing barriers and obstacles, and countering their use by adversaries are often significant requirements for engineers. Collectively these roles are covered primarily by the functional categories mobility and countermobility. Under combat engineering, these are focused on support to combat maneuver forces conducting operations on land and as a part of amphibious operations. This planning includes both the creation of barriers and obstacles and breaching or crossing those placed by nature or the enemy. This is a primary focus of the engineer role assuring mobility for the joint force. Survivability is also performed as a part of combat engineering and is focused on the hardening of facilities, personnel, equipment, and critical supplies in support of the maneuver commander at the brigade or regimental and lower echelons. It includes camouflage, concealment, and deception (CCD) support to tactical ground maneuver forces. This may include employing barriers, walls, shields, berms, and the construction of fighting positions and/or protective positions. Combat engineers typically provide the "lower end" hardening and CCD support while general engineering support is focused on aspects that are not involved with close combat. The joint force engineer should consider the following:

(1) Analyzing intelligence data, including ground and aerial reconnaissance and geospatial data to identify existing barriers, obstacles, and areas that require friendly barriers or obstacles.

(2) Evaluating terrain and climate to determine and enhance the integration of barriers and obstacles into the overall plan. This includes accounting for controlling the movement of civilians as well as anticipating how the enemy may use the terrain and identifying any critical intelligence requirements to verify this information.

(3) Evaluating terrain, climate, and enemy capabilities to assess the magnitude of survivability support that will be required from combat engineers.

(4) Assessing how much general engineering support will be required to augment/reinforce available combat engineer capabilities to meet the desired/required levels of protection and security.

(5) Identifying the weapon systems and delivery assets available to deliver or employ the selected barriers and obstacles.

(6) Coordinating with operations on the limitations and expenditure of selected obstacles and the designation of restricted areas.

(7) Publication of the barrier and obstacle plan, mine-recognition handbooks, and land mine recognition and warning posters for deploying forces.

(8) Establishing, disseminating, and enforcing route and area land mine clearance and marking procedures.

(9) Providing engineer input to the appropriate annexes and appendixes to the OPLAN or OPORD.

(10) Planning for the removal or deactivation of barriers, obstacles, and mines when they are no longer needed.

(11) Assessing base and ADR.

*For further guidance on barriers, obstacles, and minefield planning, refer to Chapter IV, "Engineer Functions," and JP 3-15,* Barriers, Obstacles, and Mine Warfare for Joint Operations.

b. **General Engineering**

(1) **Technical Expertise.** One of the challenges joint force engineers face in planning general engineering is access to specialized technical expertise. Much of this expertise resides within the Services, and can greatly assist joint force engineers. Joint force engineers should understand how to access this expertise. A good place to start is by establishing contact with the Services' engineer organizations (USACE, NAVFAC, and AFCESA). These organizations have vast expertise in engineer planning and operations

with various capabilities to reachback to technical subject matter experts, augment JFC planning staffs, and rapidly deploy specialized teams for engineering assessments and analyses.

(2) **Requirements for Facilities.** The general engineering planning process includes requirements for facilities (to include the standards to be applied). The requirements should reflect the general engineering support necessary for the expected duration and intensity of operations, be limited to the forces employed (to include multinational, HN, and contractors), and time-phased. The JFC determines what facilities are needed to satisfy operational requirements.

(a) **Categories.** Facilities are grouped into six broad categories that emphasize the use of existing assets over new construction. To the maximum extent possible, facilities or real estate requirements should be met from these categories in the following priority order:

1. US-owned, occupied, or leased facilities (including captured facilities).

2. US-owned facility substitutes pre-positioned in theater.

3. HN and multinational support where an agreement exists for the HN and partner nation to provide specific types and quantities of facilities at specified times in designated locations.

4. Facilities available from commercial sources.

5. US-owned facility substitutes stored in the United States.

6. Construction of facilities that are considered shortfall after an assessment of the availability of existing assets.

(b) **Construction.** The joint force engineer should plan expeditious construction of facility requirements that are considered shortfalls (e.g., those facilities that cannot be sourced from existing assets). In these circumstances, the appropriate Service, HN, or partner nation should to the extent possible perform construction during peacetime. Contracting support should be used to augment military capabilities. If new construction cannot be finished in time to meet mission requirements, the CCDR and joint force engineer should seek alternative solutions to new construction. Expedient construction (e.g., rapid construction techniques such as prefabricated buildings, clamshell structures) should also be considered, as these methods can be selectively employed with minimum time, cost, and risk.

(c) **Funding.** Adequate funding (see Appendix E, "Contingency Authorities and Funding") must be available to undertake early engineer reconnaissance and acquisition of facilities to meet joint force requirements, whether by construction or leasing. Funding constraints are a planning consideration. The JFC articulates funding requirements for construction and leasing of facilities by considering the missions supported and the amount of funds required. The JFC should take steps to assure that the Service components allocate

sufficient funds for facility construction, including associated contract administration services and real estate acquisition and disposal services. Facility construction planning must be routinely and repetitively accomplished to ensure that mission-essential facilities are identified well in advance of the need and, wherever possible, on-the-shelf designs are completed to expedite facility construction in time of need.

c. **Geospatial Engineering**

(1) **Information Requirements.** Geospatial data provides the foundation for analysis and visualization of the operational environment, is required for many military functions such as navigation, mission planning, mission rehearsal, targeting, obstacle and minefield reconnaissance, and terrain analysis. Engineers assist in visualization of the operational environment through theater geospatial assets. When coupled with threat analysis, environmental effects, weather, the friendly situation, and the logistics situation, geospatial information may lead to identification and location of operational centers of gravity (both friendly and enemy), a more accurate view of the operational environment, and improved situational awareness of environmental conditions and related health threats. Accurate visualization of the area in which joint forces conduct operations allows commanders to plan for branches to current operations. Requirements for geospatial information and services are determined and validated by the GI&S officer and J-2 during the deliberate planning and CAP processes.

*For further guidance on GI&S, refer to Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3901.01B,* Requirements for Geospatial Information and Services; *JP 2-01.3,* Joint Intelligence Preparation of the Operational Environment; *and JP 2-03,* Geospatial Intelligence Support to Joint Operations.

(2) **Geospatial Engineer Support**. Joint operations may be conducted in areas that have limited up-to-date geospatial coverage. When providing geospatial support to the joint force, the geospatial engineer should coordinate the following with the GI&S officer and J-2:

(a) Evaluating the availability of standard and nonstandard map and imagery products in the OA. If shortfalls exist, the geospatial engineer, the GI&S officer, and the J-2 should define specific requirements and coordinate the collection and creation of necessary data to build the joint force geospatial database. Standard data sets that are created should be coordinated back to the national level to update the Geospatial Intelligence Knowledge Base for the benefit of the rest of DOD and interagency organizations.

(b) Early collection of both classified and open-source geospatial information in the OA through reconnaissance, topographic survey, site survey, data mining, and satellite imagery.

(c) Requesting digital geospatial and imagery information from the National Geospatial-Intelligence Agency (NGA) immediately after mission requirements are established. NGA produces a variety of digital geospatial data sets. During peacetime, CCDMs may establish a basic requirement for these standard data sets. As contingencies

arise, data sets tailored to the specific operation should be requested early in the planning process to ensure that these products will be available to the joint force. The request should also include data sets for all the subordinate units involved in the operation and should identify the expected capacity of geospatial engineers in the CCMD and subordinate joint force to assist in producing and maintaining required data.

(d) Ensuring that terrain analysis and other geospatial capabilities are available to the joint force early in the JOA or through split-basing capabilities from the United States. Engineer forces deploy worldwide on short notice. It is important to define geospatial data requirements early and focus limited geospatial assets on the most important areas.

(e) Establishing a geospatial product storage and distribution capability in conjunction with the J-2, J-4, and GI&S officer. Requirements are established by the CCDR.

(f) Establishing special geospatial support procedures with special operations forces and other deployed forces.

## 6. Detailed Planning Considerations

a. **Transitions.** Engineering planning for operational phase transition is essential to ensuring uninterrupted support to the joint force. Many times operational planning details are not known in enough time to adequately respond with fully resourced engineer support plans, given that design, material, sourcing, and funding approvals may require long lead times. Accordingly, engineers, together with logisticians, must anticipate the JFC's phase transition decisive points in order to ensure adequate resources are available for the next phase of the campaign. For example, basing arrangements for US and/or coalition/indigenous forces must be anticipated far ahead of the JFC's decision to transition from Phase III to Phase IV in order to set the conditions for a smooth transition from the engineer's perspective. Another JFC decision that is important to engineers is the transition from organic support equipment and tentage to a more robust, efficient, and sustainable base support system. These engineering and logistics decisions must be made in coordination with multiple stakeholders, including the operational contract support community, as many engineering services functions can be provided by the CAP (LOGCAP, AFCAP, and GCCC/GCSC) given the right conditions.

**TERRAIN DATA**

**The availability of terrain data was a critical aspect in joint operations in Afghanistan and Iraq. Army terrain teams, working with joint and coalition forces, defined helicopter landing zones, avenues of approach, and trafficability analyses using geospatial data. After major combat operations ceased and nation building started, geospatial products were used for follow-on-stability operations and support operations. Mapping urban regions in more detail is very important, with route analysis and emerging urban terrain products becoming more relevant as lessons learned are incorporated into newer geospatial tools.**

**SOURCE: *Engineer,* January–March 2003**

(1) **Engineer Force Organization.** Engineer force packages must contain the right mix of capabilities to assure timely and relevant engineer support to the JFC. This mix will often need to change drastically during transitions, and the joint force engineer must anticipate and plan for these changes. For example, in early operational phases combat engineers often make up the majority of engineer forces in theater during sustained combat operations, but they must be reinforced during transition later phases as they typically do not have the right capabilities to accomplish all the general engineering tasks required. Also, since EOD support requirements during transition operations are often significantly higher than during combat operations, more EOD capabilities will be required.

(2) **Engineer Missions.** Engineer missions related to this type of transition will typically fall into four general categories:

(a) **Engineer Reconnaissance.** The joint force engineer must anticipate requirements for engineer reconnaissance, for example: the condition of the civilian infrastructure, facilities requiring immediate engineer effort, and hindrances to mobility. The reconnaissance conducted at this time will ideally be focused on refining plans created as a result of initial proactive planning. The initial EBS for base camps and other selected sites should also occur as a part of this reconnaissance if possible and be linked to the environmental health site assessment (EHSA).

(b) **Base Camp Construction and Maintenance.** Each Service is responsible to meet its own expeditionary basing requirements to support contingency beddown of their forces. Services are also responsible to perform the contingency base engineering functions on designated joint expeditionary bases where that Service has the majority of the forces. Theater construction policies will dictate the level of effort for construction and management of Service or joint expeditionary bases in each theater. Engineer planners must also consider Services' organic ability to provide base engineering maintenance services at combatant command designated joint bases. This is especially critical in instances where one Service is required by the JFC to act as a joint base operating support (BOS-I). In instances where the BOS-I chooses to use the civil augmentation program to provide base services, early planning by engineers and logisticians for these and other base camp support requirements will help remove undue burdens from the operational staff during critical points in the campaign. Considerations include the size of the force projected to operate from the base camp(s) and the duration the base camp will be required, and the level of construction standards to be applied. Other important parameters include geographical location, weather, available construction materials, resources, utilities, political concerns for permanency, localized environmental hazards and health threats, and impact on the local populace. These decisions should be included early in the planning process for all projected/potential base camp locations.

(c) **Civilian Infrastructure Repair and Maintenance.** Rapid repair or improvement in the infrastructure will have far-reaching impacts on mission success at all levels. Engineers typically work in conjunction with CA to conduct civilian infrastructure reconnaissance and assessment.

(d) **Other General Engineering Considerations**

1. Construction support to force protection operations and post-combat beddown.

2. SPOD and APOD facilities maintenance and expansion.

3. Repair and construction of MSRs and facilities to support future retrograde and redeployment operations.

4. Termination of real estate rights of entry, leases, and conduct of closeout activities.

5. Destruction of remnants of war, such as ammunition, mines, and UXO.

6. Conduct of HN infrastructure and operational environment damage assessment.

7. Clearance of debris and emergency repairs to critical HN infrastructure.

8. Control and removal of HAZMAT and waste.

9. Conduct of environmental remediation (see Appendix D, "Environmental Considerations").

10. Reconstitution of assets.

11. Management and quality assurance of contracted construction projects.

(3) **Intelligence.** The JFC obtains the greatest intelligence benefit by focusing the right engineer expertise on the right missions. The engineer staff officers must maintain close liaison with the intelligence staff to provide, coordinate, and integrate technical expertise, engineer priority information requirements (IRs), and specialized engineer assets to enhance information collection efforts. Engineer reconnaissance teams are particularly valuable in this role. Special operations forces can also provide valuable information for the engineer planner due to their early presence in the OA.

(4) **Logistics.** Timely delivery of the proper engineer supplies, personnel, and equipment is essential for success during transition. Logistical requirements change as operations transition to stability operations. Construction and specialized equipment requirements will impose different Class IX repair parts requirements than combat engineering equipment, and Class IV construction materials will differ from those required during combat operations. Estimates should be revised over time as more up-to-date intelligence is gathered. Engineers should work closely with logisticians to monitor Class IV stock levels to ensure materials are on hand when required.

(5) **Coordination with USG Agencies and other Organizations.** USG agencies, IGOs, NGOs, multinational partners, civilian contractors, and the HN will all have a role in

the transition to peace and normalcy. As the joint force mission begins to shift, more and more of these organizations will become involved. A successful military and political transition to USG agencies, IGOs, and NGOs requires knowledge and understanding of the roles, responsibilities, constraints, and capabilities of these agencies and organizations. The joint force engineer will play a key role during this process.

b. **Force Protection.** Engineers have unique equipment and personnel capabilities that can be used to support force protection efforts. Engineers construct protective facilities, bunkers, emplacements, vehicle barriers, fences, environmental and sanitation systems, and other structures. Combat engineering tasks like the development of fighting and protective positions (survivability) are also a part of force protection. Engineer support to force protection also includes the support of CCD. Planners should consider the following:

(1) Establishing the required level of protection based on the expected threat.

(2) Identifying and implementing force protection construction standards, including requirements for security fencing, lighting, obstacles, and guard posts. Publish proper safety standards for construction of long-term fortifications, fighting positions, bunkers, and berms.

(3) Ensuring that early-entry forces have adequate force protection construction materials, materials handling equipment (MHE), and holding areas. Service component engineers should review these materials annually to ensure the theater stocks are sufficient to meet initial entry requirements.

(4) Establishing facility security inspection procedures with military and local law enforcement personnel to quickly identify and repair breaches.

(5) Delineating force protection construction responsibilities between engineer units and supported units.

(6) Providing adequate engineer capabilities to facilitate survivability for combat maneuver forces as a part of combat engineering.

c. **EOD.** EOD augmentation to the engineer force is not only essential, but critical. The speed and efficiency with which UXO hazards, weapons caches, and IEDs are eliminated directly impacts overall mission success, both militarily and politically. Selective EOD staff integration into engineer staffs and in organizations like the EHCC or MMAC are both desirable and in some cases essential.

d. **Real Estate Requirements.** Joint force engineers must plan for the acquisition of uncontaminated land and facilities, and their management and ultimate disposal to support joint operations, including:

(1) Operational facilities (e.g., command posts [CPs], airfields, ports).

(2) Logistics facilities (e.g., maintenance facilities, supply points, warehouses, ammunition supply points, and APOD/SPOD for sustainment).

(3) Force beddown facilities (e.g., dining halls, billeting, religious support facilities, clinics, and hygiene facilities).

(4) Common-use facilities (e.g., roads, JRSOI facilities).

(5) Force protection planning considerations (e.g., site selection, proximity to potential threat areas, sniper screening).

*For additional information about real estate management, see Chapter IV, "Engineer Functions."*

e. **Construction Planning.** The joint force engineer and Service component engineers must ensure that facilities are available to support the joint force. This will often require new construction, but where possible, it is important to maximize the use of existing facilities. Facility requirements are dependent on numerous factors as indicated in Figure III-8. Planning will include those facilities that are considered shortfalls, i.e., those facilities that cannot be sourced from existing assets. In these circumstances, the appropriate Service, HN, or partner nation should to the extent possible perform construction during peacetime. Because construction is time-consuming and entails the risk of not being finished in time to meet mission requirements, the joint force engineer should seek alternative solutions to new construction. Expedient construction (e.g., rapid construction techniques such as prefabricated buildings, clamshell structures) should also be considered, as these methods can be selectively employed with minimum time, cost, and risk. Besides military engineers, construction assets include HN and civilian engineers and contractors. While all of these assets are capable of executing similar projects, they are not necessarily interchangeable. The engineer planner should consider the strengths, capabilities, and availability of each. Specialized unit requirements such as water well drilling or underwater demolition or construction teams should be identified early in the planning process. Joint force engineers must also plan to ensure the joint force has adequate construction management capability.

(1) **Funding and Resource Management.** Joint force engineers must understand funding authorities and references. Engineers should coordinate with comptrollers and legal staff and be familiar with peacetime construction authorities and procedures. However, contingency and wartime construction require different procedures. See Appendix E, "Contingency Authorities and Funding," for more detailed information.

(2) **Construction Standards.** Construction standards provide a framework to ensure efficient application of limited engineering assets and to responsively support the commander's intent and executing the theater CONOPS. The CCDR in coordination with Service components and the Services, specifies the construction standards for facilities in the theater to optimize the engineer effort expended on any given facility while assuring that the facilities are adequate for health, safety, and mission accomplishment. Figure III-9 illustrates the beddown and basing continuum and highlights the need for early master planning efforts to help facilitate transition to more permanent facilities as an operation develops. Timelines provide a framework to plan for the transition of standards, but the actual trigger for transition will be based on conditions. In addition to using these guidelines when establishing initial construction standards, the JFUB should be used to periodically


**Figure III-8. Facility Requirements Factors**

revalidate construction standards based on current operational issues and provide recommendations to the JFC on potential changes. Ultimately it is the CCDR who determines the exact construction type based on location, materials available, etc. The joint engineer must recommend the most feasible solutions to each requirement. Construction standards are guidelines, and the engineer must consider other factors in planning such as US policy and HN limitations on permanency. Example standards for expeditionary, initial, and temporary construction are detailed in Figure III-10.

(a) **Contingency phase (typically 0 to 2 years)**

1. **Organic.** A subset of initial standard construction, organic standard construction is set up on an expedient basis with no external engineer support, using unit organic equipment and systems or HN resources. Intended for use up to 90 days, it may be used for up to 6 months. It typically provides for initial force presence and maneuver activities until force flow supports arrival of engineer resources.

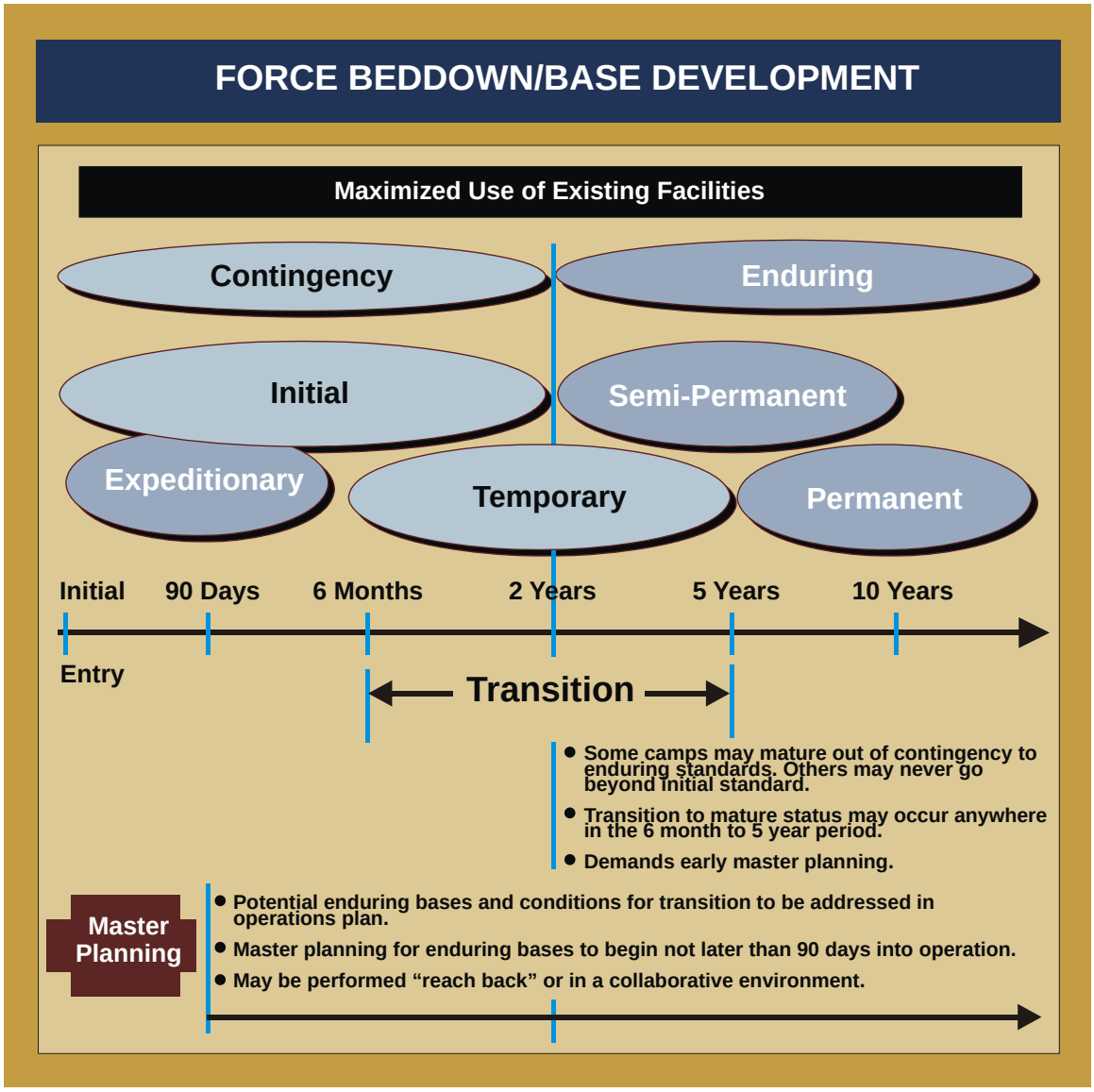



**Figure III-9. Force Beddown/Base Development**

2. **Initial.** Characterized by minimum facilities that require minimal engineer effort and simplify material transport and availability, initial standard construction is intended for immediate use by units upon arrival in theater for up to 6 months. Typical to transient mission activities, it may require system upgrades or replacement by more substantial or durable facilities during the course of operations.

3. **Temporary.** Characterized by minimum facilities and effort with material transportability or availability, temporary standard construction is intended to increase efficiency of operations for use extending to 24 months, but may fulfill enduring phase standards and extend to 5 years. It provides for sustained operations and may replace initial standard in some cases where mission requirements dictate and require replacement

**CONTINGENCY CONSTRUCTION STANDARDS IN THEATER**

**Expeditionary Standard**

- Support on expedient basis with no external engineer support.
- Uses unit organic equipment and systems and/or host nation resources.
- Mission duration typically 1-90 days.
- Provides for initial force presence and maneuver activities until force flow supports arrival of engineer resources.

**Initial Standard**

- Characterized by austere facilities requiring minimal engineer effort.
- Intended for immediate operational use by units upon arrival for a limited time ranging up to 6 months.
- May require replacement by more substantial or durable facilities during the course of operations.

**Temporary Standard**

- Characterized by austere facilities requiring additional engineer effort above that required for initial standard facilities.
- Intended to increase efficiency of operations for use up to 24 months.
- Provides for sustained operations.
- Replaces initial standard in some cases where mission requirements dictate. The temporary standard may be used initially if so directed by the combatant commander.

| Type of Construction | Expeditionary | Initial | Temporary |
|---|---|---|---|
| Site Work | Minimal to no site work; maximized use of existing facilities | Clearing and grading for facilities including drainage, revetments of petroleum, oils, and lubricants, and ammo storage and aircraft parking; aggregate for heavily used hardstands; and soil stabilization | Engineered site preparation, including paved surfaces for vehicle traffic areas and aircraft parking, building foundations, and concrete floor slabs |
| Troop Housing | Unit tents | Tents (may have wood frames and flooring) | Wood frame structures, relocatable structures, and modular building systems |
| Electricity | Unit tactical generators | Tactical generators: high and low voltage distribution | Nontactical or commercial power and high or low voltage |
| Water | Water points and bladders | Water points, wells, and/or potable water production and pressurized water distribution systems | Limited pressurized water distribution systems that support hospitals, dining halls, firefighting, and other major users |
| Cold Storage | Contracted or unit purchased | Portable refrigeration with freezer units for medical, food, and maintenance storage | Refrigeration installed in temporary structures |

**Figure III-10. Contingency Construction Standards in Theater**

| Type of Construction | Expeditionary | Initial | Temporary |
|---|---|---|---|
| Sanitation | Unit field sanitation kits, pit latrines | Organic equipment, evaporative ponds, pit or burnout latrines, lagoons for hospitals, and sewage lift stations | Waterborne to austere treatment facilities—priorities are hospitals, dining halls, bathhouses, decontamination sites, and other high-volume users |
| Airfield Pavement* | | Tactical surfacing, including matting, aggregate, soil stabilization, and concrete pads | Conventional pavements |
| Fuel Storage | Bladders | Bladders | Bladders and steel tanks |
| * The type of airfield surfacing to be used will be based on soil conditions and the expected weight and number of aircraft involved in operations. | | | |

**Figure III-10. Contingency Construction Standards in Theater**

during the course of extended operations. Temporary standard construction can be used from the start of an operation if directed by a CCDR. It is typical for non-transient mission activities.

(b) **Enduring phase (typically 2 years and beyond).** DOD construction agents (USACE, NAVFAC, or other such DOD-approved activity) are the principal organizations to design, award, and manage construction contracts in support of enduring facilities which shall be in accordance with the applicable Unified Facilities Criteria (UFC).

1. **Semi-Permanent.** Designed and constructed with finishes, materials, and systems selected for moderate energy efficiency, maintenance, and life-cycle cost, semi-permanent standard construction has a life expectancy of more than 2, but less than 10, years. The types of structures used will depend on duration. It may be used initially if directed by the CCDR after carefully considering the political situation, cost, quality of life, and other criteria.

2. **Permanent.** Designed and constructed with finishes, materials, and systems selected for high energy efficiency and low maintenance and life-cycle costs, permanent standard construction has a life expectancy of more than 10 years. Construction standards should also consider the final disposition and use of facilities and any long-term goals for these facilities to support HN reconstruction. The CCDR must specifically approve permanent construction.

(c) **Transition and Strategic Support.** Facilities should transition from contingency to enduring standards when appropriate, typically any time within a 6-month to 5-year period. Relative timelines of acquiring funds and resource availability will challenge execution of any planned efforts. Potential enduring bases and conditions for transition should be addressed in OPLANs, along with early master planning of the required bases. This planning may be performed by reachback to distribute engineer staff workloads to other

support areas or centers of excellence. Given the implications the transitions bring about, centralized management of these decisions is essential to effective theater support and consistency. In any case, the joint engineers at the strategic, operational, and tactical level must all be involved to ensure the best utilization of engineer resources.

(d) **Construction Standard Considerations.** Decisions on construction standard are not to be based on time alone; there are many other factors to consider. For example:

1. Is it cost-effective to use building systems (facility-equivalent equipment) or local labor and materials? Does it make sense to use a temporary standard for a mission that has an expected duration of less than a year? Consider the use of tent extendible modular personnel (TEMPER) systems (or similar systems) and the fact it may cost more to relocate these systems than to hire local labor to build initial standard indigenous tent systems or semi-permanent structures with local material. Assuming there is no political constraint limiting the visibility of permanency and the local labor source can build the facilities within the required time, it may be more cost-effective to build to the semi-permanent standard with a higher quality of life for the troops.

2. Should different standards be applied to the same location if variations in missions warrant it? Consider a base camp with units permanently assigned to the location compared with units transiting through the location.

3. When planning for new construction, one must also account for supervisory and administrative costs, planning and design costs, and contingency costs in the overall project amount when incorporating any of the DOD contract construction agents (CCAs) into construction management.

(e) **Construction Standards Implementation.** Construction standards need not be stepped through progressively; there are many other factors to consider. For example:

1. For troop housing, the initial standard may be met by billeting personnel in available facilities or constructing general purpose medium or equivalent indigenous tents. Expeditionary base camp sets (i.e., TEMPER-based or similar systems) could be considered initial standard when austerely configured and requiring minimal engineer effort. Otherwise these complete expeditionary base camp systems meet the minimum facility requirements of the temporary standard and when directed by a CCDR can be used from the start of an operation. Likewise, construction of basic Southeast Asia (SEA) huts may meet this temporary need. Development of semi-permanent and permanent standard facilities would include SEA huts, expeditionary structures, local contract brick or steel frame construction, and prefabricated buildings according to their life expectancy.

2. Other requirements may follow different timelines. Power production facilities, for example, may follow a much quicker timeline than the facilities they support. The initial standard of tactical power production may move to the temporary standard local contractor generation followed by semi-permanent connection to commercial power all within the contingency timeframe.

3. It may sometimes be prudent to "step" over standards. For example, a unit supported with initial standard systems may be enhanced to semi-permanent structures if the situation justifies it. Likewise, forces may transition from organic standards to a temporary standard construction.

(3) **Building Systems.** Building systems may provide a rapid solution to facilities requirements. The engineer planner analyzes cost, availability, and timeline for execution of construction when considering the procurement and use of building systems (e.g., fabric skin, metal frame structures, steel arch structures, and panel building systems).

(a) The Services maintain and deploy a number of expeditionary basic camps (e.g., US Air Force's base expeditionary airfield resources [also known as BEAR sets] and US Army's FORCE PROVIDER sets) consisting of tents and fabric skin, together with metal frame structures that are rapidly assembled. These systems may require engineer support for site preparation and set layout and assembly.

(b) Commercial building systems are also available worldwide. These systems include basic shelters and modular building systems complete with built-in utility wiring and utilities. While rapidly assembled and usually capable of being relocated, they are typically more expensive than austere facilities constructed in the field.

(4) **Service Standard Designs.** Service standard designs should be considered for use in support of joint operations and are starting points for Service component general engineer planners. The designs may be modified based on operational, environmental, and unusual site conditions or unique customer requirements. Examples of standard designs can be found in the Theater Construction Management System for land and maritime components.

(5) **Procurement of Construction Materials.** Engineer planners must understand the commander's intent and CONOPS, including expected duration of operations, to ensure appropriate material selection. Sustaining military operations usually requires large amounts of construction materials. Obtaining materials on time and in the quantity and quality needed must occur in order to bring other resources (time, personnel, and equipment) together to complete the project. The ESP is used to establish the initial requirements during initial planning. Materials can be procured through military supply channels, local procurement, or can be produced locally. Each method has inherent costs and benefits.

(a) **Military Supply Channels.** Obtaining materials through the normal military supply channels requires extensive planning and material forecasting, and in cases where the objective is building partner capability or economic development, it is less desirable than local procurement, but will often be necessary if materials are not locally available. To support these shipments, adequate port or airfield facilities must be available for early reception of required equipment and materials. If adequate facilities are not available or existing facilities cannot be adapted or modified, it may be necessary to establish sites for joint logistics over-the-shore (JLOTS) operations. Many Class IV materials are bulky, require handling and transportation over long distances, and are in high demand. Due to long lead time, it may take several months for certain materials to arrive. For these

reasons, initial construction material forecasts based on the ESP are usually submitted by the Service components.

(b) **Local Procurement.** Procuring construction materials locally from countries within or near the AOR is often the most advantageous. To maximize its benefits, local procurement should occur as close as possible to the actual construction site in order to minimize transportation requirements. Use of local building materials and techniques minimizes shipping of materials and produces structures that are best suited to the local environment.

(c) **Quality of Materials.** The quality of locally available materials often varies widely and may differ significantly from those used in standard designs. This can have a significant effect on a structure's safety and constructability.

(d) **Quantity of Materials.** The ESP gives an order of magnitude for the quantities of materials required to support the operation. Because operational requirements may change after the materials have been ordered and shipped, engineer planners should consider materials and building systems that can be adapted for other uses.

(e) **Production of Construction Materials.** Certain materials required in large quantities make it advantageous to be produced locally. Engineers may operate borrow pits and quarries or contract with suppliers. Significant environmental restrictions may be placed on joint forces when creating or operating these sites.

(f) **Cost.** The cost of construction materials is highly visible to the JFC. Whether built by military engineering forces or contractors, procurement of materials is funded by the Service components for support to joint operations. The engineer planner must consider the impact of limited funding on the overall priority of projects to meet essential facility requirements of the joint force.

*For additional information on construction costs and funding, refer to Appendix E, "Contingency Authorities and Funding."*

f. **Construction Contracting Support.** Construction contracting in contingency operations is conducted in a highly dynamic and uncertain environment. Often, reconstruction is begun before or even in the midst of combat operations. Multiple partners from the military, government agencies, NGOs, HN and partner nations coupled with tenuous security and political environments can severely impact planning, execution, oversight, and completion of construction projects. Overlapping jurisdictions, competing interests, and changing goals further complicate the task of rebuilding. Joint engineers must consider the capabilities of all Services when addressing how to support contingency contracting requirements.

(1) **Contractor Planning Considerations.** The challenge for engineer planners is to achieve the optimal mix of engineering capabilities, which may include contractor support. Planning considerations influencing the use of contractors include:

**CONTRACTING IN A CONTINGENCY**

*"The United States struggled in Iraq to establish integrated contracting and program management systems that could provide effective direction, support, and oversight of the reconstruction program. Beginning with the creation of the CPA's [Coalition Provincial Authority's] Program Management Office in August 2003, a succession of contracting and program management offices suffered under varying sets of complex contracting regulations, divergent chains of authority, changing program requirements, and shifting reconstruction priorities. A shortage of qualified contracting officers, continuous staff turnover, and poor program management practices, particularly regarding quality assurance programs, weakened oversight of reconstruction projects. Finally, contracting officers did not have adequate information systems to track contract activity."*

**"Hard Lessons," Stuart W. Bowen, Jr., US Government Printing Office, 2 February 2009**

(a) Duration, scope of work, security, and stability.

(b) Availability of local resources (labor and construction materials).

(c) Impact on intratheater lift and port facilities.

(d) Availability of funding.

(e) Impact on local area political and economic stabilization.

(f) Impact of force limitation imposed by force caps that could limit the number of military engineering forces.

(g) Capabilities of contractors.

(2) **DOD Construction Agents.** The DOD CCAs (see DODD 4270.5, *Military Construction*) are USACE, NAVFAC, or other approved DOD activity such as AFCEE. Their responsibilities include the design, award, and management of construction contracts for projects associated with the peacetime MILCON program. Overseas, USACE, NAVFAC, and the Air Force are assigned specific geographical areas under DODD 4270.5, *Military Construction*.

(3) **Contingency CCAs.** The GCC may also use USACE, NAVFAC, and, where approved, AFCEE as contingency CCAs for design, award, and management of construction contracts in support of military operations. For countries where there is no designated DOD construction agent, the GCC will usually designate a CCA for support in a contingency. USACE and NAVFAC also provide facilities planning, contract administration, and technical engineering support to JFCs (e.g., advanced base master planning, geospatial engineering, force protection engineering, and cold weather mobility).

*For additional information on CCAs, refer to Appendix C, "Contract Construction Agents."*

(4) **Civil Augmentation Programs.** Civil augmentation programs, such as the Army's LOGCAP, the Navy's GCCC and GCSC program, the Air Force's AFCAP, and DOD's civilian employee volunteers are additional support sources that can provide worldwide facilities construction support and provide the JFC and joint force engineer with additional options and flexibility in facilities construction. Civilian contractor augmentation programs are managed by a contract agent and are structured with one contractor responsible for providing support that effectively integrates construction, facility maintenance, and logistic support to the joint force. Funding of these programs is a key issue. A single contractor prevents multiple agencies and their contractors from bidding against one another for services and materials in the JOA. Use of civilian augmentees requires planning and operational oversight as well as quality control and assurance to ensure that costs are effectively controlled, while support is provided consistent with the JFC's CONOPS.

(a) **Army.** LOGCAP is an Army umbrella support contract that can be utilized to provide broad based logistic and selected engineering support in contingency operations. Currently, LOGCAP is a cost-plus award fee contract managed by the US Army Materiel Command (USAMC). An important aspect is that, in peacetime, the LOGCAP contractor maintains an on-call, preplanned, ready capability. The contractor demonstrates readiness through the development of a worldwide plan, supporting plans to OPLANs, specific regional plans, and participation in exercises.

1. **USAMC Support Contract.** The USAMC support contract provides engineering, construction, and general logistic services. USAMC is supported by USACE for engineering and construction contract administration and by the Defense Contract Management Agency (DCMA) for logistic services contract administration.

2. **LOGCAP Support Contract.** In the JOA, the USAMC Army Field Support Brigade, which is OPCON to the senior Army logistics commander in the JOA, manages the contract. The contract can support all DOD components and missions and is a cost-plus award fee service contract that provides support to the joint force in three major areas: facilities repair and construction, base operations and maintenance, and logistic services.

(b) **Navy.** The Navy's GCCCs and GCSCs are cost-plus award fee indefinite delivery/indefinite quantity, multiple-award contracts administered by NAVFAC Atlantic and Pacific, respectively. Each command provides on-site support in their respective OA for both contract programs. The contracts offer- responsive, rapid engineering and construction capabilities for a wide range of engineer missions. The GCCC is a construction-oriented contract with incidental facility/BOS, mobilization, and material liaison functions that may be used worldwide, including in the United States. Major capabilities include, but are not limited to, planning, design, and construction. The GCSC is service-oriented with incidental construction that may be used worldwide, including in the United States. The capabilities of this contract are far ranging, including, but not limited to, air operations; facility/base support; galley; morale, welfare, and recreation; environmental; and health care services.

(c) **Air Force.** AFCAP is a cost-plus award fee contract established to augment engineer and services capabilities to support worldwide contingency planning and

**LOGISTICS CIVIL AUGMENTATION PROGRAM SUPPORT IN BOSNIA**

**In order to complete all the Bosnia camps by March 1996, Brown & Root was integrated with Army engineer units, Navy Seabees, and Air Force RED HORSE [Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer] engineers on a fast-tracked scenario. Specifically, Brown & Root's tasks were to:**

**Set up 12 camps;**

**Provide flooring materials for the Army, Navy, and Air Force engineer units charged with setting up all other camps;**

**Upgrade all camps to meet the Army's sustaining base standards with hard-back tents or modular buildings (in areas with the harshest conditions);**

**Provide all basic life-support services, such as food services, laundry, water delivery, garbage collection, and shower and sanitary facilities; and**

**Provide other logistics services, such as transportation and cargo handling, vehicle maintenance and washing, port operations, road repair and maintenance, and storage yards.**

**SOURCE: LOGCAP: Providing Vital Services to Soldiers, *Engineer*, March 1997**

deployment operations. The AFCESA at Tyndall Air Force Base, Florida, manages AFCAP. AFCAP may augment a base sustaining force at any Air Force base where engineer and services forces have been deployed. Furthermore, AFCAP can provide construction support at existing overseas locations and can support base recovery operations as a result of natural disasters, accidents, or terrorist attacks. Major capabilities include the full scope of engineer capabilities and logistics, with the exception of EOD and flight line fire and emergency services including aerospace rescue firefighting, to include the following:

1. Professional engineering services and infrastructure support, including architectural and engineering design, maintenance, repair, and construction.

2. Emergency incident management, firefighting, technical rescue, emergency medical care, HAZMAT response, weapons of mass destruction (WMD)/terrorism response, EM capabilities, facility hardening, dispersal, obstacles, redundancy measures, reconstitution of assets, and non-environmental site restoration.

3. Environmental management services including permits and HAZMAT and/or waste management and disposal.

4. CSS capabilities and logistics to include food service, troop support, lodging, laundry, fitness, and recreation (excludes mortuary affairs and field exchange).

*For further guidance on construction contracting and civilian augmentation programs, refer to Appendix C, "Contract Construction Agents."*

g. **Environmental Considerations**

(1) **Shared Responsibility.** Successful planning and execution of joint engineering operations requires ever-increasing attention to environmental considerations. Environmental considerations extend far beyond the engineer and logistic communities. Operators, intelligence staffs, medical representatives, legal counsel, and other members of a JFC's staff have a shared responsibility to ensure that environmental considerations are incorporated into operation planning. An environmental site assessment (i.e., a multi-branch effort to include engineering and medical expertise at a minimum) should be conducted prior to deployment whenever possible to document current/known environmental conditions of specific sites. This provides a screening mechanism and will also support the completion of an EBS for each of those sites. Coordination with preventive medicine functions assessing environmental health risks to deployed personnel is essential. Joint force engineers develop annex L (Environmental Considerations) to OPLANs in coordination with other staff elements and the JEMB, to include medical, logistics, operations, intelligence, legal, and CA. Coordination with other DOD agencies, such as the Defense Logistics Agency (DLA), and other US agencies, such as DOS and the Department of Energy, may also be necessary. In the event other nations are involved in the operations, coordination with appropriate multinational counterpart staff agencies must also be considered. Requirements related to environmental considerations can be divided into overseas requirements and requirements applicable in the United States and its territories, and are discussed in detail in Appendix D, "Environmental Considerations."

(2) **Environmental Planning.** Executive Order (EO) 12114, *Environmental Effects Abroad of Major Federal Actions,* and DODD 6050.7, *Environmental Effects Abroad of Major Department of Defense Actions,* provide direction and policy guidance regarding environmental planning when major federal actions have significant effect on the environment outside the United States and its territories. For operations within the United States, its territories, and jurisdictions, environmental planning must be accomplished as required by the National Environmental Policy Act, the implementing regulations of the Council on Environmental Quality, and DODI 4715.9, *Environmental Planning and Analysis*. In cases of emergency or where national security interests are involved, DOD actions may be exempted from environmental planning requirements or applicable requirements may be modified. Legal counsel should be consulted to determine applicable requirements and confirm DOD actions are lawful. USACE, NAVFAC, and AFCEE have capabilities (either deployable or through reachback) available to the joint engineer to assist with environmental planning with the JOA.

(3) **Natural and Cultural Resources.** Joint operations have the potential to adversely affect natural and cultural resources. As required by law, and as practicable and consistent with operational requirements, planners should identify these resources, including endangered or threatened species, historic and archeological resources, and other cultural or natural resources in the OA, whether overseas or in the United States, so that appropriate action can be taken to minimize potential damage.

**ENVIRONMENTAL ISSUES ASSOCIATED WITH OPERATION ENDURING FREEDOM**

**In the first year of deployment to Afghanistan and Uzbekistan, US forces faced numerous challenges in protecting the environment from the effects of the coalition footprint and protecting the force from existing environmental hazards. These hazards, in many cases, were the result of years of inconsistent application of environmental laws, regulations, and programs by the host nation.**

**Environmental guidance was provided from three command levels: the combatant commander, the coalition joint task force commanders, and the local base operations commanders. Environmental considerations were integrated into daily activities from the base camp design stage to present-day operations.**

**As force protection infrastructure improved, such as the establishment of a fixed perimeter, more effort was focused on environmental issues. These issues included waste stream and wash rack operations, construction of landfills, and construction of hazardous waste and used oil collection points. Environmental conditions that presented an acute health hazard received the highest priority at all base camps and were quickly resolved. This included construction of consolidated landfills and information messages to help soldiers avoid potential chemically contaminated sites.**

**Engineers conducted and maintained an environmental baseline survey (EBS) for use in base camp planning and as a basis for comparison against a site closure report. Both the EBS and site closure report are critical documents that record activities of US forces and are maintained with the resident facility engineer team, which doctrinally assumed the role of the deployed public works directorate.**

**SOURCE: *Engineer,* October–December 2003**

*For further guidance on environmental considerations, refer to Appendix D, "Environmental Considerations."*

h. **Host-Nation Support.** HNS can be an important, and in some cases an essential source of support for US joint forces or multinational forces (MNFs). During the Cold War, deploying US forces planned on predeployed equipment and supplies in mature theaters with HNS. Since then, deployments have become increasingly expeditionary, with greater dependency on HNS and a greater engineering effort to develop secure ports and forward operating bases. Through national planning channels, HNS and contingency mutual support agreements are developed to facilitate joint operations. Whenever possible, available and suitable HNS should be considered as an alternative to deploying major or specialized support. HNS may also increase the timeliness of response to a developing situation. While HNS may be encouraged for common support items, the use of HNS must be weighed against mission requirements. The JFC must carefully balance the advantages of using HNS with the danger of establishing dependence on potentially unreliable sources. See Figure III-

11 for HNS areas. In addition, HN military engineer forces may supplement joint force engineer assets.

*For guidance on environmental considerations during North Atlantic Treaty Organization (NATO) operations, refer to Allied Joint Publication 3.12,* Allied Doctrine for Engineer Support to Joint Operations, *and NATO Standardization Agreement 2238.*

(1) **Host-Nation Engineer Considerations**

(a) **Deployment Preparations.** Joint force engineers should review HNS agreements, identify logistic support items requiring negotiation, and coordinate additional support requirements through the joint force engineer.

(b) **APODs and SPODs.** Engineering support includes the evaluation of the quantity and type of HN facilities available for offloading and staging of personnel, equipment, and supplies. Engineering support operations may include the construction, improvement, and maintenance of APOD, SPOD, and RSOI facilities. Because existing HN capabilities can vary widely, especially at APODs, SPODs, and RSOI facilities, military engineers may supplement HNS through the civilian augmentation programs.

(c) **Government Infrastructure.** A viable HN government infrastructure at all levels for stability during negotiations and coordination of logistics is essential. Countries without a government infrastructure may provide limited support, resulting in strained engineer assets. To maximize the logistic effort, HNS functions should be centralized and coordinated within the J-4.

(d) **HN Forces and Personnel Considerations.** Doctrine, operational competence, training, experience, types and quality of equipment, and types of units can vary


**Figure III-11. Host Nation Areas of Support**

substantially among HN military engineer forces. To facilitate matching missions with capabilities, the joint force engineer will implement measures to assess the capabilities, strengths, and weaknesses of HN engineer forces. Where HN engineer forces have unique or special capabilities (i.e., engineering capabilities specifically adapted to the local environment), those capabilities should be appropriately integrated into operations. Interpreters and advisory personnel can often facilitate interoperability, provide communications links among engineer forces, and share area expertise of HN needs and reactions to joint force engineering projects.

(e) **Infrastructure.** Infrastructure construction issues should be factored into the development of host-nation support agreements (HNSAs). The joint force engineer and staff, in coordination with the staff judge advocate (SJA) or legal officer and civil-military staff officer, can assist the JFC in identifying facility construction and other issues to address with the HN. These aspects are critical in terms of support to deploying forces and costs of construction to the USG. HNSAs should include the authority for the JFC and joint force engineer to coordinate directly with the HN for support, acquisition, use of facilities and real estate, and facility modifications necessary to meet applicable UFCs.

(f) **Duties and Taxes.** The status-of-forces agreement (SOFA) and/or HNSA should address the duty and tax status of USG contractors. US contractors are critical for support in joint and multinational operations for equipment maintenance, logistic services, and construction. Special provisions within the SOFA or HNSA may need to be added to eliminate import and export duties, value-added taxes on goods acquired by or on behalf of the US, and HN corporate taxes.

(g) **Host-Nation Resources.** Access to the HN labor, equipment, construction materials, infrastructure, and services should be delineated in the HNSA. Balance between reducing costs to the United States and hyper-inflating the local economy is an essential consideration. In consultation with the CMO officer, the joint force engineer and staff should take measures to avoid exposing HN personnel to possible HN liability, such as environmental management.

(h) **DOD Civilians and Contractor Personnel.** The SOFA should address the status afforded to DOD civilians and US contractor personnel. If the status of DOD civilians and US contractor personnel is not adequately addressed in the SOFA, there will be increased risk of disruption to operations.

(2) **Redeployment and Transition from Military Engineers to Contractors and HNS.** Redeployment can be a significant engineer challenge, particularly when terminating overseas contingencies. In planning for redeployment operations, the JFC should consider the priority for redeploying units. Engineers support force redeployment through the preparation of facilities for retrograde, completion of construction projects, and refurbishment and turnover of property and real estate to the HN. Additionally, engineers terminate leases and facility contracts, construct wash racks and other redeployment facilities, prepare collection points, vehicle and equipment holding areas, and customs inspection points, and coordinate for the safe disposition of HAZMAT and hazardous waste (HW). Even without follow-on missions, engineers are among the last to leave. As engineer

forces begin to redeploy, the CCA and its contractors remain in the OA to complete engineering tasks. Transition planning should be fully coordinated between the joint force engineer and staff, military engineering forces, the CCA, and the HN. Important engineering planning considerations include the following:

(a) **Identify Projects.** The joint force engineer and staff should identify ongoing projects and maintenance responsibilities to be assigned to the CCA or HN for continuation and/or completion. The CCAs are experienced in using contractors to complete military engineering projects, provide facilities to support redeployment of forces, and engage in HN infrastructure recovery activities.

(b) **Funding Requirements.** Funding requirements for projects will need to be coordinated with the CCA and HN. HN infrastructure projects may be funded by international development bank loans, foreign aid, or the HN's own funds. The CCA may provide technical assistance to the HN as part of the transition. Often, the CCAs are used by USG agencies and others to oversee expenditure of funds provided for HN infrastructure projects.

(c) **Transition of Engineer Tasks to the HN.** Key engineering planning considerations for transition of engineer tasks to the HN include:

1. HN technical capabilities.

2. HN ability to handle the additional workload.

3. HN ability to fund the work.

(d) **Transition of Engineer Tasks to the CCA.** Key engineering planning considerations for transition of engineer tasks to the CCA for contractor execution include the following:

1. CCA management and contract funding.

2. Security of contractor personnel.

3. Status of contractors in the HN after US forces redeploy.

4. CCA relationships in the HN with respect to the GCC and the US ambassador.

i. **Interagency Support.** Because of the leverage of their wide range of expertise and funding resources, USG agencies can support the JFC's mission objectives and can greatly expand the capabilities of the joint force. This is true whether the response is international in nature or within the United States (e.g., during incident response in the United States, engineers might provide support in the cleanup, which requires close coordination with USG agencies). Coordination and a clear understanding of the commander's intent are critical when synchronizing operational efforts involving multiple USG agencies. The JFC will be required to coordinate with USG agencies in order to achieve overall US objectives. Joint

force engineers should have an understanding of the capabilities of these agencies and their direct support functions. While USG agencies may increase the resources engaged in a given operation, they may also increase and complicate the coordination efforts. Stability operations are now regarded as a core US military mission and are given priority comparable to combat operations. Since integrated civilian and military efforts are key to successful stability operations, DOD engineer personnel must be prepared to conduct or support stability operations by working closely with US departments and agencies, foreign governments and security forces, global and regional international organizations, US and foreign NGOs, and private sector individuals and for-profit companies. Following are some of the USG agencies which joint force engineers will interface with:

(1) **Joint Interagency Coordination Group.** The JIACG is an interagency staff group that establishes regular, timely, and collaborative working relationships between civilian and military operational planners within a CCMD staff. Composed of USG civilian and military experts accredited to the CCDR and tailored to meet the requirements of a supported CCDR, the JIACG provides the CCDR with the capability to collaborate at the operational level with other USG civilian agencies and departments. JIACGs complement the interagency coordination that takes place at the strategic level through the National Security Council System.

(2) **Department of Defense Agencies.** DOD has a major role in the interagency arena. It interacts with almost every government agency and department and is involved in interagency coordination at the strategic, operational, and tactical levels.

(a) **Defense Logistics Agency.** DLA is a logistics combat support agency whose primary role is to provide supplies and services to US military forces worldwide. In addition, DLA provides contract, administrative, technical, and logistic services to the joint force. With respect to engineering support operations, DLA provides the following:

1. Conducts a logistics sustainability analysis of the CCDR's OPLAN.

2. Manages Class IV construction materials, including procurement, distribution, and resupply support.

3. Manages the reuse of materials.

4. Conducts bulk map and NGA hard-copy geospatial distribution.

5. Establishes capabilities and manages the disposal of HW and personal property.

(b) **National Geospatial-Intelligence Agency.** The NGA provides essential GI&S to the JFC. With respect to engineering support operations, NGA can provide the following:

1. Digital surface models (e.g., digital terrain elevation data [DTED] and higher resolution terrain elevation data).

2. Feature data (e.g., digital nautical charts, digital aeronautical flight information file, and mission specific data).

3. Precise positioning (e.g., digital point positioning database, targeting support).

4. Digitized maps and charts (e.g., compressed ARC digitized raster graphics, eCHART).

5. Orthoimagery (e.g., controlled image base).

6. Other standard and nonstandard maps, charts, and specialized geospatial products and services.

(c) **Defense Contract Management Agency.** The DCMA provides deployable contract administration services, primarily for large civil augmentation program contract work such as seen in LOGCAP in support of Operation IRAQI FREEDOM.

(3) **Other US Government Agencies**

(a) **Department of State.** DOS is the lead agency responsible for planning and implementing the foreign policy of the United States as directed by the President. DOS is usually the first USG agency to respond to international crises, including those that may require significant engineering support. DOS also conducts negotiations and concludes agreements with en route and OA countries, including overflight/access agreements and SOFAs, which can serve to facilitate the deployment and employment of the joint force, including engineering assets. In a foreign country, the US ambassador is responsible to the President for directing, coordinating, and supervising all USG elements in the HN except those under the command of a CCDR.

(b) **US Agency for International Development.** USAID is the USG agency that implements America's foreign economic and humanitarian assistance programs. USAID is the principal US agency to extend assistance to countries trying to escape poverty, engaging in democratic reforms, and recovering from disaster.

(c) **Office of US Foreign Disaster Assistance (OFDA).** When disasters strike in foreign countries, the response within USAID is led by the OFDA, which coordinates response to international disasters and is organized under the USAID Bureau for Democracy, Conflict, and Humanitarian Assistance. When a disaster occurs, US representatives to that country determine if there is a need and desire for US assistance. If US assistance is requested, OFDA, the US embassy, and the USAID mission in the affected country determine what OFDA assets are best suited for the specific disaster. Military engineers are often requested in the response teams.

(d) **Federal Emergency Management Agency (FEMA).** FEMA is part of the Department of Homeland Security and is the USG's lead agency for coordinating federal EM activities within the United States and its territories. The director of FEMA has the authority to establish policies and coordinate civil defense and civil emergency planning, management,

and mitigation, including coordination of assistance from other federal executive agencies. FEMA coordinates the activities of the USG, military, and civilian engineering organizations to ensure effective assistance and prevent duplication of effort. FEMA prioritizes the use of engineering resources in support of emergency management activities.

*A more extensive description of the engineer support provided for homeland security is provided in Appendix A, "Engineer Support to Homeland Security."*

(e) **Environmental Protection Agency (EPA).** EPA has responsibilities for administration and enforcement of laws related to environmental media (air, water, and land) in the United States and its territories. After consulting the joint force SJA, the joint force engineer and staff may need to consult with the EPA regarding environmental compliance issues for operations under the purview of the EPA. See Appendix D, "Environmental Considerations," for an outline of specific environmental considerations and guidance for the JFC and staff when planning and conducting joint operations and exercises.

(4) **Nongovernmental Organizations Coordination.** In addition to USG agencies, the joint force engineer and staff may have to coordinate engineering activities with NGOs. Where long-term problems precede a deepening crisis, these organizations are frequently on-scene before the military. Agreements may be made at the strategic level, but the JFC interfaces and coordinates with these organizations at the operational level. Agreements should be established through negotiation and be in a written memoranda of understanding or terms of reference to ensure understanding and avoid confusion. Agreements may have significant legal implications on using military personnel and equipment and must be negotiated IAW DODD 5530.3, *International Agreements.* In all cases, authority must exist for direct coordination. Once coordinating authority is granted, coordination and negotiations are normally conducted through the joint force's CMOC. NGOs may have unique engineering capabilities that can be leveraged as part of the overall operational effort. One example of great interest to engineers is their ability to conduct HDO. These organizations may also request extensive military engineer support for their activities and programs. It is critical to establish an effective engineer liaison in the CMOC to coordinate and execute engineering support with these organizations.

*For further guidance on interagency coordination, refer to JP 3-08,* Interorganizational Coordination During Joint Operations, *and JP 3-57,* Civil-Military Operations.

j. **Multinational Support.** The US often participates in multinational operations with other nations within the structure of a coalition or alliance. A coalition is an ad hoc arrangement between two or more nations for common action. An alliance is the result of formal agreement between two or more nations to further the common interests of the members. Multinational operations may include combat and are often conducted during contingency operations. Each multinational operation will create the command structure that will best meet the objectives of the participating nations. The arrangement may include placing US forces under the OPCON of a foreign commander.

(1) **Intergovernmental Organizations.** IGOs are usually equipped with the resources and expertise to participate in complex multinational operations, allowing joint

force engineering projects to be more thoroughly planned and resourced. A JFC and a joint force engineer and staff will coordinate within the agreed-upon command structure of an MNF to achieve MNF engineering goals.

(2) **Organizational Considerations.** The organization and mechanisms used for C2 within an MNF depend on the structure of the multinational operation. Coalition or alliance forces will require a multinational force commander (MNFC) and may require a MNF engineer and staff to plan and coordinate engineer efforts. In multinational operations, the MNF engineer is responsible for coordinating all engineering operations that affect the MNF. MNF engineers will be responsible for a broad range of operational and tactical level engineer tasks. Control of engineer assets is dependent on the MNF arrangement in theater.

(3) **Responsibilities of the MNF Engineer.** Whatever the specific coordinating organization, it is the responsibility of the MNF engineer and staff to conduct centralized planning and decentralized execution of the engineering effort and to ensure a unified and efficient use of engineering resources for common support of MNF operations. Close cooperation is ensured when the US and its MNF allies preplan engineering activities that collectively support the MNFC's intent. Specific planning considerations for the joint force engineer and staff for multinational engineer plans and operations include:

(a) Identify and prioritize requirements for engineer projects that support MNF operations.

(b) Work with participating nations to obtain engineer capabilities to execute common engineer projects.

(c) Arrange local engineer capabilities, if available.

(d) Prioritize and centrally coordinate the procurement by nations of engineer materials for both common and national specific engineer projects.

(e) Establish funding policies and agreements to finance projects.

(f) Identify standards to be achieved in the construction of facilities.

(g) Task units provided by nations for common infrastructure projects.

(h) Employ engineer LNOs with participating nations and at critical geographic locations.

(i) Develop multinational command relationships and coordination cells that will assist the MNF engineer and JFC in leveraging engineer capabilities throughout the OA.

(4) **JFC Considerations.** Working within an MNF may result in unique challenges for a JFC. The joint force engineer and staff must determine what engineering support can be provided by other participating nations, what engineering support will be required from US forces by the participating nations, and what the overall facility requirements will be for the MNF.

(a) **Engineer Coordination Element.** To assist the MNF engineer, an engineer coordination element may be established. In a US-led multinational operation, this coordination element will normally comprise a staff element within the combined force logistics staff and will usually involve a number of functionally specific joint engineer boards—for example, JFUB, JCMEB, and JEMB. These engineer boards would be expanded with personnel from multinational partners to form combined organizational elements with multinational engineer coordination functions. In NATO doctrine, the central coordinating organization for engineering is called an engineer coordination cell (ECC) and may directly support the force engineer, who is a special staff officer under the MNFC. If joint engineer boards have been established in support of US forces in a NATO operation, they should coordinate closely with the ECC. The theater engineer may also establish regional/component subordinate offices to assist the ECC in coordinating multinational engineering activities.

(b) **Engineering Capabilities.** The engineering capabilities of other MNF nations often differ based on doctrine, organization, training, leader development, equipment, history, and budget. In a US-led multinational operation, the joint force engineer and the engineer staff must consider these differences when assigning missions and conducting operations. For example, several nations have engineers that are experts in mine detection and removal. Others focus on specific missions, such as disaster relief.

1. Missions assigned to MNF partners should be consistent with their capabilities. The joint force engineer and staff should anticipate the requirement to augment those engineering forces.

2. MNF partners may lack an engineering capability. The joint force engineer and engineer staff should plan to provide engineering capabilities, as required.

3. Where participating forces have the capability for advanced construction, those engineering forces can be assigned major projects in support of the overall MNF. Those engineering forces will most likely support their own engineering requirements first.

(c) **Engineering Integration.** The basic challenge in multinational operations is effective integration and employment of all assets toward achievement of a common objective. The objective can be achieved through unity of effort despite disparate capabilities, equipment, and procedures. The following aspects should be considered in the planning process:

1. To reduce disparities among MNFs, engineering standards should be established once agreed to, and a certification process developed. These standards should include standards of materials as well as training, equipment, and procedures.

2. There are cases where international standardization agreements (ISAs) may already exist. For example, within NATO, the United States is party to a number of standard NATO agreements. In addition, the United States has signed other ISAs, such as the American, British, Canadian, and Australian Standardization Program (US Army), Air

Standardization Coordinating Committee (US Air Force), and Naval Quadripartite Standardization Program (US Navy), which require implementation as an allied common approach to conducting military engineering. These ISAs are authoritative directives for implementation by US forces and forces of other signatory nations operating as part of an alliance.

3. Standards and agreements are more difficult to establish and implement when operating within a coalition, as these are typically arranged in short timeframes for limited purposes. Usually, there is little time before deployment to establish these standards and agreements.

4. Identified engineering shortfalls should be satisfied by either bilateral or multinational support agreements prior to the deployment of forces. This aspect will require detailed coordination between prospective forces and the MNF.

(d) **Employment of Engineer Assets.** After a determination of the engineering tasks required to achieving the objectives, specific engineering tasks should be assigned to specific elements of the MNF based on an assessment of the capabilities of each nation's forces. If there are several elements that can complete a particular task, consideration should be given to assigning the task in a manner that ensures that all capable elements of the MNF can make a meaningful contribution.

*For further guidance on multinational operations, refer to JP 3-16,* Multinational Operations.

k. **Foreign Assistance.** In support of disaster relief efforts, the United Nations (UN), DOS, or OFDA within USAID may generate requirements for DOD assistance (e.g., **Operation UNIFIED ASSISTANCE,** 2004-2005 South Asian tsunami relief and recovery efforts). FHA is conducted to relieve or reduce the results of natural or man-made disasters or other endemic conditions such as human pain, disease, hunger, or privation that might present a serious threat to life or that can result in great damage to or loss of property. While all elements of the joint force are focused on providing immediate FHA to avert the loss of life, the engineering contribution is focused on logistic support, securing an area to allow relief efforts directed by other agencies to proceed, and projects that open LOCs and provide shelter, water, and the infrastructure to relieve human suffering and support life. Engineer rapid response capabilities and the ability of engineers to work with HN forces are especially effective in quickly mitigating human suffering and stabilizing the situation. The joint force engineer and staff must work closely with the servicing legal office and through the CMOC and with representatives of the HN and US embassy country team to formulate effective engineering support to the disaster relief efforts.

(1) **Humanitarian and Civic Assistance.** HCA programs are separate and distinct programs from FHA, specifically authorized under Title 10, United States Code (USC), Section 401. HCA are preplanned activities designed to provide assistance to the HN populace, conducted in conjunction with military operations and exercises. They are usually planned in advance and are included in a GCC's theater security cooperation planning as part of the theater campaign plan. These operations typically fulfill a unit-training requirement

(i.e., training and skills development) that incidentally creates humanitarian benefit to the local population. They are usually not in response to disasters, although HCA activities have been executed following disasters at the direction of the GCC. Specific engineer activities for which HCA funds can be used include construction of rudimentary surface transportation systems; water well drilling; construction of basic sanitation facilities; rudimentary construction and repair of public facilities (e.g., schools, medical clinics, community centers); training and skills development of HN personnel; and site surveys and development of construction plans.

*For further guidance on HCA, refer to JP 3-22,* Foreign Internal Defense.

(2) **Foreign Humanitarian Assistance.** FHA support provided by US forces is generally limited in scope and duration and is intended to supplement or complement efforts of HN, government agencies, NGOs, and IGOs. US military forces may be the only organization in the OA capable of providing assistance of a large magnitude. US military forces transition FHA support to civilian authorities as soon as possible. Requests for military support, including engineering support, should be initiated and coordinated through the CMOC or appropriate military/civilian authority established for coordination.

*For further guidance on FHA operations, refer to JP 3-29,* Foreign Humanitarian Assistance.

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# CHAPTER IV
## ENGINEER FUNCTIONS

*"My engineers can do anything. There just aren't enough of them."*

**Major General Raymond Odierno**
**Commander 4th Infantry Division, Operation IRAQI FREEDOM**

## 1. Combat Engineering

a. **Overview.** Combat engineering consists of those engineering capabilities and activities that support the maneuver of land combat forces and which require close support to those forces. Therefore, combat engineering activities are **focused on the tactical level of war,** though they can also contribute directly to the achievement of strategic and operational objectives. Most combat engineering activities are **planned and executed by a joint force's Service or functional components.** Even so, the joint force engineer must understand how combat engineering requirements are affected by the operational environment and the joint force's CONOPS and how combat engineering capabilities can affect a joint force's ability to execute the CONOPS. There are **three types** of combat engineering capabilities and activities: mobility, countermobility, and survivability. (Mobility, countermobility, and survivability also have broader meanings which encompass capabilities and activities that are outside the combat engineering function. This section focuses on their combat engineering application.)

(1) **Mobility.** Combat engineering mobility capabilities and activities assure the ability of land combat forces to maneuver. They only include tasks that meet the definition of combat engineering, and they typically include tasks associated with conducting **combined arms breaching operations**, **clearing operations**, and **gap crossing operations**; constructing and maintaining **combat roads and trails;** and performing **forward aviation combat engineering (FACE).** Joint forces should be prepared to encounter obstacles (including IEDs, mines, and other UXO) across the range of military operations. (Mobility also has a broader meaning which encompasses capabilities and activities that are outside the combat engineering function. For example, to ensure rapid global mobility, Air Force general engineers open, establish, and maintain airbases for mission generation and follow-on air operations after airbases are acquired from the HN or by forcible entry operations.)

*For additional information, see JP 3-15,* Barriers, Obstacles, and Mine Warfare for Joint Operations.

(2) **Countermobility.** Combat engineering countermobility capabilities and activities reinforce terrain to delay, disrupt, and destroy the enemy. Their primary purpose is to slow or divert the enemy, to increase time for target acquisition and fires, and to increase weapons' effectiveness. They only include tasks that meet the definition of combat engineering, and they typically include tasks associated with the development of **barriers and obstacles** and their integration with fires and with the maneuver of land forces. Countermobility supports the JFC's CONOPS by adding depth in space and time, attacking

the enemy's ability to maneuver its forces, and attacking the enemy's ability to execute its plan. Emplacement of large-scale barriers or obstacles will likely require support from general engineers.

*For additional information about barriers, obstacles, and mines, see JP 3-15,* Barriers, Obstacles, and Mine Warfare for Joint Operations.

(3) **Survivability.** Combat engineering survivability capabilities and activities enhance the protection of land combat forces. They only include tasks that meet the definition of combat engineering, and they typically include tasks associated with the construction of fighting and protective positions, recovery after attack actions, and tactical CCD. In most cases, survivability support is designed to reduce vulnerability to enemy fires and is a means to enhance force protection.

(4) While combat engineering mobility, countermobility, and survivability tasks are **primarily performed by combat engineers** organic to land combat forces, general engineers can sometimes assist them. However, the capabilities of general engineers limit them from performing those tasks requiring them to integrate their activities with the fire and maneuver of land combat forces or to operate as part of a combined arms team in close combat.

*For additional information about combat engineering, see Chapter I, "Joint Engineer Fundamentals."*

b. **Information and Intelligence Requirements.** The basic principles for engineer intelligence are the same at all levels: liaison with other elements that gather engineer technical information and intelligence, brevity, accuracy, and timeliness. Accurate and current intelligence is critical to combat engineering activities.

(1) **Engineer reconnaissance** is critical to all three types of combat engineering activities and must be integrated into the planning of mobility, countermobility, and survivability activities. Engineer reconnaissance in support of combat engineering may be tactical and/or technical in nature.

*For additional information about engineer reconnaissance, see Chapter I, "Joint Engineer Fundamentals," and Chapter III, "Engineer Planning."*

(2) **Evaluating the Terrain.** Combat engineering activities require a detailed understanding and evaluation of terrain, how it will affect operations, and how friendly and enemy forces may use it to their advantage. This requires accurate and current geospatial information. Even though most combat engineering activities are planned and executed by a joint force's Service or functional components, it is critical that the joint force engineer identifies geospatial IRs. Sources of geospatial information include the J-2, the GI&S officer (who can obtain NGA products and services), other staff functional elements (weather, medical, planners, etc.), Service geospatial capabilities (e.g., Army topographic units), and engineer reconnaissance.

(3) **History of the Operational Area.** Combat engineering activities require an understanding of the history of the OA. For example, foreign armies mark obstacles and minefields differently, and adversaries have different methods of employing mines and obstacles. An understanding of the joint operational environment must include knowledge of both symmetric and asymmetric methods and techniques used by adversaries, such as how adversaries use IEDs.

c. **Combat Engineer Reporting.** Through the reporting, recording, and marking of barriers, obstacles, and minefields, combat engineers are able to discern and identify enemy patterns, develop detection strategies, integrate friendly intelligence plans, and ensure the safety of friendly forces and civilians. Procedures for reporting, recording, and marking are in place for conventional minefields, scatterable minefields, enemy minefields, UXO, joint mine laying operations, and obstacles other than minefields.

*For additional information on reports, records, and marking, refer to JP 3-15,* Barriers, Obstacles, and Mine Warfare for Joint Operations.

d. **Other Considerations**

(1) **Offensive and Defensive Operations.** The requirements for combat engineering capabilities are highest during offensive and defensive land operations. When land forces conduct sustained offensive and defensive operations, combat engineering requirements often exceed organic combat engineering capabilities, requiring augmentation by additional combat engineers and severely limiting the availability of combat engineers for general engineering tasks. When offensive and defensive operations diminish, combat engineering requirements diminish also, often making combat engineers available to perform selected general engineering tasks.

(2) **Forcible Entry Operations.** In forcible entry operations, the joint force will be faced with natural and man-made obstacles intended to restrict or halt movement and allow the enemy to mass its forces and repulse the assault. The role of combat engineering in forcible entry operations is to keep the force moving forward and protect the force. Combat engineers focus on support to the combined arms force and its conduct of close combat as the assault forces are inserted. Initially, mobility is the primary focus to support the needs of the maneuver commander and ensure the seizure and control of the entry site. Special consideration will be given to techniques for breaching obstacles and clearing beaches, ports, roads, and airfields of obstacles (including mines, UXO, and IEDs), to tactical gap crossing, for repairing airfields for friendly use, and for hasty airfield construction to enhance the mobility of assault and follow-on forces. The enemy will contest the insertions and counterattack to recover them. This will require combat engineers to perform countermobility and survivability tasks early in the insertion. Combat engineers facilitate insertion of assault forces and prepare for onward movement to the objective.

*For additional information on forcible entry, refer to JP 3-18,* Joint Forcible Entry Operations.

(3) **Amphibious Operations.** In an amphibious operation, combat engineers ensure their combat maneuver units are provided with terrain analyses and other geospatial products and analysis during the planning process and throughout the conduct of the operation. This includes location suitability evaluations and level-of-effort estimates for various amphibious scenarios and sites. Intelligence (or geospatial elements) units provide imagery and maps, while hydrographic surveys are typically provided by Navy and selected Marine or Army reconnaissance assets. Navy assets clear and breach natural and man-made obstacles from the three and one-half fathom curve (a depth of 21 feet) to the high-water mark. Army or Marine combat engineers clear and breach natural and man-made obstacles from the high-water mark to the objective area as part of their combat engineering tasks. Engineers are critical in developing and maintaining beach support areas and beach throughput and enhancing unit RSOI. Engineers continue supporting force projection from the sea by sustaining the logistic operations ashore. As the lodgement expands, general engineers are brought in to free combat engineer units to move forward in support of combat maneuver forces.

(4) **Engineer and EOD Considerations.** The joint term for UXO includes mines and minefields; however, the breaching, neutralization, or large-scale clearing of land-based mine hazards is the responsibility primarily of combat engineer units and special units of the Navy. The neutralization or clearing of all other UXO hazards, to include IEDs and booby traps, is the responsibility primarily of US military EOD units. Each Service has EOD organizations, personnel, and equipment that can perform a variety of common Service EOD capabilities. The role of each unit is unique, but similar, and necessitates close coordination between combat engineer and EOD units in the planning process and throughout the OA. The linkage of EOD and combat engineers at the tactical level to support combat operations is essential to the conduct of combat engineering and provision of complete support to combat maneuver forces. The tremendous increase in IEDs/booby traps and other related UXO hazards encountered by combat maneuver forces dictate a broader participation by EOD in tactical operations. Combat engineers within the task-organized clearance force detect and mark EHs, and they then reduce the hazard or allow an EOD unit to respond appropriately based on mission variables and the commander's guidance. Combat engineers do not possess the technical skills to disarm or render safe explosive ordnance and devices.

(a) **Assisting EOD Units.** UXO and other hazardous devices (e.g., IEDs) in a theater will often threaten military forces and operations. UXO and IEDs threaten not only military forces, but also civilians, who are unfamiliar with military ordnance. While Service components usually deploy with, and are supported by, their own EOD assets, the number of these assets is very limited and in high demand. In many situations, the GCC, through his directive authority for logistics, can achieve economy of effort by organizing his EOD forces using common servicing. Common servicing may allow the JFC to provide more efficient and effective EOD support to the joint force, depending upon the situation. The joint EOD force could also include integration of multinational EOD forces in a joint/multinational EOD task force. EOD forces are the only personnel authorized to render safe UXO, to include IEDs and booby traps.

(b) **Coordination.** Operational and tactical considerations for engineers and EOD units should include: LNOs working together in the planning process; engineers

exchanging reporting and tracking information on mines, UXO, IEDs, and booby traps; establishing a training scenario to teach mine awareness and the most current procedures; and using combat engineers to detect, mark, and record UXO in concert with the tracking system for other similar obstacles.

(5) **Humanitarian Demining.** Because of the threat to peace and safety, HDO have become a significant disarmament and peace operations activity. Disarming may include seizing ammunition, collecting and destroying weapons and supplies, closing weapons and ammunition factories, and preventing resupply. Demining is ultimately an HN responsibility; however, the US promotes its foreign policy interests by assisting other nations in protecting their populations from landmines through mine awareness education and training of HN personnel in the surveying, marking, and clearing of mines. Engineers do not remove mines, but will assist and train others in demining techniques and procedures. EOD personnel may participate in destroying UXO. Special forces, CA, and military information support operations personnel are the primary participants in the execution of the GCC's HDO program. EOD and engineer personnel are also included in these programs and integrated into operational training missions, mine awareness education, and most importantly, training of HN personnel in the surveying, marking, and clearing of mines.

*For additional information on barriers, obstacles, and mines, refer to JP 3-15,* Barriers, Obstacles, and Mine Warfare for Joint Operations.

## 2. General Engineering

### a. Overview

(1) General engineering consists of those engineer capabilities and activities, other than combat engineering, that modify, maintain, or protect the physical environment. As shown in Figure IV-1, general engineering is a very diverse function often involving horizontal and vertical construction, but also encompassing numerous specialized capabilities. General engineering often is a supporting or sustaining operation, however, the commander's intent may dictate that it be the supported function, for example in recovery, reconstitution, or reconstruction operations. General engineering operations can encompass large-scale tasks requiring detailed design and logistic support as well as expedient operations in environments across the range of military operations. General engineering tasks are usually resource and time-sensitive, demanding a high degree of preplanning and control to effectively manage the limited general engineering resources.

(2) **Strategic and Operational Roles.** General engineering support is closely linked to the strategic and operational levels of war, and vital to the successful attainment of national security objectives.

(a) **Strategic Role.** General engineering operations are conducted to prepare an OA for future joint operations. Engineering operations are planned and conducted in support of a CCDR's strategic concepts, as well as in support of crisis response and limited contingency operations. Support includes the improvement of infrastructure, construction of bases, and activities to support joint and multinational operations. General engineering

## GENERAL ENGINEERING CAPABILITIES AND ACTIVITIES

- **FACILITIES. Construction, repair, modification, maintenance, and operation of facilities (often related to lines of communications, bases, aerial ports of departure/seaports of departure, infrastructure, force protection, or camouflage, concealment, and deception). Examples include:**
  - **Roads**
  - **Airfields**
  - **Bridges**
  - **Bases and camps (including airbases, expeditionary base camps, etc.)**
  - **Buildings**
  - **Seaports**
  - **Utility systems**
  - **Railroads**
- **SPECIALIZED SUPPORT. Examples include:**
  - **Fire and emergency services**
  - **Explosive hazard disposal (including explosive ordnance disposal)**
  - **Chemical, biological, radiological, nuclear, and high-yield explosives defense**
  - **Civil-military operations**
  - **Construction contracting, engineering support contracting, and engineering technical support**
  - **Facilities engineering and management**
  - **Water well drilling**
  - **Concrete and asphalt production and quarry operations**
  - **Power generation and distribution support**
  - **Environmental support operations**
  - **Real estate acquisition and management**
  - **Airfield damage repair**
  - **Support to joint logistics over-the-shore**
  - **Disaster preparation and civil support**
  - **Disaster preparation and chemical, biological, radiological, and nuclear response**

**Figure IV-1. General Engineering Capabilities and Activities**

facilitates strategic deployment of the joint force to reception, staging, and marshalling areas and supports pre-positioning through various contracting methods, facility construction to store material, and real estate management. Exercise-related construction and humanitarian and civic assistance projects and engineer assessments often provide significant strategic leverage in many countries. General engineering projects enhance the ability to project and sustain combat power. Due to their large scope, these projects are typically programmed and constructed during peacetime.

(b) **Operational Role.** General engineering operations support the JFC's CONOPS and enhance logistic support in the OA. General engineering support addresses major facilities, construction policies, environmental considerations, and allocation of general engineering resources in support of mobilization, deployment, employment,

sustainment, redeployment, and demobilization of the joint force across the range of military operations. CCDRs may exercise directive authority for logistics to ensure the effective use of limited general engineering resources, to include the reallocation of these resources between Service components to achieve strategic and operational goals.

*For further guidance on Service capabilities, refer to Appendix B, "Service Engineer Organizations and Capabilities."*

b. **General Engineering Throughout the Range of Military Operations.** General engineering operations are conducted throughout the range of military operations and will vary by type and level of effort depending on the type of operation conducted. Multiple joint operations occurring simultaneously within an AOR may have different general engineer requirements. Major combat operations may occur or be initiated while transitioning to stability operations. General engineer units must be flexible and be prepared to transition from activities supporting combat operations to activities supporting stability operations or from stability operations back to combat operations. General engineers may be required to perform selected combat engineering tasks.

(1) **Major Operations and Campaigns.** General engineer activities during major operations and campaigns ensure theater access, sustain operations, protect the force,

**ENGINEER UNITS HELPING TO REBUILD SOUTH ASIA'S INFRASTRUCTURE**

**Various engineer units were helping to improve land access to hard-to-reach areas and to clear debris after the tsunami that struck South Asia on December 26, 2004. The US Army Corps of Engineers (USACE), Navy Seabees, a Marine engineer battalion, Air Force airfield pavement experts, even a US Coast Guard environmental strike team, joined forces in the massive effort.**

**The Combined Support Force 536 engineer team's main goal is to develop a plan to help facilitate the flow of supplies to those who need it. The engineer team consists of Naval Mobile Construction Battalion (NMCB) 40 in Indonesia and the NMCB 7 in Sri Lanka, as well as the Marine Corps' 9th Engineer Support Battalion. The engineer battalions brought their typical equipment, such as bulldozers, backhoes, and dump trucks. The Navy's Underwater Construction Team 2 is on its way and another 270 Seabees are now in Okinawa in a "ready status." USACE technical experts are on hand, as well as expeditionary construction unit survey teams are headed to Indonesia and Thailand.**

**In Indonesia, with as many as 30 to 40 bridges out and much of the road running down Sumatra's west coast washed away, the engineers had to clear and repair roads and bridges to get supplies to remote areas.**

**SOURCE: Pacific Stars and Stripes**
**January 13, 2005**

facilitate maneuver of forces, and include: construction and upgrade of ports, airfields, and JRSOI facilities; construction and repair of interconnecting routes; repair of ports, railroads, pipelines, and other assets; construction of bridging; construction of enemy prisoner of war facilities; construction of hardened facilities; construction of decontamination facilities; and tent and base camp construction. Engineer activities vary by phase, as follows:

(a) **Shape.** General engineering activities during the shape phase, such as improving HN infrastructure and preparing of overseas bases and facilities to support force deployment, help prepare the potential OA, shape perceptions, and influence the behavior of both adversaries and allies.

(b) **Deter.** General engineering operations during the deter phase prepare the OA. Successful accomplishment of general engineering support is essential to maintain the schedule for force deployment and employment, as contained in the OPLAN and/or OPORD and TPFDD documents. One of the principal general engineering tasks during this phase is to establish advanced bases. Advanced bases support the reception, beddown, and employment of personnel, equipment, and logistics. Engineers may also be tasked to establish ISBs. While these bases may be identified in OPLANs and OPORDs, final placement of bases will depend on an evaluation of mission requirements, threat level, supporting infrastructure, expected duration of the deployment, and specific weapon system requirements. Support could be required from geospatial engineering, ground maneuver forces, naval vessels, aircraft, space support, or information systems.

1. **Resources.** Advanced base development relies on the resources made available from pre-positioned sources, HN agreements, local contracting for existing facilities and infrastructure, multinational assistance, and deployed specialized teams and equipment. These resources can include billeting sets, vehicles, power generation systems, and consumable supplies.

2. **General Engineering and Service Capabilities.** General engineering supports advanced base development by the following means: constructing, repairing, and maintaining facilities for staging and force beddown facilities; providing systems improvements in support of JRSOI and JLOTS; providing potable water and utility support; erecting bridges; installing bulk fuel and distribution systems; erecting prefab shelters, to include collective protection systems; analyzing existing force protection capabilities and recommending areas requiring improvement to ensure protection of the force; and repairing and maintaining airfield pavements. Advanced base development includes construction of facilities in support of rest and refit sites, airfield operations, and base camps for the joint force in the conduct of crisis response and limited contingency operations such as FHA, disaster relief, and peace operations. General engineers enhance the survivability of the joint force by recommending to the JFC essential construction in support of force protection measures (e.g., hardening of essential facilities and utilities).

(c) **Seize Initiative**

1. General engineering support operations during the “seize initiative” phase focus on providing the facilities and infrastructure systems necessary to move, receive,

and bed down deploying forces. These support operations include JRSOI, JLOTS, and real property support, not only in the OA, but also at locations within the United States and at en route support sites. In noncombat operations, such as humanitarian relief operations, engineers can provide immediate assistance to help resolve the crisis.

2. **Joint Reception, Staging, Onward Movement, and Integration.** General engineering supports JRSOI through a variety of means, including improving or constructing advance bases, APODs, SPODs, highways, railroads, bridges, tunnels, and communications infrastructure.

a. **Engineering Considerations.** Initially, the engineer must facilitate the establishment of beddown standards for an operation. Once these standards are established, the engineer can determine and make arrangements to obtain the real property needed to support the reception, marshalling, and staging areas. Transportation and support infrastructure strongly influence the ability to rapidly execute JRSOI. An engineering survey of the transportation infrastructure will be needed to evaluate roads, bridge limitations and/or restrictions, rail lines, airfields, and tunnels. A robust infrastructure of modern air and sea ports, highways, railroads, and inland waterways will expedite the flow of forces, equipment, and logistic support. A lesser-developed or austere infrastructure can impede JRSOI, thereby slowing the deployment of the forces and may require an early deployment of support capabilities such as port opening teams and engineering units.

b. **General Engineer Support.** Engineers can perform expedient repairs to battle-damaged JRSOI infrastructure and support systems and subsequent operations to restore them to fully capable status. General engineering support involves evaluating the quantity and type of HN facilities available for offloading and staging of personnel, equipment, and supplies. Construction in support of force protection and antiterrorist measures in vulnerable marshalling and staging areas are also high-priority tasks.

*For additional information on JRSOI, refer to JP 3-35,* Deployment and Redeployment Operations.

3. **Battle Damage Repair.** Engineer support to battle damage repair is one of the focal points of recovery operations after hostile actions. General engineers have responsibility for battle damage repair of the various systems and support facilities required to sustain, maintain, and restore base operations. Engineers assess and repair those facilities deemed mission-essential by the JFC for continuing force projection. The joint force engineer, in concert with the joint force J-4 and J-3, develops and prioritizes the list of requirements and monitors repairs. The major engineer tasks of battle damage repair include rubble clearance, fire protection services, EOD capabilities, electrical power production and restoration, and infrastructure repair, particularly to airfields, port facilities, fueling and electrical systems, MSRs, defense emplacements, and key C2 facilities. General engineering tasks may also include emergency repair of damaged property or structures that may be used by the HN. More permanent repairs can be planned and executed as mission requirements warrant. Battle damage repair typically occurs during seize initiative, dominate, and stabilize phases of an operation. Selected battle damage repair priorities are listed in Figure IV-2.


**Figure IV-2. Battle Damage Repair Priorities**

(d) **Dominate**

1. General engineering support to sustainment is essential during this phase. General engineering operations can also support base defense, force protection, and battle damage repair.

2. In a linear, contiguous joint operation, general engineering tasks are typically performed at rear boundaries by theater-level engineer units. As the OA becomes less contiguous and more nonlinear, general engineering tasks are required in forward areas near front-line units. The impacts of the noncontiguous, nonlinear battlefield on general engineering tasks include:

a. Need for increased general as well as local work site security.

b. Increased number and length of LOCs and MSRs.

c. Increase in the facilities construction effort.

d. Augmentation of combat engineer units to conduct selected general engineering tasks.

e. Task organization general engineering assets in either a command or support relationship to a much lower level.

(e) **Stabilize.** General engineering operations in this phase help to sustain the force, operate bases, assist in coordination with the CA staff in infrastructure repair, and support force protection. Engineer and joint forces conduct these activities in support of the other USG agencies, NGOs, IGOs, and the HN. This support must be planned as part of combat operations as there is no clear break from combat operations to stability operations. Environmental support operations will often be required during stability operations. US

interests and objectives in the stabilization of the region determine the magnitude of engineer support to foreign governments.

(f) **Enable Civil Authority.** General engineering operations, established during the stabilize phase, continue. During redeployment of the force, engineers undertake preparation of facilities for retrograde, including close out of construction projects, refurbishment and turnover of property and real estate to the HN, construction of wash racks and other redeployment facilities, and preparation of collection points and coordination with DLA and other appropriate activities for the safe disposition of HAZMAT.

(2) **Crisis Response and Limited Contingency Operations.** Engineers often have a significant role in crisis response and limited contingency operations. The general engineering level of effort may be very high at the onset and decrease as the operation continues. Preparing for crisis response and limited contingency operations requires examining a broad range of potential missions. Early engineer assessments are critical to tailoring initial engineer assets and to supporting follow-on engineer operations. Sending only those engineer capabilities that are actually required reduces the burden on the deployment system as well as minimizing the engineer footprint on the ground in theater. As the operation continues, the general engineering effort may transfer to civilian contractors.

(a) **Military Support to Homeland Security.** Engineer forces play an essential role in homeland security operations.

(b) **Civil Support.** US military engineer units with their varied capabilities play a major role in responding to domestic emergencies and, when mobilized, closely coordinate with the lead federal agency in providing assistance. Typical general engineering missions in CS operations are listed in Figure IV-3. In many cases, joint forces will encounter National Guard engineers operating under the C2 of the state governor which requires close coordination to assure unified action.

*For additional information on homeland security, homeland defense, CS, and military support of civil authorities, refer to Appendix A, "Engineer Support to Homeland Security"; JP 3-27,* Homeland Defense; *and JP 3-28,* Civil Support.

(c) **Foreign Humanitarian Assistance.** Typical engineer missions for FHA are listed in Figure IV-4. The level of assistance can vary from limited, highly specialized teams to complete engineer units. Limited teams are used to assess damage or estimate engineering repairs and can assist in specialized support such as power supply and distribution, utilities repair work, water purification, and well drilling operations. The joint force engineer and staff may participate in the CMOC that serves as the interface between civil and military authorities. Assistance provided by US forces is intended to supplement or complement efforts of the HN, government agencies, NGOs, and IGOs. In large FHA and disaster relief operations, engineer units provide essential general engineering support including facility construction, structural repair, and camp construction for deployed forces. Initially, US military forces may be the only organization in the JOA capable of providing assistance, and military engineers will normally be tasked to provide extensive cleanup and construction services. US military forces will transition support to civilian authorities as


**Figure IV-3. Engineering Support to Civil Support Operations**

soon as possible. Requests for military support, including engineering support, should continue to be initiated and coordinated through the CMOC.

*For additional information on civil and military coordination, refer to JP 3-57,* Civil-Military Operations.


**Figure IV-4. Engineering Support to Foreign Humanitarian Assistance Operations**

*For additional information on FHA operations, refer to JP 3-29,* Foreign Humanitarian Assistance.

(d) **Noncombatant Evacuation Operations (NEOs).** Engineers supporting NEOs may construct temporary facilities and protective structures, conduct reconnaissance, repair airfields, and clear helicopter landing zones (LZs).

(e) **Peace Operations.** The engineer's role in peace operations typically changes as the operation progresses. For example, peace enforcement operations in East Timor were initially complex, multifaceted relief operations, then transitioned to rebuilding efforts that included assistance by US military engineers. These long-term operations require significant engineering support, especially in the initial phases of a joint operation. A long-term operation requires a higher degree of facility construction and services (e.g., utilities) to maintain morale and quality of life. As the operation transitions to a more stable environment, military engineers can be replaced by external support contracting. General engineering missions could include rebuilding roads, utility systems, and essential infrastructure.

1. **Peacekeeping Operations.** Engineers participate as part of a combined arms force and may construct and maintain roads, airfields, LZs, ports, pipelines, force protection enhancements, and other associated missions such as land mine detection and

destruction. Clearance of mines by engineers during peacekeeping operations is based on necessity. HDO will provide the preponderance of mine removal.

2. **Peace Enforcement Operations.** Engineers may participate in disarming to include seizing ammunition, collecting, and destroying weapons and supplies, closing weapons and ammunition factories, and preventing resupply. Engineer participation in HDO focuses on mine-awareness education and, most importantly, training of HN personnel in the surveying, marking, and clearing or lifting of mines. US military personnel are prohibited from conducting humanitarian demining, but they may assist and train others in demining techniques and procedures. Specialists, such as EOD personnel, may destroy UXO, including munitions shells, fuses, grenades, and rockets. Special forces, CA, and military information support operations personnel are currently the primary means to execute the GCC's programs of HDO. EOD and engineer personnel are also included in these programs and integrated into operational training missions.

*For additional information on peace operations, refer to JP 3-07.3,* Peace Operations.

(3) **Military Engagement, Security Cooperation, and Deterrence.** These operations may involve engineer forces in diverse activities and services as part of small-scale operations conducted by tactical units or special forces.

(a) **Antiterrorism.** Measures taken to establish a defense may include the use of engineer assets for force protection or construction of obstacles and barriers, fortification, and fixtures.

*For additional information on antiterrorism, refer to JP 3-07.2,* Antiterrorism.

(b) **Nation Assistance** (Foreign Internal Defense, Security Assistance, and HCA). US military assistance to the local populace is provided in conjunction with military operations and exercises. Engineer assistance may include training, construction of rudimentary surface transportations systems, well drilling and construction of basic sanitation facilities, and rudimentary construction and repair of public sanitation facilities.

c. **Information and Intelligence Requirements.** A wide variety of national and DOD intelligence organizations, as well as open sources, can provide information essential to general engineering support planning efforts. In addition, the joint force engineer and staff can play an effective role in the identification of intelligence requirements and assist in the collection and assessment of that data. The joint force engineer and staff determine IRs and submit those that concern the enemy to the joint force J-2 and those covering HNs, allies, and coalition partners to the joint force J-3 for resolution.

(1) **Joint Intelligence Preparation of the Operational Environment and Intelligence Preparation of the Operational Environment Products.** Engineer participation in the JIPOE process improves planning by identifying the most effective use of terrain and infrastructure. General engineering operations may require additional data and information beyond that required by other staff planners. The following are general engineering IRs at the operational level:

(a) **Geology.** Knowledge of the surface and subsurface strata for foundation designs and selection of anchoring systems.

(b) **Hydrology.** Planning and design require site surveys of the hydrologic characteristics of the OA as critical considerations in the placement of logistic base complexes and base camps.

(c) **Hydrography.** Hydrographic conditions in the near shore and surf zones of shore areas impact the selection of sites for amphibious assault, assault follow-on, maritime pre-positioning force (MPF), and JLOTS operations.

(d) **Weather and Climate.** The immediate impact of weather or seasonal aspects of climate can limit the progress of general engineering operations and project execution. Certain types of general engineering work are especially impacted by adverse weather or climatic conditions.

(e) **Infrastructure.** Information on infrastructure (e.g., facilities, airfield data, utilities systems, and transportation structures) includes HN design, construction, and maintenance practices as well as overall condition assessment (particularly of roads, bridges, ports, and airfields). This should include detailed engineering data on APOD/SPODs, road networks, etc., including surface and subsurface soil conditions, quantities (mile of road), and construction materials. This will probably require technical engineer reconnaissance to facilitate an infrastructure assessment.

(f) **Availability of Construction Resources in the HN and Region.** Class IV construction materials may be acquired anywhere in the world; however, not all construction material is of adequate quality and quantity to meet mission needs. Adoption of local building design practices and use of local materials often provide facilities that meet mission needs while reducing costs and demands on logistic support systems. Capability of construction contracting resources, labor, and equipment available for rent are also key elements of information.

(g) **Effect on HN Economy.** Significant general engineering operations can have an impact on the HN economy. As the United States increases its reliance on contracting for logistic support, more is demanded from the HN and regional economies. The JFC should closely manage the US military demands on the local economy to maintain the minimum capabilities (e.g., skilled personnel, materials, and equipment) needed to sustain the HN's own requirements.

(h) **Environmental Information.** Environmental characteristics may affect the JFC's COA and should be considered in the planning process. These characteristics include, but are not limited to: important cultural and historical resources; sensitive flora and fauna; environmental hazards and health threats; and valuable natural resources such as coal, oil, clean air and water supplies, and arable land. Institutional information (e.g., environmental procedures and standards expressed in treaties, conventions, SOFAs, and HN laws or standards) is also critical to planning.

(2) **Engineer Information Collection.** Engineer organizations may also be considered sources of intelligence information to satisfy the CCDR's or subordinate JFC's priority intelligence requirements (PIRs) and IRs. As the result of engagement activities over the years, the CCMD, subordinate joint force engineer, and Service engineer organizations (e.g., USACE, NAVFAC, AFCESA) have acquired vital engineering data and information not otherwise available from traditional intelligence resources. For example, the AFCESA pavements evaluation team provides an array of information on airfields around the world. Engineers can also make important contributions to the intelligence information collection effort by conducting onsite reconnaissance and discussions with local officials. Engineers can determine if the local infrastructure can support military operations through technical engineer reconnaissance.

(3) **Engineer Assessment of Intelligence.** As data and information are collected, the joint force engineer can contribute to the assessment of that information. Additionally, the joint force engineer can support the development of special products, studies, and new materials and systems. The engineer assessment process serves the following purposes:

(a) Contributes to the JFC's development of COAs.

(b) Allows the joint force engineer and staff to consider potential support for anticipated engineering missions.

(c) Leads to refinement of the engineer force list.

(d) Documents and disseminates lessons learned.

(4) **General Engineer Reporting.** The JFC requires accurate status on general engineering support as part of ensuring timely logistic support and sustainment of joint operations, as well as the prioritization of future projects within the context of the JFUB, JCMEB, and JEMB. Status of the following general engineering support is essential: deployment of engineering forces and assets; construction and improvement of LOCs including APODs, SPODs, and MSRs; force beddown and construction of advanced bases, base camps, operations, maintenance, and logistic facilities; engineer manpower, equipment, and construction materials; and environmental conditions. Components generally submit reports to the JFC varying from daily to weekly, depending on the situation and established reporting requirements from the JFC and higher HQ. The joint force engineer and staff provide guidance and collect, consolidate, and track essential general engineering status reports to effectively monitor execution and recommend changes to the JFC in a timely manner. The joint force engineer and staff develop specific format, contents, and rating systems, based on JFC requirements and instructions. Important aspects in general engineering status reports may include the following:

(a) APOD construction and improvement—runway condition, the condition of the airfield lighting and navigation systems, maximum-on-ground number, capability to refuel aircraft, aircraft arresting barriers, and construction projects.

(b) SPOD construction and improvement—port berthing status, beach status, littoral support assets, and construction projects.

(c) LOCs—MSRs, bridges, railroads, and waterways.

(d) Force beddown—advanced base and ISB status, force protection construction support, and major projects.

(e) Engineer manpower and capabilities—military, civilian, HN, and contractors.

(f) Engineer equipment—in-service rates and critical maintenance.

(g) Class IV material—quantity reports, delivery dates, and HNS status.

(h) Environmental—reportable incidents and materials.

(i) Other project status—humanitarian, CA, reconstruction, force protection.

d. **Sustaining Military Operations.** Sustaining military operations include the general engineering support activities required for effective operation of advanced bases, LOCs, ISBs, and other general engineering support activities. Examples include installing central power plants, contracting base service support, replacing field latrines with dedicated portable assets, implementing quality of life improvements to billeting areas, and replacing tents and other equipment with more robust temporary structures. These structures can be acquired, installed, and operated by deployed engineering units or through contingency contracting procedures. General engineers are essential to ensuring the continuous operation of airfields.

(1) **Base Defense and Force Protection.** Engineers play an important role in supporting force protection and in helping to protect the force from a variety of threats—including crimes of opportunity against US personnel and property, deliberate environmental contamination, terrorist acts, and WMD. Engineers analyze existing terrain and advise on its optimal use for force protection. Engineers support the force protection effort through the construction of protective structures such as berms, revetments, obstacles, fortifications, specially designed and reinforced buildings, and sophisticated facility alarm systems. Engineers are also members of force protection assessment teams. General engineering operations also accomplish specific requirements for area damage control (ADC) in support of base defense. ADC includes the measures taken before, during, and after hostile action or natural and accidental disasters to reduce the probability of damage and minimize adverse effects. Plans for base construction and operations must consider ADC requirements. Plans for ADC should also include the joint force capabilities and a summary of potential threats against the advanced base. General engineering support for base defense includes:

(a) Hardening of structures and shelters to include incorporating “stand-off” distances when creating or improving base infrastructure.

(b) Protecting utility systems and establishing redundant capabilities.

(c) CCD measures.

(d) Construction and emplacement of obstacles and barriers.

*For additional information on base defense, refer to JP 3-10,* Joint Security Operations in Theater.

(2) **Facilities Construction.** Facilities are fundamental to the success of force projection, play a critical role in preparing the OA and infrastructure to support the joint force, and are critical to sustaining joint operations. Facilities are fundamental to JRSOI, logistic sustainment, and some combat operations. The GCCs are responsible for prioritizing, planning, and coordinating the proper siting construction and maintenance of facilities necessary to support their mission and should ensure that minimum essential engineering capabilities and facilities required to support theater operational and tactical requirements are assigned to the Service components. All Services are capable of some facilities construction to support the JFC in a variety of mission requirements in any environment. Examples of general engineering facilities construction include: shelter, warehouses, terminals, hospitals, water and electric power facilities, sanitation and environmental facilities, fuel storage and distribution facilities, and APOD and SPOD facilities. General engineering facilities construction includes new construction to satisfy force beddown and expeditionary airfield (EAF) construction.

(3) **Power Generation.** Electrical power is of critical importance as the military relies on electricity for the conduct of daily business. Consideration of electrical power requirements must occur from the lowest tactical level to the strategic level. As joint forces move forward, access to safe, reliable power is an operational necessity and a basic life support requirement. In some cases, the level of electrical service available may serve as a measure of success for the operation itself. Since power generation is a component of general engineering, this consideration must include synchronizing work on power systems with the overall general engineering effort and associated environmental considerations.

(4) **Pipelines.** The joint force is dependent on petroleum products. Bulk petroleum is delivered through ports or JLOTS, off-loaded into storage facilities, and shipped forward. The preferred method of shipment of petroleum products to joint forces on the battlefield is pipeline. The engineer mission is to provide general and specialized assistance in constructing and maintaining pipeline systems. For example, engineers install the inland petroleum discharge system. Environmental considerations are huge and can impact the JFC simply due to the volume of petroleum and the hazards associated with its movement.

(5) **Wells and Water Distribution.** Maintaining a constant supply of water is critical to sustaining the joint force. Specialized engineer teams are capable of drilling water wells and supporting water distribution systems. However, for engineers to successfully drill producing wells, sufficient data on location and availability of ground water is required. Such data is maintained for DOD in the Water Resources Database at the US Army Topographic Engineering Center. Engineers also have water purification capabilities to include reverse osmosis water purification units which can be used to purify most above ground water sources including salt or brackish water.

(6) **Logistic Support Facilities.** Engineers contribute to theater logistic operations by constructing and upgrading logistic bases, troop beddown facilities, airfields, ports, and MSRs. Engineers at all levels construct, maintain, and repair facilities for receiving, storing, and distributing all classes of supply, and supporting all other logistic functions, to include HAZMAT management facilities. Engineers tasked to support logistic installations have three major missions: provide new facilities; maintain existing facilities; recover and repair facilities damaged by hostile actions. In some AORs, peacetime construction and HN agreements provide extensive facilities. In less-developed theaters with no preexisting logistic facilities, adapting and converting commercial property to military use or constructing new facilities may be required.

(7) **Joint Logistics Over-the-Shore Operations.** The establishment of JLOTS capability requires a period of preparation and facility installation that will precede the initiation of JLOTS operations. Engineer support to JLOTS operations may be considerable and may include, but is not limited to: improving beaches and port facilities to increase cargo and personnel throughput; shore stabilization, site grading, drainage, facility construction and improvements at SPODs; environmental damage mitigation; and utility installation. Navy PHIBCBs also operate the Improved Navy Lighterage System (INLS) to accomplish in stream off-load activities in support of JLOTS. Engineers also support sea-delivered bulk fuel and water systems such as the offshore petroleum discharge system (OPDS) and amphibious assault fuel system. General engineering operations may also include the assembly and insertion of modular causeways, elevated causeways, and petroleum distribution systems. However, Army modular causeway units include organic equipment and forces to conduct general engineering operations associated with floating modular causeway placement. Typical engineering support activities in support of JLOTS operations are shown in Figure IV-5.

*For additional information on JLOTS operations, refer to JP 4-01.6,* Joint Logistics Over-the-Shore (JLOTS).

(8) **Environmental Support Operations.** The intent of environmental support operations is to minimize adverse environmental impact, ensure the safety and health of personnel, and reduce post-deployment environmental cleanup. Typical environmental support operations are listed in Figure IV-6. While deployed engineering units may have the capability to provide environmental support, the use of contractors is usually required for long-term or large-scale projects.

*For additional information on environmental considerations, refer to Appendix D, "Environmental Considerations."*

e. **Lines of Communications Support.** There are strategic, operational, and tactical LOCs, and establishing and maintaining them may be a combat or general engineering operation. JFCs ensure that the concept of logistics supports the CONOPS. The logistics concept of the COA does this by planning for a base of operations and opening and maintaining MSRs and LOCs, providing intermediate bases of operations to support phasing and sustainment, and establishing priorities for service and support. Combat and general engineers provide the JFC with maneuver options through MSRs and LOCs by constructing

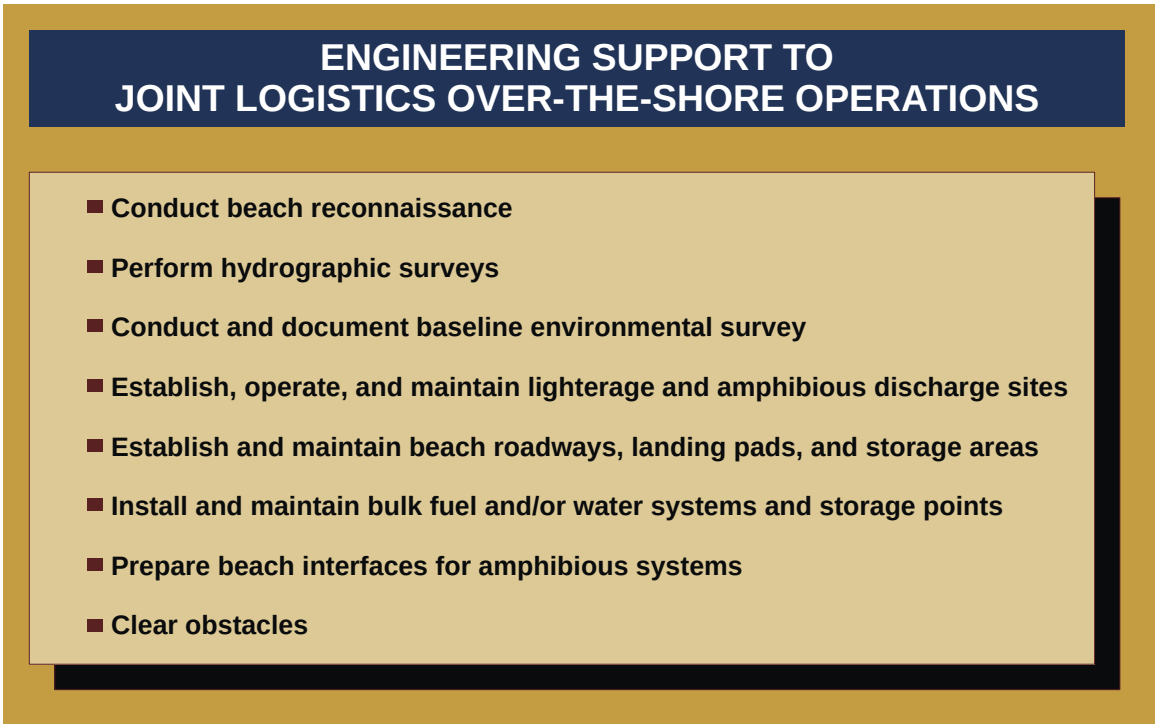


**Figure IV-5. Engineering Support to Joint Logistics Over-the-Shore Operations**

and repairing roads, bridging, railroads, ports, and airfields that link tactical- and operational-level logistics. Combat engineers provide MSR upgrade for tactical units to ensure mobility. General engineers support mobility by providing LOC development and sustainment support at the operational level through base development, facilities and infrastructure construction, and real estate management. Changes to base development and adjustments to LOCs by general engineers continue as forces adjust to phases of the JFC's campaign or operations. The joint force depends on ports and airfields for OA access and links to the United States base of operations. The joint force depends on roads and railroads, of which bridges are a necessary element, for a link to its base of operations.

(1) **Ground LOC Network.** An adequate ground LOC network is a critical part of the logistic network and one of the keys to sustaining operations. Engineers are responsible for the construction and maintenance of roads and railroads.

(a) **Roads.** When suitable road networks do not exist or cannot be used, roads must be upgraded or constructed to support operational requirements. The degree of permanence varies depending on how long the roads are needed. Combat trails or earthen roads may be hastily cut pathways designed to initial standards to enhance mobility for only a short time (less than 6 months). More permanent road networks such as MSRs and primary LOCs are designed to temporary standards to sustain mobility for a longer period of time (up to 2 years). During contingency operations, nearly all roads are constructed to temporary standards.

(b) **Railroads.** Railroads are often the preferred means of transportation during contingency operations. Engineering requirements may include the construction,


**Figure IV-6. Environmental Support Operations**

rehabilitation, and repair of railroads. The focus of engineer effort should be on modifying and repairing existing railroads to meet mission requirements.

(2) **LOC Bridging.** Few ground LOCs will exist without some form of bridge, bypass, or detour. Engineers assure mobility of ground forces through construction, repair, and reinforcement of bridges, bypasses, and detours. New construction of LOC bridges is possible, however, improving existing structures is the primary engineering focus because of the intense resource requirements of new construction.

f. **Real Estate Management.** Real estate operations involve planning, acquisition, management, and disposal of land and facilities to support joint operations. General engineering encompasses real estate management from acquisition of real property to final turnover of land and facilities upon completion of an operation. USACE (contingency real estate support team) and NAVFAC have experts who can deploy in support of these requirements.

(1) **Responsibilities.** GCCs are responsible for coordination of real estate requirements within the theater. GCCs will resolve conflicting requirements for additional real estate and incompatible use of existing real estate. The Services are normally responsible for facility acquisition funding and support.

(2) **Planning, Acquisition, and Coordination.** Real estate planning should be initiated as OPLANs are developed to identify land and facility requirements needed in support of joint operations. Real estate planning and surveys are initiated as campaign plans are developed to provide timely and adequate facilities to sustain the combat force. Deployment of real estate personnel is essential early in an operation to ensure that needed

uncontaminated land and facilities are acquired in a timely manner. Real estate acquisition, maintenance, and disposal require special contracting procedures that are performed by USACE, NAVFAC, or a designated executive agent. When facilities and real estate can be obtained through HNS and commercial leases, or through international agreements, facilities acquisition and real estate management becomes an important component of general engineering. Local HN officials can help identify available facilities or land that meets military requirements. If local governments are capable of maintaining or improving existing infrastructure, agreements may be developed for their support. Engineer real estate teams coordinate with HN agencies and private owners to acquire and dispose of real estate and establish the terms of lease agreements. CA and real estate personnel may be required to work through HN governments to settle agreements with property owners. Acquisition of land and facilities not owned by the USG is accomplished through assignment, international agreements such as SOFAs, memoranda of agreement, leasing from the HN, or direct leasing from the private sector. Within the DOD, the Secretaries of the Military Departments are authorized to use leases to acquire real property relating to structures in foreign countries that are needed for urgent military purposes (see Title 10, USC, Section 2675, *General Overseas Leasing Authority [other than Family Housing]*).

g. **Airfield, Port, and Beddown Engineering Operations**

(1) **Airfield Engineering Operations and Contingency Planning.** Engineer support to airfields and heliports is a vital mission for joint forces. Engineers should be included in airfield contingency planning because of their understanding of an airfield's operational mission and the impact the types and numbers of aircraft will have on the airfield's complex system of collective facilities and utility networks. Engineer units selected to open, establish, and sustain airfield operations will deal with complex issues of safety, compatible land use, test and evaluation of pavements, certification of pavements for specific military aircraft types, installation and maintenance of visual air navigation systems, and mitigation of environmental impact from airfield operations. For joint airbases, the JFC should establish clear responsibilities for engineering support to the base.

(a) **Opening Airfields.** Early in the planning process, operations, logistics, and engineer planners should identify potential forward airfields to support offensive air operations and logistics buildup, and outline the engineer tasks necessary to open the airfields. It is critical that joint force engineers ensure early and effective coordination between airfield planners and the commands which will operate aircraft at the airfield. Many of the decisions made early in the airfield planning process (e.g., airfield siting and layout) can have critical impacts on an airfield's utility for aircraft operations. In non-permissive environments, engineers should plan to repair major damages to airfield pavements and clear airfield obstructions as part of the initial airfield seizure operations. Follow-on engineer actions are required to complete airfield repairs, provide aircraft rescue and firefighting, EOD operations, airfield lighting, and aircraft arresting systems, and support tactical airlift control, air traffic control, communications, and petroleum, oils, and lubricants (POL) systems installation. Engineers support the installation of EAF systems that include: AM-2 mat; folded fiberglass matting; airfield lighting; minimal operating lighting systems and field marking lighting systems; aircraft terminal guidance systems; and aircraft arresting systems. Use of one or more of these systems provides the commander with the ability to conduct and

support flight operations from existing airfields, highways, parking lots, rooftops, and open fields. Engineers also accomplish all earthmoving tasks to install these systems and construct expeditionary fueling locations and systems, expeditionary munitions storage, and all aircraft beddown infrastructure.

(b) **Airfield Damage Repair.** Engineer support is critical to quickly restoring airfields after damage from enemy attack. Airfield repair operations normally are done on an emergency basis. All Services have capabilities to participate in ADR and may be called upon to assist such operations. In order to enable air operations to resume quickly, engineer teams must be predesignated, trained, and prepared for short-notice employment and adequate materials must be stockpiled nearby.

(c) **Air Force Engineering Support to Airfield Operations.** The primary mission of Air Force engineers is to provide mission-ready base systems, to include force beddown and aircraft beddown. Air Force engineer units, organized as Prime BEEF or RED HORSE units, are structured, trained, and equipped to provide the full range of support required to establish, operate, and maintain garrison and contingency airbases that support fixed-wing aircraft. Due to their specialized expertise in airfield operations, Air Force engineers take the lead role to open, establish, and sustain airfield operations that support large and high-performance aircraft, or at locations where primarily Air Force aircraft will operate because of a specialized expertise in airfield operations. Another Service may provide BOS engineers. Prime BEEF units are typically assigned OPCON to a specific installation to provide force beddown, infrastructure maintenance and repair, firefighting,

**PRIME BASE ENGINEER EMERGENCY FORCE TEAM DIGS EXPEDIENT RAMP PROJECT**

**The tasking was to construct a 385,000-square-foot expeditionary aircraft-parking ramp at a forward operating location, to support Operation ENDURING FREEDOM, by a must-have completion date of 28 February. We had 66 days to clear enough land and build a 228- by 1,688-foot asphalt ramp that would support the weight of the aircraft. The challenge was that 80 percent of the area to be excavated was solid rock. About a week into the project, it became evident that it was going to take a combined effort and more equipment to finish on time. They brought in help from Navy Seabees stationed nearby and contracted help from United Gulf Asphalt. Their excellent leadership and the combined efforts of contractor, Navy, and 384th Expeditionary Civil Engineer Squadron (ECES) troops moved 90,000 cubic meters of rock and sand and expended 30,000 man-hours of labor. Civil engineers changed the entire scope of the 384th Air Expeditionary Wing's capabilities by adding 50 percent more available parking space to accommodate the base's increase in aircraft. This gave the wing flexibility to bring in different missions and expand the current one. In just two months, the 384th ECES Prime BEEF [Prime Base Engineer Emergency Force] team rose to the challenge of this awesome task, saving both time and money while providing agile combat support.**

**SOURCE:** ***Air Force Civil Engineer,*** **Spring 2003**

**AIRFIELDS**

**The expeditionary Air Force relies on the airfield as a critical weapon system. Many airfields are situated in austere locations without much in the way of preexisting infrastructure, equipment, or material resources for sustained high-tempo operations. During contingency and, especially, crisis action planning, Air Force commanders must account for those capabilities that ensure airfields are well suited for all intended operations. In addition to tactical airlift control elements, combat support, and contingency response units, the Air Force relies upon airfield operations capabilities to prepare airfields for their combat missions.**

**SOURCE: HQ Air Force, Task Force Enduring Look, "Quick Look Report #9" September 2002**

EM services, EOD, and CBRN defensive operations for that installation's weapon systems, organizations, and personnel. Normally, RED HORSE units are assigned OPCON to the Air Force forces and are tasked through the commander , Air Force forces (COMAFFOR), to provide force beddown, construction, heavy repair, or other general engineering and limited combat engineering capabilities as needed throughout the theater of operations. Other Service engineers may provide these and other services in support of airfield operations.

(d) **Army Engineering Support to Airfield Operations.** In addition to the participation of combat engineers in airfield seizure, Army general engineers are capable of survey, design, construction, or improvement of airfields and bases. Army engineers assist Air Force teams to repair critical airfield or base support facilities when such repairs exceed the Air Force's capability. The preponderance of work may be performed by Army engineers due to the availability of general engineering assets, and in some cases it may be preferable for Army (or other Service) engineers to take the lead role for support to the operation of certain airfields. The level and focus of general engineering support to airfields is significantly more specialized than the combat engineering skills associated with the mobility task of FACE.

(e) **Navy Engineering Support to Airfield Operations.** The NCF can perform the full range of support required for EAF construction supporting fixed- and rotary-wing aircraft. Construction capabilities include runways, taxiways, aircraft maintenance hangars, ADR, and other infrastructure that directly supports airfield operations. The NCF also constructs base operations facilities. The NCF is a viable first responder and can deploy an air detachment within 48 hours. The NCF may be assigned in a supporting role to the Marine Corps MAGTF to sustain MAGTF operations and support Marine Corps engineers in the construction of EAFs, and to provide construction of more permanent facilities at forward operating bases.

(f) **Marine Corps Engineering Support to Airfield Operations.** Marine wing support group (MWSG) provides aviation ground support (AGS) to ACE within the MAGTF. The MWSSs are the operational arm of the MWSG. MWSG coordinates AGS in support of the Marine aircraft wing; AGS is provided by four MWSSs. The engineer company of the MWSS is capable of survey, design, construction, repair, and improvement

**EXPEDITIONARY AIRFIELD**

**The expeditionary airfield (EAF) is a shore-based aviation support system that permits landing force aircraft to operate from forward operating bases (FOBs) within effective range of ground forces. Engineers work closely with EAF personnel to construct EAFs or enhance FOBs. Although a FOB may be a simple grass landing zone supporting helicopter operations to the installation of airfield surfacing material, the installation and use of one or more EAF subsystems will add versatility and durability to the site selected. Airfield surfacing installation requires formal training and familiarization with equipment characteristics and design requirements beyond that of the organic engineers resident in the Marine wing support squadron. The airfield design and construction must be in accordance with Naval Air Systems Command certification requirements. Therefore, Marine engineers and EAF personnel have a habitual supporting relationship while constructing expeditionary airfields.**

**Various Sources**

of EAFs and bases. The NCF may be assigned in a supporting role to the MAGTF to sustain MAGTF operations and to provide construction of more permanent facilities. Additionally, AGS provides the following functions to the MAGTF ACE: internal airfield communications; EAF services; aircraft rescue and firefighting; aircraft and ground refueling EOD; motor transport; field messing; medical; CBRN; security and law enforcement; air base commandant functions to include air base ground defense (ABGD); and organic and support unit personnel training. The MAGTF commander may direct the ESB to reinforce/augment MWSS efforts during the construction of EAFs or improvement/repair of a base air facility.

(2) **Port Engineering Operations.** The GCC's plans for the entry of joint forces into the AOR and sustaining those forces may include the availability and use of ports. Use of existing ports has immediate advantages over the construction of new ports and facilities. Construction of new port facilities is a large task not recently undertaken by military engineers without the support of contractors.

(a) **Considerations Prior to Port Occupation.** Before occupying a port, planners must consider the current and expected physical condition and the logistic capabilities of the port. Army and Navy engineers would be involved in initial reconnaissance and survey teams to determine an existing port's physical condition, repair requirements, bare beach transfer sites, and in the leasing of port facilities. Reconnaissance and survey teams should be identified and sent into existing port facilities as soon as possible to assist the planners by collecting crucial information on the existing port and infrastructure. Planners study the relative value of rehabilitation and construction and the value of specific facilities to the construction effort required. The JFC coordinates indicated changes and their impact on logistics through Army engineer, transportation, and other command channels, as well as with naval units engaged in clearance, dredging, and other harbor projects.

**During Operation IRAQI FREEDOM Marine Wing Support Group-37 (REIN) was tasked with establishing support of over 15,000 Marines and almost 400 aircraft. Augmented by Seabees, they poured an 880,000 square foot aircraft parking ramp, laid almost 1.7 million square feet of AM-2 matting, and erected over 900 hardbacks. They constructed an expeditionary airfield in the desert and set up 21 forward arming and refueling points and eight KC-130 tactical landing zones using highways, empty fields, repaired Iraqi airfields, and concrete building slabs in a leapfrog manner, thereby allowing the aviation combat element to provide continuous air support to I Marine Expeditionary Force as they attacked north into Iraq.**

**SOURCE: No FARP Too Far! *Marine Corps Gazette.* Quantico: December 2003, Vol. 87, Issue 12, p. 24.**

(b) **Improvements to Existing Facilities.** Army transportation and Navy expeditionary logistics groups operate port facilities and coordinate construction and repair requirements with Service engineers. Army or Navy divers clear underwater mines and obstructions, conduct underwater surveys, and investigate bottom materials. They inspect sunken vessels and other obstructions and assist in developing salvage plans and removal requirements. General engineers construct shelters that increase the length or height of natural formations such as reefs and islands and build breakwaters or jetties as protection for the inner water. General engineers construct or repair container ports, non-container cargo ports, and other loading/unloading facilities, elevated causeways, and piers. Army and Navy engineers provide waterfront utilities and services of potable water, electricity, fire protection, and fuels. Geospatial IRs include hydrographic surveys from which topographic units create products for engineer use. The joint force engineer coordinates the work of all topographic units. Concurrent supporting engineer construction outside the port area may include roads, railroads, canals, and storage facilities to keep pace with port operations.

(c) **Joint Logistics Over-the-Shore.** JLOTS requires significant engineer support for site survey and to prepare access routes to and from the beach. Army and Navy engineer units will provide the majority of construction and transportation equipment and most engineering construction tasks.

*For further guidance on logistics over-the-shore (LOTS) and JLOTS, refer to JP 4-01.6,* Joint Logistics Over-the-Shore (JLOTS).

(3) **Beddown Engineering Operations.** Most contingency operations of any significant size conducted by joint forces require facilities for rapid beddown. General engineer support optimizes facility and force beddown requirements consistent with expected operational requirements, duration of need, and forces to be supported. Early assessment by engineers is critical in site selection for troops and aircraft beddown. Geospatial engineer products are extremely useful in identifying adequate geographical sites. Engineers will consider the adequacy of roads, ports, airfields and construction material supply, and existing real estate facilities. Site selection includes engineer requirements for force protection, countermine, counter obstacle, and early entry force support operations. Environmental engineers will consider sites that safeguard human health and do not harm the environment. The ESP will include guidance on general engineer requirements for force beddown

**FORWARD OPERATING BASE**

**One of the most formidable challenges faced by a maneuver commander during Operation IRAQI FREEDOM was that of establishing a forward operating base. After an area of operations was secured, forward operating bases were established to house and support troop occupation as well as provide adequate force protection. These facilities were constructed in urban areas with many fixed structures and areas completely void of any hardened structures. Commanders had to make decisions concerning base camp footprint, resource requirements to construct each camp, and facilities to support the Soldier. Decisions had to be made concerning the utilization of containerized troop housing versus tent cities. Electrical and communications grids had to be designed and constructed. Water for shower facilities had to be piped to the correct areas and gray water accumulated at the proper discharge points. Dining facilities had to be constructed to protect food processing areas and troop service areas. And once completed, these facilities had to be maintained for extended durations.**

**SOURCE: Operation IRAQI FREEDOM**
**Combined Arms Assessment Team II Initial Impressions Report**
**Center for Army Lessons Learned**

construction. On-site, a principal task of the joint force general engineer is to provide beddown facilities and infrastructure for reception, onward movement, and sustainment of deploying forces. Beddown planning is also key during the transition to stability operations after decisive combat operations. Successful joint engineer beddown support operations also require adequate logistics and strategic lift capabilities. All the Services are capable to some extent of planning and executing beddown support operations. However, differences among each Service's equipment, construction standards, and doctrine may pose compatibility, equivalency, or interoperability challenges.

### 3. Geospatial Engineering

a. **Overview.** Geospatial engineering encompasses those tasks that provide geospatial information and services to enhance awareness, understanding, and effective use of the operational environment for commanders and staffs across the range of military operations. Geospatial engineering provides the JFC with terrain analysis and visualization of the operational environment through the utilization and display of accurate terrain and other geospatially referenced information and derived actionable advice that is referenced to precise locations on the earth's surface. This geospatial data forms the foundation upon which all other information on the operational environment is layered to form the common operational picture (COP) for the JFC and is an element of GEOINT. Geospatial engineer units provide strategic, operational, and tactical terrain analysis; terrain visualization; digital terrain products; nonstandard or updated map products; and baseline survey data to combat, combat support, and CSS forces.

(1) Geospatial engineering support is provided based on OPLAN, concept plan (CONPLAN), and training requirements. These requirements are determined and validated by the GI&S officer in coordination with the joint force engineer. It is required to support all joint operations and should meet the anticipated needs of the JFC. Examples of geospatial engineering support include: terrain analysis, terrain visualization, creating digital geospatial products, special map production, general and precision survey, and geospatial data management and conflation, all of which contribute to an understanding of the battlefield environment and its effect on operations.

(2) The joint community requires geospatial data to function effectively on the battlefield and to help establish the COP. Joint forces use geospatial data to provide an understanding of the terrain. Lower-resolution terrain data enables leaders at the theater level to plan operations, while higher-resolution products facilitate tactical-level operations. Because forces deploy worldwide on short notice, there will never be enough terrain data immediately available to meet all needs. It is important that data be requested as early as possible and that the terrain data requirements be defined carefully to focus the limited geospatial production assets on the areas that are the most important.

(3) The NGA is the functional manager for GEOINT with the responsibility to provide standard geospatial products and services. The GI&S officer serves as the primary link to ensure that support from NGA and the extended National System for Geospatial Intelligence community, including allies and the geospatial assets of the Services, is developed and provided during all phases of an operation throughout the theater. Geospatial content may be delivered as maps, imagery, elevation data, and feature data. Maps, whether in digital form or hard copy, are the geospatial mainstay for joint forces and provide the foundation for the COP. It is important to have both a hard copy and digital versions depending on type of use. To be useful all imagery needs to be georeferenced. Orthoimagery provides a digital map-like "photo" of the terrain, enabling it and other geospatial content to be "stacked" on top of each other like overlays. DTED provides a digital representation of the bare earth's surface; it is a key element for terrain reasoning as it is used to derive slope and other reference aspects of the surface of the earth that directly impact maneuverability. DTED also gives a basic understanding of the land when its three-dimensional surface is draped with imagery. Higher resolution digital surface models provide a detailed representation of structures in urban and complex environments.

(4) Feature data identifies and provides attributes for natural and man-made entities like roads, bridges, rivers, utilities, and buildings. Attribution conveys detail, such as bridge specifications, number of lanes in a road, stream velocity and bank height, for use with analysis-type software and high-end computer systems to predict mobility, cover and concealment, countermobility, and other aspects of the terrain important to the force.

(5) C2 systems and platforms require the ability to evaluate the terrain and use terrain reasoning tools and planning tools to meet mission requirements. Geographic information system (GIS) software using terrain reasoning gives the CCDR the ability to perform "what if" terrain analysis based on changes in the terrain using a C2 system in real time. For example, if a bridge is destroyed or suddenly blown, the user can enter an icon to indicate the road is blocked and the terrain reasoning GIS tool will conduct a new route

analysis yielding several choices for the commander. Parameters such as fastest route, most concealed from the ground, most concealed from the air, on-road, off-road, or a best combination are set by the user. Terrain reasoning requires elevation and feature data that is detailed and complete enough to enable automated analysis. Geospatial engineers have access to and help build and maintain the data sets required for terrain reasoning predictions.

b. **Collection and Development of Accurate Information.** Detailed and accurate geospatial information may require long lead times for collection and extraction. The GI&S officer must carefully plan for product support from the total geospatial community and ensure that the most critical requirements are met in time. Stereo imagery and ranging sensors such as interferometric synthetic aperture radar and light detection and ranging provide elevation data and some indications of features and their attributes. Ephemeris and attitude data, which accompanies the imagery and other sensed data, allows for the precise positioning of the images and mensuration of features. Commercial systems supplement national imaging systems and meet a critical need when images must be shared with coalition partners, NGOs, and others. Once geospatial data has been collected, it must be extracted and processed into useful geospatial information. While NGA fulfills the bulk of DOD standard geospatial data extraction requirements through contracts and agreements with allies, the Services and joint forces also possess limited data extraction capabilities best suited for the production of system- or theater-specific data and the update of standard data sets.

c. **Information Management.** Detailed, high-resolution data is subject to rapid change as the forces of nature and man modify the landscape and seas with the construction of roads and obstacles and the shifting of beaches and waterways. The JFC requires up-to-date GEOINT in order to make the best tactical decisions. Digital systems allow the JFC access to tremendous amounts of updated geospatial data and current information. The management of the enhanced data must not become a burden as the GI&S officer, engineer, J-2, and the JFC determine what data is tactically significant.

d. **Development of Geospatial Knowledge.** The geospatial terrain analyst evaluates available content for fitness for use in needed analyses or visualizations, filters needed data to remove irrelevant content that would slow analysis or clutter displays, checks the integrity of content to ensure its completeness and logical consistency, and then performs analyses to generate tactical decision aids. These analyses move geospatial content from information to knowledge, generating actionable advice for supported commanders and staff.

e. **Geospatial Visualization.** Geospatial engineers assemble geospatial content for visual presentation to decision makers. This might involve bringing together data such as orthoimagery and elevation surfaces, information such as road networks, and knowledge such as mobility predictions within three-dimensional space for fly-throughs, or superimposing the content in plan view and clipping it into combat graphics for printing in the quantity needed for an operation. Geospatial engineers use standardized symbology and processes to assure quality of visualization products and services.

f. **Sharing Geospatial Knowledge.** Geospatial content in databases, the results of analyses, and products and other services are shared across the geospatial engineering

**TERRAIN UNDERSTANDING**

**Engineer delivery of terrain analysis was a huge success. They enabled maneuver commanders to "see" the terrain like never before. Commanders continuously sought high-resolution imagery, special map products, operational overlays, slope tints, moisture content analysis, and terrain analysis briefings.**

**Terrain visualization products, in combination with intelligence data from multiple sources, especially the National Geospatial-Intelligence Agency, were critical to developing a coherent plan whose details were well understood, and allowed fairly detailed understanding of the terrain's limitations on operations.**

**SOURCE: Operation IRAQI FREEDOM, Engineer Lessons Learned US Army Engineer School**

community and disseminated to commanders and staffs in many ways. Standard products on media (such as compact discs or printed hard copy) from NGA and its co-producers are distributed through the DLA. Tailored products on media from the national level may move through DLA channels or be shipped directly to customers depending on urgency. Most products and services are digital or have digitized versions and are hosted on NGA's portal, through which geospatial engineers, commanders, and staff may also reach hosted geospatial content from databases. Several GCCs have established theater geospatial databases that hold content from NGA that is relevant to the theater as well as additional content obtained or collected in theater and integrated to provide a trusted, maintained data store for theater operations. For major operations, NGA may deploy support teams to theaters and augment organic or assigned geospatial engineers in producing and sharing geospatial data across the force.

g. **Geospatial Engineering Integration.** Geospatial engineering plays a key role in the range of military operations. The JFC uses geospatial information to help determine friendly and enemy COAs and to plan for the deployment of forces. Coupled with intelligence data, the disposition of friendly forces, weather, and the logistics situation, geospatial information assists the JFC to visualize and develop the operational environment. Joint forces require geospatial data for targeting. During planning, the JFC GI&S officer and J-2 work closely with subordinate command GI&S officers, J-2s, and with NGA to develop a strategy to provide GEOINT support for future operations. The GI&S officer coordinates and shares information with other directorates. Services provide GEOINT-capable forces and requirements to the joint force to support planning. Army geospatial engineers and Marine Corps geographic intelligence analysts can provide special geospatial products that support mobility, countermobility, and survivability operations. The geospatial engineer products are also extremely useful in the engineer planning process as a means of identification and feasibility determination for beddown and staging areas, possible resource (gravel, sand, etc.) locations, and capability of LOCs.

# APPENDIX A
## ENGINEER SUPPORT TO HOMELAND SECURITY

### 1. General

The Armed Forces of the United States support the homeland security strategy through two distinct but interrelated mission areas—homeland defense and CS. Homeland defense is the protection of US territory, sovereignty, domestic population, and the critical defense infrastructure against external threats and aggression or other threats as directed by the President. CS refers to DOD support to US civil authorities for domestic emergencies, and for designated enforcement and other activities. Since US military forces do not operate, train, and equip specifically for homeland defense, this appendix focuses only on the CS portion of the homeland security strategy.

### 2. Civil Support

a. In an emergency situation, such as managing the consequences of a terrorist attack or natural disaster, DOD may receive requests for assistance to provide additional capacity or unique capabilities in support of state and local governments. DOD has the capability to provide self-deploying, self-sustaining forces with a wide variety of skills and equipment, including engineer forces, which can play a major role in support of civil authorities.

b. **Support** of civil authorities usually consists of catastrophic emergencies such as natural or man-made disasters. Emergency response is managed locally, with response capability growing, to include the state government, and, if the disaster is large enough in scope to exceed local and state resources, the federal government becomes involved. If federal support is required, it is managed under authority of the Secretary of Homeland Security using the National Response Framework (NRF). CS falls into several categories illustrated in Figure A-1. While the military can be called upon to provide support in any of these categories, the most common CS categories that can potentially employ engineer forces include:

(1) **National Security Special Events.** SecDef may also designate special events to receive military support. Examples include the Olympic Games or support to the UN General Assembly.

(2) **Disasters and Declared Emergencies.** DOD support to a disaster or emergency involves a response to requests for assistance during domestic incidents in support of the NRF primary or coordinating agencies. When appropriate, military commanders and responsible DOD civilians may respond under the authority of immediate response in order to save lives, prevent suffering, and mitigate great property damage under imminently serious conditions. The President may also direct DOD to support the response to a disaster or emergency as well as assign DOD temporary lead responsibility. Under this category, CS may consist of support for high-profile emergencies that often invoke presidential or state emergency/disaster declarations. Engineers would potentially deploy in response to:

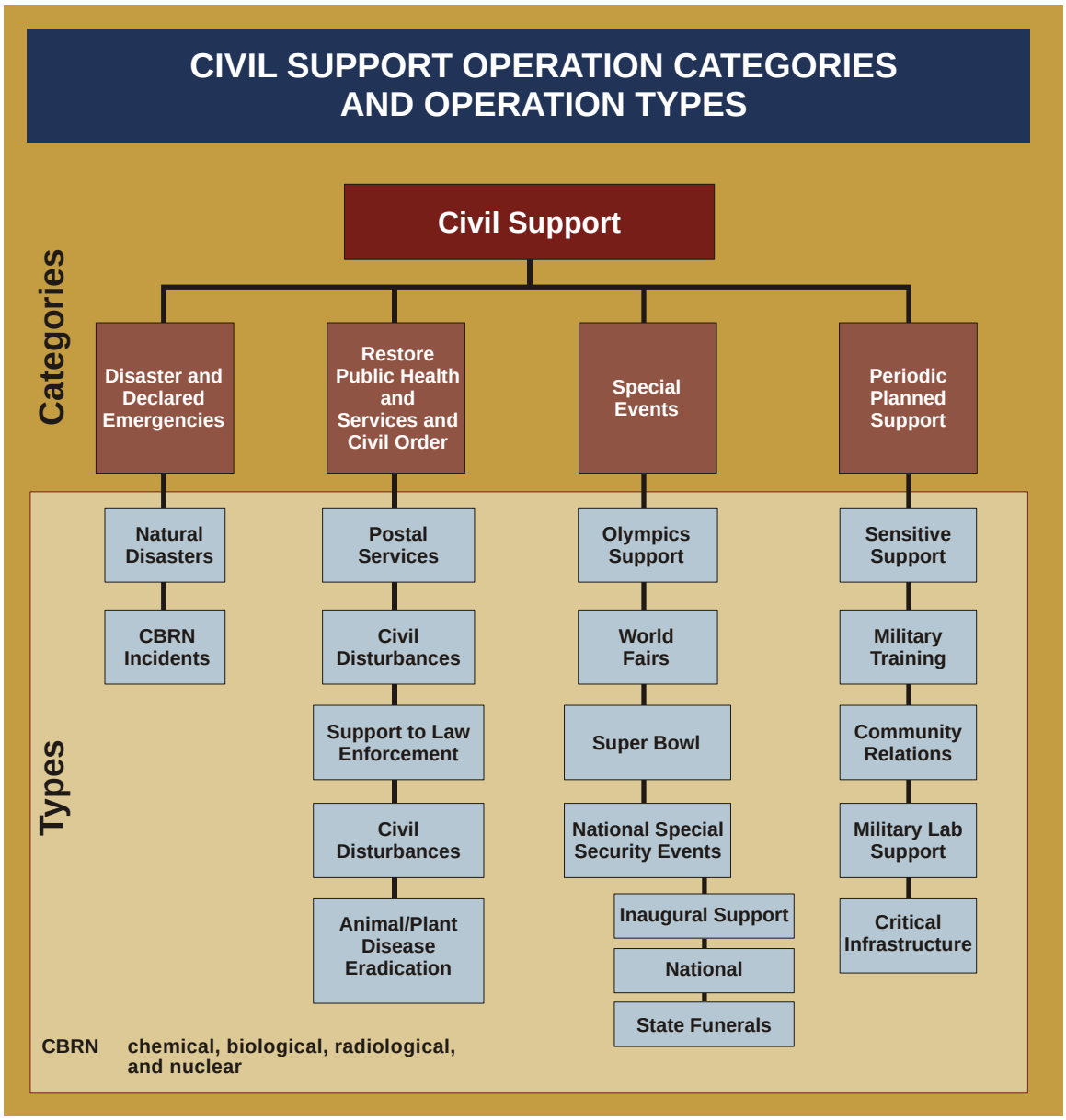


**Figure A-1. Civil Support Operation Categories and Operation Types**

(a) **Natural Disasters.** Natural disasters include, but are not limited to, severe weather, earthquakes, and wildfires. Engineers can expect to respond with equipment assets to remove rubble and debris. Engineers may be tasked to maintain or restore essential services and activities, to mitigate damage, and take actions to avoid hardship and human suffering. Engineers may be called upon to provide manpower support or general engineering support such as water purification operations. Other engineer contributions include technical advice and assessments, construction planning, management and inspection, emergency contracting, and emergency repair of wastewater and solid waste facilities.

(b) **Man-Made Disasters.** Examples of man-made disasters include oil spills, terrorist acts, or a CBRN incident. These events can produce catastrophic loss of life, destruction of property, or irreparable damage to the environment. Support to domestic CBRN incidents is a major support requirement for military forces and may be an extensive support operation for military engineers. Engineers possess mobility and heavy equipment assets and may provide support similar to that provided in response to a natural disaster.

(3) **Support to Civilian Law Enforcement Agencies.** Military support to civilian law enforcement is carried out in strict compliance with the Constitution. Military forces performing in this role will normally work in support of a primary agency (PA) (e.g., Department of Homeland Security or Department of Justice/Federal Bureau of Investigation.) Depending on the circumstances, and with SecDef approval, units providing this support may be armed. When armed, forces will adhere to the standing RUF unless SecDef has approved mission-specific RUF. Examples of support include general engineer missions to support counterdrug operations, maritime security, and general support (e.g., training and equipment loans). Support to law enforcement agencies may also include maps, geospatial services, and manpower support.

(4) **Support of Civil Disturbance Operations.** It is unlikely that engineer forces will be directly involved in civil disturbance operations. The President is authorized by the Constitution and US statutes to employ the Armed Forces of the US to suppress insurrections, rebellions, and riots, and provide federal supplemental assistance to the states to maintain law and order (Insurrection Act Title 10, USC, Sections 331-335). Responsibility for the coordination of the federal response for civil disturbances rests with the Attorney General. Any DOD forces employed in civil disturbance operations shall remain under military authority at all times.

### 3. Organization and Coordination of Missions

DOD engineer forces may serve in a supporting role to a PA in support of civil authorities. Deployed DOD forces remain under the C2 of SecDef at all times. Engineer forces may operate under the following scenarios:

a. **Immediate Response.** Local military commanders or responsible DOD officials may respond immediately to a request from local or state governments to an emergency that has imminent serious conditions that require immediate response to prevent loss of life, human suffering, or major property damage, but may not be a Presidential declared emergency. Engineer assets on military installations may be directed to respond in support of public fire, search and rescue services, and public works. DOD support for local environmental operations can begin immediately within the authority delegated to installation commanders. The commander's authority is limited to the initial 72 hours of an emergency.

b. **Support to a Primary Agency or as part of a JTF.** Requests for assistance follow the NRF procedures. If the PA determines that existing resources are inadequate or not available, a request is initiated and passed to the defense coordinating officer (on site with the PA) who validates the request and forwards to the Joint Director of Military Support

(JDOMS) and the geographic combatant command for approval. JDOMS coordinates, validates, and provides the Assistant Secretary of Defense for Homeland Defense and Americas' Security Affairs with recommendations, and then passes it to SecDef for approval. Once approved, JDOMS processes the request (in the form of deployment and execute orders) to task the Services for the best-matched capability to meet the requested requirement. A JTF may be established with engineering support under a joint force engineer, or supporting engineer forces may be assigned to an existing JTF under the supported commander (i.e., JTF-Civil Support, JTF-Alaska, JTF-National Capital Region, or JTF-North).

## 4. Engineer Planning Considerations

a. General engineering planning in support of civil authorities is focused on taking actions to save lives and property, assisting in stabilizing a disaster area, and assisting state or federal agencies where needed. Typical engineer units include the NMCBs, Air Force Prime BEEF and RED HORSE units, Army construction engineering battalions, and battalion, reinforced company, or detachment-sized task-organized Marine Corps units. Specialized units may include capabilities for bridging, water well drilling, power generation, and water purification.

b. DOD planning for general engineering response action should include the following:

(1) Emergency infrastructure repairs (e.g., emergency public facilities and debris/road clearing operations).

(2) Damage assessment and technical assistance.

(3) Possible requirement for military tactical bridging assets.

(4) Base camp support to deployed forces (temporary base camp construction) and possible requirement to provide emergency shelter for disaster victims.

(5) Need for protective equipment for operating in a contaminated environment due to CBRN contamination or other environmentally threatening event.

(6) Use of geospatial products to include imagery of the disaster area (e.g., inundation zones, flood zones).

(7) Transition from military engineering forces to USACE- or PA-contracted capabilities (ensure a clear end state is identified).

c. Unique planning considerations for joint engineer operations in the homeland:

(1) Incident awareness analysis.

(2) FEMA approach to the infrastructure and assessment survey model (Figure III-7).

(3) National Guard role in engineering support in the homeland.

(4) USACE role in emergency support functions.

*For additional information, see JP 3-27,* Homeland Defense; *JP 3-40,* Combating Weapons of Mass Destruction; *and JP 3-41,* Chemical, Biological, Radiological, and Nuclear Consequence Management, *as appropriate; and JP 3-28,* Civil Support, *for discussion of the National Incident Management System and the NRF*.

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# APPENDIX B
## SERVICE ENGINEER ORGANIZATIONS AND CAPABILITIES

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# ANNEX A TO APPENDIX B
## ARMY ENGINEER ORGANIZATIONS AND CAPABILITIES

### 1. General

a. Army engineers operate at the strategic, operational, and tactical levels across the range of military operations. Units are organized in a scalable, modular, adaptable manner to support combat, general, and geospatial engineering requirements. Army engineers operate as an integral member of the combined arms team during peace and war to provide a full range of joint engineering capabilities. They execute combat engineering tasks at the tactical and operational levels of war in support of combat maneuver forces and provide general and geospatial engineering throughout the entire OA and at all levels of war.

b. **Fighting as Engineers and Fighting as Infantry.** Throughout history, combat engineer organizations have been required to fill the role of infantry as a secondary mission. Combat engineer units are well armed and equipped, and capable of executing many of the infantry tasks, although they do have some organizational shortcomings for such missions. These include shortfalls in organic fire-control support, communications equipment, and necessary medical personnel. If a combat engineer unit has been designated to fight as infantry it requires the same combined arms support as other maneuver units would receive (fire support, air and missile, or other elements) and potentially the integration of other armor or other maneuver elements into its task organization to accomplish a specific mission. While combat engineers are normally involved in the close fight as engineers, reorganizing engineers to fight as infantry is an operational-level decision that requires corps commander or higher authorization due to the nature and considerations involved with reorganization and the impacts (resourcing, training, etc.) on both the engineer unit and the higher organization. While combat engineer units have the capability to be reorganized to fight as infantry, the JFC should carefully weigh the gain in infantry strength against the loss in combat engineer support. Normally, it is better to have combat engineers fight as engineers since this does not require reorganization and allows the combat engineers to quickly transition back to engineering tasks when conditions permit.

c. **Engineer Reconnaissance Capabilities.** Although the Army has no dedicated engineer reconnaissance units, commanders routinely form mission-tailored engineer reconnaissance teams to collect engineer-specific tactical and technical information. These teams are a critical source of information for engineers and combined arms commanders and staffs, playing an important role in the JIPOE.

### 2. The Modular Construct

a. The modular construct of the Army engineer force is a complementary and interdependent relationship between four major categories of units (that includes the USACE-provided engineering technical and contract support). The four categories include organic engineers and staffs and the engineer force pool (all engineer units not organic to a BCT or embedded in a BCT/HQ staff). The assets in the force pool exist to augment organic BCT engineers and provide echelons above the BCT with necessary engineer capabilities. The pool consists of engineer C2 units, core units, and specialized engineer capabilities. All

categories form a team whose diversity, breadth, and flexibility are among its greatest strengths.

b. **Engineer C2** is the basis for integrating engineer functions, elements, and capabilities. They consist of the TECs, the engineer brigade, and the engineer battalion. Each has a staff that allows the commander to battle command assorted and various engineer organizations. They each are also capable of C2 of other selected non-engineer units to support missions that require this. **Organic** engineers of the three types of BCTs provide the baseline requirements for combat and geospatial engineering and very limited selected general engineering capability in focused support of the BCTs. **Core** engineer units consist primarily of tactically/operationally focused combat and general engineering units that may augment the organic forces of the BCTs or be assigned to other supporting operations to include those typically performed under the C2 of the combat support brigade (maneuver enhancement brigade) (CSB [MEB]) at the division or corps levels. All of these units may also perform roles/missions under the C2 of the functionally focused engineer brigade or the TEC. The remaining category of engineer support is the **specialized** engineer capabilities units. These units are technically focused units that (while providing selected support at the tactical level) are focused on providing their specialized engineering capabilities in support of the operational/strategic levels throughout the range of military operations.

*For additional details about the capabilities of these units, see Army Field Manual (FM) 3-34,* Engineer Operations.

c. **Command and Control Units.** Engineer C2 is provided by three echelons of engineer units with staffs. These include the TEC, the engineer brigade, and the engineer battalion.

(1) The TEC provides battle command for all assigned or attached Army engineer brigades and other engineer units and missions for the CCDR or JTF commander. When directed it may also provide battle command (or simply C2) for engineers from other Service, allied or coalition, and contract construction engineers. The TEC is focused on operational C2 of engineer operations across all three of the engineer functions and typically serves as the theater or land component engineer.

(a) Tasks performed by the TEC include providing the support for all operational planning for the theater across all of the engineer functions. The TEC synchronizes all engineer planning and support for the CCDR or JTF commander, providing peacetime training and support of military engagement for their supported respective CCDRs. It plans and operates in close coordination with the senior CCAs in the OA.

(b) Both the TEC and the USACE are capable of rapid deployment of modular deployable staff elements and organizations to support the needs of the operational commander. Together they are capable of providing a wide range of technical engineering expertise and support from USACE, other Service technical laboratories and research centers, and other potential sources of expertise in the civilian community. They are enabled by the global reachback capabilities associated with field force engineering (FFE). TEC resources are synchronized with the USACE for peacetime engagements and to provide

operational FFE capabilities. These capabilities include technical assistance, project planning and design, contract construction, real estate acquisition, infrastructure support, and support to nation-building capacities.

(2) The engineer brigade is one of the Army's functional brigades and is capable of planning, integrating, and directing the execution of engineer missions conducted by up to five mission-tailored engineer battalions and integrating missions across all three of the engineer functions. It may also provide battle command to other non-engineer units focused on the performance of such missions as support of a division deliberate gap (river) crossing.

(a) One or more engineer brigades are required in the division or corps whenever the number of engineer units or the functional nature of engineer missions exceed the C2 capability of the multifunctional CSB (MEB). Once deployed, engineer brigades become the focal point for apportioning and allocating mission-tailored engineer forces within the OA. The engineer brigade is capable of supporting the JTF commander or component commander (land, air, or maritime) and providing C2 to all Service engineers and contracted engineering within an OA, and battle command as directed. The engineer brigade has the ability to provide deployable CPs and staffs' expertise to meet engineer-specific C2 as required. With augmentation, it may serve as a joint engineer HQ.

(b) The engineer brigade has the capability to simultaneously provide two deployable CPs. It provides engineer specific technical planning, design, and quality assurance and quality control during 24-hour operations. The engineer brigade provides training, readiness, and oversight for up to five assigned engineer battalions, preparing them for deployment in support of the brigade or other organizations.

(3) The engineer battalion is capable of planning, integrating, and directing the execution of engineer missions conducted by any mix of up to seven assigned engineer companies. They are typically found within the engineer brigade, the CSB (MEB), or in support of a BCT. With the exception of those battalions performing specific technical roles (prime power or topographic) all engineer battalion HQ are capable of providing C2 for either combat or general engineering missions when they have been task organized to perform in those roles. Training relationships will make certain battalion HQ more capable in either combat or general engineering roles. For the conduct of construction of EH clearance missions, the battalion will receive design/survey or EH teams from an engineer brigade.

(a) One or more engineer battalions may support a CSB (MEB) for combat and/or general engineering missions. In this role, or when operating as a part of an engineer brigade, the engineer battalion is typically tasked with either a combat or general engineering focus. The engineer battalion provides training, readiness, and oversight for up to seven assigned engineer companies, preparing them for deployment in support of the battalion or other organizations.

(b) When in support of a BCT, an engineer battalion will provide engineer battle command of engineer operations. The engineer battalion may be organized to perform as a breach force commander when the BCT is conducting a brigade combined arms breach,

and during a brigade gap (river) crossing operation the engineer battalion provides the option to function as the crossing site commander.

d. **Organic Engineer Units.** Each of the three types of BCTs has an engineer capability organic to it. The heavy BCT and infantry BCT each has one combat engineer (sapper) company, organic to the brigade special troops battalion. The Stryker BCT contains a single organic combat engineer (sapper) company and is positioned as a separate unit under the brigade. These organic combat engineer units provide the minimum combat and geospatial engineering capability to support BCT operations and may also perform some very limited and selected general engineering tasks. During offensive and defensive operations they will require augmentation by core elements to include potentially an engineer battalion HQ. Other specialized engineer units and equipment may also provide mission-tailored engineer support when their specialized engineer capabilities are required. EOD elements may be included in this augmentation. Organic engineers train with and remain an integral part of their parent BCT. Additionally, engineers are organic within the staffs of all Army command level echelons, providing engineer staff planning functions and integrating geospatial engineering support.

e. **Core Engineer Units.** Core engineer units include both combat and general engineer units (see Figure B-A-1). They are the primary building blocks for the organization of most engineer battalions. These units are used to augment the organic engineer capabilities of BCTs and may be task-organized under engineer battalion HQ to serve under a variety of larger HQ, providing the specific tailored capabilities needed to support any particular mission requirements.

(1) **Combat Engineer Units.** Core combat engineer units are focused on support to combat maneuver organizations at the tactical level and are designed to participate in close combat as necessary. All have the capability of fighting as engineers, or, if required, as infantry. An engineer battalion HQ will typically provide the necessary C2 and staff

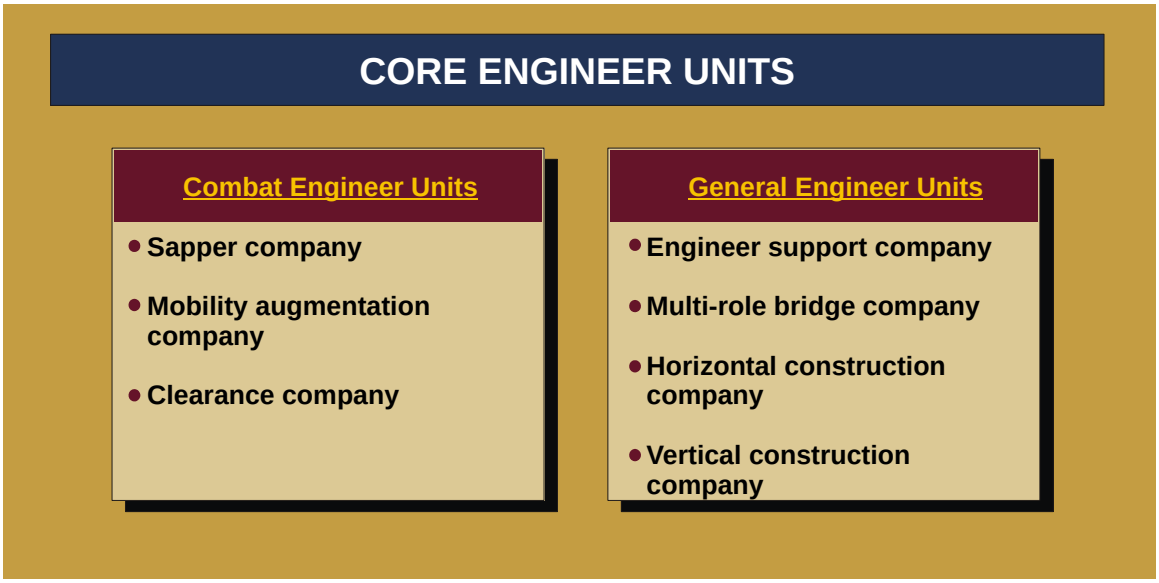


**Figure B-A-1. Core Engineer Units**

supervision for attached and assigned units when they are assigned to BCTs, maneuver enhancement brigades, or other organizations. Combat engineer (sapper) units may construct tactical obstacles, defensive positions, fixed and float bridges; repair CPs, LOCs, tactical routes, culverts, fords, and other selected general (horizontal and vertical construction-related) engineering tasks. Combat engineer units also provide engineer support for gap (to include river) crossing operations, assist in assaulting fortified positions, and conduct breaching operations. Airborne and air assault capable engineer units also have the unique ability to employ air-droppable rapid runway repair kits in support of forcible entry operations. The more specialized combat engineering capabilities of assault bridging, breaching, and route and area clearance are added to the organic engineer capabilities in BCTs (or to deployed core sapper companies) to allow them to accomplish their broader mission requirements.

(2) **General Engineer Units.** These general engineer units are comprised of bridging, support, and construction capabilities. The horizontal and vertical companies have a construction focus and are capable of constructing, rehabilitating, repairing, maintaining, and modifying landing strips, airfields, CPs, MSRs, supply installations, building structures, bridges, and other related aspects of the infrastructure. These units may also perform repairs and limited reconstruction of railroads or water and sewage facilities. The basic capabilities of these construction units can be expanded significantly. Through the augmentation of specialized personnel and equipment these baseline construction units can provide bituminous mixing and paving, quarrying and crushing, and major horizontal construction projects such as highways, storage facilities, and airfields. Additional augmentation could also include pipeline construction or dive support, depending on the type and scope of the construction mission.

f. **Specialized Engineer Capabilities.** The specialized engineer capabilities portion of the force pool provides for general and geospatial engineering capabilities at the operational and strategic levels and for specific augmentation to the tactical level (see Figure B-A-2). Some of these capabilities are among the FFE capabilities provided by the USACE. These key capabilities translate into units that are typically of a lower availability and density than the core engineer units. These smaller more specialized units are designed to typically support larger engineer-related missions/tasks or provide augmentation to selected HQ elements.

(1) **Explosive Hazards Support.** Focused on providing specialized C2 elements and the integration of other EH capabilities.

(2) **Construction Support.** Provides construction support to C2, management, procurement and contract support, greater capabilities for asphalt, concrete, and haul operations. All of these capabilities also have a role in infrastructure support.

(3) **Infrastructure Support.** Engineer prime power units generate electrical power and provide advice and technical assistance on all aspects of electrical power and distribution systems. Prime power units have a limited electrical engineering capability (design and analysis), provide electrical surveys, and operate, maintain, and perform minor repairs to other electrical power production equipment, to include HN fixed plants. Facilities

## SPECIALIZED ARMY ENGINEER FORCE POOL CAPABILITIES

| Explosive Hazards Support | Construction Support | Infrastructure Support | Geospatial Support | USACE-Related Support |
|---|---|---|---|---|
| EHCC | Survey and design section | Facility engineer detachment | Topographic engineer company | FFE (see below) |
| Explosive hazards team | Construction management section | Prime power detachment | Geospatial planning cell | |
| EOD[1] | Real estate team | Firefighting team | | |
| Mine dog team | Diver team<br>Asphalt team<br>Concrete team<br>Quarry platoon<br>Well drilling team<br>Pipeline[2] company | | | |
| Area clearance platoon | | | | |

[1] Army capability is limited in scope for Army engineers and is primarily resident in the EOD specialty of the ordnance branch.

[2] Army capability is within scope of horizontal company with subject matter expert support.

EHCC explosive hazards coordination cell
EOD explosive ordnance disposal
FFE field force engineering
USACE US Army Corps of Engineers

**Figure B-A-2. Specialized Army Engineer Force Pool Capabilities**

engineering teams assist in real estate acquisition, design, and construction support. Pipeline construction companies construct and rehabilitate pipeline systems.

(4) **Geospatial Support.** Geospatial (topographic) engineer units provide terrain and digital imagery analysis and support the integration of other geospatial information to the HQ that they support.

(5) **United States Army Corps of Engineers-Related Support.** USACE support provides for technical and contract engineering support, integrating its organic capabilities with those of other Services, civil engineering, and all other sources of engineering-related reachback support.

(a) Engineering technical and contract support is provided by a variety of supporting organizations and is a category of specialized engineer capability support. The USACE is the Army's major command assigned responsibility to execute Army and DOD MILCON, real estate acquisition, and development of the nation's infrastructure through the civil works program. Other services include wetlands and waterway management and disaster relief support operations (USACE has primary responsibilities to execute Emergency Support Function #3 for DOD). With its subordinate divisions, districts, laboratories, and centers, USACE provides a broad range of engineering service support to the Military Departments, federal agencies, state governments, and local authorities. The USACE also provides technical assistance and contract support to joint forces deployed worldwide. The USACE operates the US Army Engineer Development Center, a comprehensive network of laboratories and centers of expertise, to include the Engineer Waterways Experiment Station, Cold Regions Research and Engineering Laboratory, Construction Engineering Research Laboratories, and Topographic Engineering Center.

(b) **Field Force Engineering.** USACE has expertise at the strategic, operational, and tactical levels in engineer planning and operations and can leverage reachback to technical subject matter experts in districts, divisions, labs and centers of expertise, other Services, and private industry. USACE FFE is a means to access specialized engineer capabilities that can augment JFC planning staffs. Teams can rapidly deploy to meet requirements for engineering assessments and analyses in support of the full array of engineer operations. The two types of FESTs provide support to primarily general engineering efforts through forward-deployed engineer elements that can communicate with TETKs and reach back to technical experts within USACE. Facility engineer teams (FETs) assist in the reception and staging of troops. FETs and facility engineer detachments from the TECs provide a wide variety of services to forward deployed forces in a public works capacity.

1. **FEST-A.** Its mission is to provide additional planning capability to CCMD and Army Service component command engineer staffs. It can also deploy in support of a JTF with a limited execution capability. Its capabilities include: multiple engineer planning and design, real estate acquisition and disposal, and contracting personnel.

**FIELD FORCE ENGINEERING**

**This is the first conflict where field force engineering concepts led to a total engineer regimental effort. The US Army Corps of Engineers (USACE) and forward engineer support teams in Iraq brought expertise to the strategic, operational, and tactical level engineer effort. They evaluated and assessed the Iraqi infrastructure systems of power, water, and oil and helped solve field-engineering problems associated with bridging, power generation, and field sanitation. USACE provided a TeleEngineering Kit that was a valuable link back to centers of expertise. In one instance, this link enabled communication with the very best experts on bridge design.**

**SOURCE: Operation IRAQI FREEDOM, Engineer Lessons Learned**
**US Army Engineer School**

The FEST-A may provide an initial technical infrastructure assessment/survey, technical engineer assistance, contracting support, and real estate acquisition support.

2. **FEST-M.** Its mission is to provide C2 for USACE teams in the OA and sustained USACE engineering execution capability within an OA. This team generally supports a JTF or the land component of a JTF. The FEST-M provides LNOs and USACE engineering planning modules to supported units, as required. It is a flexible, self-sustaining organization with a mission of providing USACE capabilities through forward presence and reachback for the following primary mission areas: infrastructure engineering planning and design, technical engineering expertise, contract construction, real estate acquisition and disposal, environmental engineering, and geospatial engineering support.

# ANNEX B TO APPENDIX B
## NAVY ENGINEER ORGANIZATIONS AND CAPABILITIES

### 1. General

a. Navy engineers provide services across a full range of civil and military operations. Engineering projects, services, and missions are generally handled between two major organizations: NAVFAC and the NCF.

(1) The NCF, commonly known as Seabees, conducts peacetime, contingency engineering, and expeditionary construction operations in support of Navy, United States Marine Corps (USMC), and joint forces. The NCF provides the JFC with an expeditionary toolkit of scalable and rapidly deployable military engineers who provide contingency construction and public works in support of mission objectives.

(2) NAVFAC manages the Navy and Marine Corps MILCON projects, environmental restoration programs and supports Commander, Navy Installations Command's (CNIC's), shore installation management program. Providing engineering services, acquisition, and technical support to shore facilities and real property are the responsibilities of NAVFAC. NAVFAC also provides support to the joint warfighter. Though not a part of an operating force, CCDRS and component commanders receive support from NAVFAC in three areas:

(a) Execute contract construction funded from the MILCON appropriation.

(b) Provide construction supplemental and contingency contracting capability for planning, designing, and executing construction in theater, including architect-engineering services, real estate, environmental compliance, and BOS facility services.

(c) Provide a broad spectrum of technical support capabilities in engineering and scientific disciplines during both deliberate planning and CAP, and solve challenging problems related to engineering, infrastructure, and environmental compliance during contingency operations.

b. Although the missions differ between these two naval engineering organizations, they do provide support when necessary and vital. Both organizations provide support for FHA missions and natural disasters.

c. The NCF is organized, trained, and equipped to construct, maintain, operate, and repair advanced bases and their associated logistic pipelines. The force also provides disaster recovery and relief assistance and performs civic action projects to complement military and other national programs. NCF units are organized for quick and effective response as required by planning assumptions and guidance. Seabee units are trained in force protection operations and in limited defensive combat. The common thread that is woven throughout all Seabee units is responsiveness and flexibility. Most NCF units are organized under the 1NCD, headquartered at Joint Expeditionary Base Little Creek/Fort Story, Virginia.

## 2. Engineer Structure

a. 1NCD exercises administrative control (ADCON) and OPCON (when delegated) over NCRs and Seabee readiness groups (SRG), which encompass about 16,000 active duty and reserve NCFs. These commands are responsible for C2 over NMCBs, UCTs, and CBMUs. As a force provider, 1NCD provides ready combat construction forces to fulfill operational and forward engagement requirements of CCDRs and their component commanders for expeditionary construction, contributory support to naval shore activities and USMC bases and camps, and FHA and disaster recovery operations. 1NCD also provides contingency engineer planning in support of CCDR planning efforts.

b. During normal homeport operations (when delegated) NCF units are under the ADCON of the Navy component commander of their assigned CCDR. When deployed during peacetime, NCF units are normally transferred to the supported theater Navy component commander under the GCC. During contingencies when NCF units deploy in support of a MAGTF, NCF units are generally transferred to the theater Marine Corps forces component commander. When not directly supporting Navy or Marine Corps forces, Seabee units may be assigned as part of a JTF, or assigned to operate with other Service engineers under a special engineering task force.

## 3. Naval Construction Regiment

a. NCRs are organized under 1NCD as operational commands. Two Active Component NCRs, 22nd and 25th NCRs, are under 1NCD which reports to Commander, Second Fleet, and the 30th NCR is assigned under 1NCD Pacific, which reports to Commander, US Pacific Fleet. There are also four RC NCRs with readiness support sites spread across the continental United States (CONUS).

b. The NCR is an independent, permanently structured command element (CE) that conducts construction and engineer project management operations. They exercise OPCON over assigned units only when tasked to do so via OPORD. The NCR provides C2 over assigned subordinate engineer and other expeditionary units when deployed to an assigned geographical area. The NCR also implements general engineering policy, guidance, and standards, and conducts limited construction contracting capability when augmented by NAVFAC.

c. **Mission of the NCR.** In addition, NCRs are responsible for ensuring subordinate units assigned to them achieve maximum operational readiness prior to the unit's deployment to a contingency or forward deployment site. Responsibilities include the following tasks:

(1) Exercise TACON and OPCON when delegated.

(2) Provide construction project management oversight for all NCF units in a designated OA.

(3) Perform engineering reconnaissance and assessments.

(4) Manage Class IV stocks.

(5) Provide policy recommendations.

(6) Determine the detailed composition of the engineer force in a designated OA.

(7) Coordinate development of tactical plans for C2, intelligence, maneuver, fires, logistics, and force protection.

(8) Coordinate intelligence support requirements and assessment, guidance, and reports to assigned units.

(9) Plan and coordinate support to CA, civic action matters, and military-diplomatic operations.

(10) Plan, conduct, and maintain communications and information systems operations with various forces.

(11) Coordinate NCR MPF operations.

(12) Provide fiscal oversight and resources to subordinate commands and ensure accountability for the maintenance and management of items for which the command is responsible.

(13) Coordinate the requirements for the receipt and distribution of material resources.

(14) Function as a joint force engineer group functional HQ when designated.

(15) Coordinate NCF embarkation requirements for assigned units.

(16) Provide safety program oversight to assigned units.

(17) Maintain oversight of subordinate units and personnel readiness conditions.

(18) Function as the immediate superior-in-command and the certifying authority for subordinate assigned units per the requirements of the NCF fleet response training plan (FRTP). Certify units as they achieve their warfighting capabilities.

*Refer to Commander 1NCD Instruction 3501.4,* Naval Construction Forces (NCFs) Fleet Response Training Plan (FRTP), *for additional information on the FRTP and unit certification.*

## 4. Seabee Readiness Groups

a. **Mission.** The SRG provides training, equipment, maintenance, and logistical support to combat-ready active and reserve NCF units in support of the GCCs. SRG support is provided to those units under its ADCON to the level necessary to achieve their assigned Navy mission-essential tasks and to the associated capabilities contained in their required

operational capabilities document. The SRG also prepares units for deployments in support of a Navy component commander, JFC, or MAGTF.

b. **Responsibilities.** The SRG is organized to accomplish the following functions and tasks:

(1) Provide ADCON over assigned NCF units during the entire FRTP, both homeport and deployment phases.

(2) Provide oversight of Service operational requirements and coordinate with the cognizant NCR for construction project management oversight.

(3) Execute unit homeport training IAW the 1NCD-published FRTP and the gaining NCR.

(4) Provide homeport construction project logistics support.

(5) Provide table of allowance (TOA) management for 1NCD and its subordinate NCF units.

(6) Provide mobilization support of reserve forces (31 SRG only) to the NCF.

(7) Provide personnel support to 1NCD deployed units.

### 5. Naval Mobile Construction Battalions

a. NMCBs provide responsive military engineering and construction support to Navy, Marine Corps, and other forces in military operations. NMCBs have extensive heavy horizontal and vertical construction capabilities. NMCBs construct and maintain roads and bridging for supply routes, build EAFs and advanced bases, construct or extend airfield pavements, establish ammunition supply points, install, repackage and redeploy Mabey Johnson bridges and medium girder bridges, construct base facilities and force beddown facilities, and conduct defensive combat activities. Additional functions include repair, maintenance, and construction of shore facilities and LOCs during contingency, emergency, or FHA/CS operations. NMCBs also perform specialized construction such as water well drilling, quarry and rock crusher operations, asphalt and concrete placement, and battle damage repair such as ADR. They are able to work and defend themselves, including self-decontamination of organic equipment and personnel at construction sites outside of their base camp and execution of tactical convoys.

b. NMCBs are operationally self-sustainable for up to 60 days, requiring only replenishment of consumables. In times of emergency or disaster, NMCBs conduct FHA/CS operations. NMCBs are capable of limited operations in a CBRN environment. They are outfitted with individual personal protective gear, limited chemical and radiological detection equipment, and decontamination apparatus capable of decontamination of personnel, facilities, and equipment organic to the unit. Other configurations of the NMCB's manpower and equipment such as those pre-positioned on the maritime pre-positioning ships, have been tailored to meet various missions. An NMCB can task-organize and deploy

away from its main body a number of detachments, details, and teams depending on the operational tasking and theater requirements. Active duty NMCBs are homeported at Construction Battalion Center Gulfport, Mississippi, and Naval Base Ventura County (NBVC) Port Hueneme, California, and reserve NMCBs are headquartered at various reserve support sites throughout CONUS.

c. NMCBs have standing 89-person air detachments capable of deploying anywhere in the world within 48 hours of notification, using Air Mobility Command intertheater airlift or GCC controlled intertheater airlift. Air detachments can be reinforced in total end strength from 89-125.

### 6. Underwater Construction Teams

a. UCTs are specially trained and equipped units that perform underwater engineering, construction, repair, and inspection. UCTs facilitate port-opening operations with underwater surveys, damage repair, and obstacle removal through the use of precision demolitions, as well as detailed beach and port hydrographic and side-scans surveys for MPF or amphibious operations. UCTs conduct battle damage repair and assessments to ocean and waterfront and port facilities and are capable of a light salvage capability.

b. UCTs perform complex inshore and deep ocean underwater construction tasks in any climate, including extreme cold weather environments. They provide ocean bottom surveys for appropriate site selection of underwater facilities. UCTs are capable of diving to and working at 190 feet and rely on self-contained underwater breathing apparatus and surface-supplied-air driving systems. Typical projects include underwater repair of wharves, piers, pipelines, moorings, boat ramps, and underwater utility systems. The unit also supports OPDS operations by sinking, installing/connecting, and maintaining the single anchor let moorings.

c. A UCT is divided into three construction diving detachments and a platoon-sized shore echelon, capable of deploying as one unit or separately. Each construction diving detachment carries its own transportable recompression chamber to support diving operations anywhere in the world. The shore echelon is composed of additional and larger unit equipment for sustained operations. There are two active UCTs, one at Naval Amphibious Base Little Creek, Virginia, and the other at NBVC Port Hueneme, California.

### 7. Construction Battalion Maintenance Units

CBMUs provide initial construction and continuous public works support to the Navy's expeditionary medical facilities deployed in support of a contingency. The CBMU can provide follow-on public works operations to maintain and repair existing advanced base shore facilities or facilities constructed by NMCBs during contingency operations. The unit is capable of equipping, manning, and maintaining water production as well as steam and electrical power generation and distribution systems for advanced base facilities of up to 5,000 personnel. A CBMU performs battle damage repairs to base camps, power, sewage, POL, and water systems. A CBMU also operates and maintains automotive and construction

equipment including MHE. There are two active CBMUs, one on each coast of the CONUS, headquartered in San Diego, California, and Little Creek, Virginia.

### 8. Amphibious Construction Battalion

Amphibious construction battalions (PHIBCBs) are organized under the two NBGs, Atlantic and Pacific. The NBGs provide an administrative and CE from which personnel and equipment are formed in tactical elements and made available to appropriate commanders to support beach and waterfront operations, especially amphibious and MPF off-load operations. The PHIBCBs provide LOTS movement (ship-to-shore or shore-to-shore) and construction support to amphibious forces. PHIBCBs are part of the naval support element and report to the NBG, which is responsible for in-stream offload of maritime ships in support of amphibious operations or the pier-side offload of a maritime pre-positioning squadron in support of a more permissive operation. Primary tasking of PHIBCBs is to provide ship-to-shore transportation of fuel, materials, and equipment in support of amphibious operations. Transport is accomplished primarily by means of assembling INLS powered and non-powered causeway sections into causeway ferries. Additional tasks include operating INLS causeways, installing and operating OPDS and assault bulk liquid transfer systems, and meeting the salvage requirements of the NBG. PHIBCBs construct elevated causeways and INLS floating causeway piers, erect 1,300-man expeditionary camps, and provide camp public works support, perimeter defense, and other beach improvement construction support.

### 9. General Engineering Support to the Marine Corps

The NCF provides general engineering support to reinforce and augment the general engineering capability of the Marine Corps. The normal employment of the NCF is as a major subordinate element within the MAGTF to maximize engineering capabilities available to the MAGTF commander. NCFs are an essential support element to any size MAGTF and routinely deploy and exercise with Marine Corps units. The NCF constructs and maintains base facilities, repairs battle damaged facilities, accomplishes disaster recovery efforts and FHA construction projects, and conducts limited defensive operations as required by the operating environment.

### 10. Engineering Technical and Contract Support

a. Engineering technical and contract support is provided by a variety of supporting organizations. NAVFAC provides engineering planning, design engineering, project management, environmental engineering support, construction contracting, and operations and maintenance for shore-based and ocean facilities. In particular, NAVFAC has mobile utilities support equipment (MUSE) teams, which provide temporary or short-term utility support. Typical MUSE team missions include support for MILCON and special projects, pier-side naval vessel support, emergency response to natural disasters (e.g., typhoon damage recovery), and joint contingency operations. The officer in charge of construction (OICC) is an organizational element within NAVFAC that's established primarily for large temporary construction programs lasting 3 to 7 years. Their responsibilities range from design and acquisition to post-award construction oversight. The resident officer in charge

of construction (ROICC) is another element traditionally responsible for only acquisition and post-award construction oversight particularly in support of non-Navy commands, such as Marine Corps and Air Force. During contingencies, the OICC and ROICC organizations can either expand or be established to support contingency construction requirements.

b. NAVFAC is designated as a CCA by DOD. It administers the Navy's GCCC and GCSC program. One method of execution is through the use of NAVFAC's contingency OICC team. It's capable of performing contingency engineering and acquisition services in any operational environment. Its mission is to provide technically competent engineering and mobilization-ready personnel to rapidly deliver NAVFAC products and services in support of NAVFAC mission requirements for contingency operations including surge and operational support for:

(1) CCDR engineer requirements across the range of military operations.

(2) Homeland defense.

(3) Natural disasters.

(4) Other contingency/expeditionary support. Another method is to employ contingency engineering response teams (CERTs). CERTs are temporary task-organized detachments formed to support specific missions, normally in response to emergent requirements and contingencies such as natural disaster or man-made event. Their mission is to provide responsive, technical engineer expertise, and assistance support for emergency response to natural disasters, such as typhoon damage recovery, and naval and joint contingency operations.

c. The Naval Facilities Engineering Service Center (NFESC) provides a variety of technical and scientific expertise in facilities engineering, technology, and specialized products and services on a worldwide basis. NFESC also serves as a research consultant to operating forces in the following areas:

(1) Contingency engineering,

(2) Amphibious and expeditionary systems,

(3) Logistics C2,

(4) Explosive safety and blast mitigation,

(5) Ordnance facilities,

(6) Utilities and energy,

(7) Environmental engineering,

(8) Ocean engineering,

(9) Shore facilities engineering, and

(10) Force protection services.

*For additional information on the naval civil engineering refer to Navy Warfare Publication (NWP) 4-04,* Naval Civil Engineering; *Navy Tactics, Techniques, and Procedures (NTTP) 4-04.2,* Naval Construction Force Operations*; NTTP 4-04.3,* Naval Contingency Engineering Operations; *and Navy Tactical Reference Publication (NTRP) 4-04.2.1,* Doctrinal Reference for the Naval Construction Force.

# ANNEX C TO APPENDIX B
## AIR FORCE ENGINEER ORGANIZATIONS AND CAPABILITIES

### 1. General

The primary mission of Air Force civil engineers is to provide basing for beddown of forces, aircraft, and Air Force weapon systems. Air Force civil engineers focus primarily on general engineering and installations support activities including base establishment and survivability, force protection, ADR, and base denial. Air Force civil engineers organize as Prime BEEF and RED HORSE forces to support contingencies. They are highly trained and equipped to rapidly mobilize and establish airbases to enable the projection of air, space, and cyberspace power across the globe and throughout all phases of military operations. Engineering technical and contract support for Air Force civil engineer mobility forces are provided by a variety of other supporting organizations. AFCESA provides technical engineering support and training, and administers the AFCAP. Additionally, AFCESA provides specialized teams to assess pavement and runway conditions along with teams to conduct depot-level maintenance and repair of power generation equipment and aircraft arresting systems. The AFCEE provides a full range of environmental program support, base planning, construction, and contract services.

### 2. Organization and Command

Air Force engineer forces are assigned to CCMDs through the Service component. The CCDR exercises command authority over Air Force civil engineers through the COMAFFOR. During deployments, engineers remain under OPCON of the COMAFFOR. Although RED HORSE units are considered theater assets not assigned or attached to any wing structure, OPCON for these forces also remain with the COMAFFOR. Air Force engineers deploy as part of an AETF, or as detached units supporting limited missions or taskings. Air Force engineer forces are organized by unit type codes (UTCs) that can be tailored to meet specific mission requirements. These UTCs can be combined to provide the full range of support needed to achieve the CCDR's objectives.

### 3. Prime BEEF Capabilities

a. Prime BEEF teams consist of total force military Air Force personnel assigned to home-station civil engineer organizations. During contingencies, engineers transition to an expeditionary mode capable of rapidly responding worldwide, providing the full range of engineering support and emergency services to establish, sustain, and recover bases for employing Air Force weapon systems and supporting joint/multinational forces. Prime BEEF capabilities include site surveys, bare base construction, concrete and asphalt paving, utility system installation and maintenance, installation GI&S, ADR, fire protection/crash rescue, EOD operations, and EM. Prime BEEF UTCs are rapidly deployable via airlift with team kits to support initial beddown taskings.

b. Prime BEEF teams can be formed into an expeditionary civil engineer squadron (ECES) to sustain bases as they transition from short-term bases with initial standards of construction to more enduring bases with temporary or permanent infrastructure. The ECES

would provide installations support, consisting of activities necessary for effective real property life cycle management and installation services (e.g., planning, providing installation assets, operating and maintaining utilities systems and infrastructure, environmental management, energy conservation, recapitalization, disposal, economic adjustment activities). This capability focuses on managing real property facilities and infrastructure on US or enduring bases in foreign theaters of operations while providing protection, safety, security, and sustainability for personnel and mission critical assets. Sustainment supplies and project materials can be procured from pre-positioned stockpiles, war readiness materiel depots, or contract sources.

c. Prime BEEF core competencies are expeditionary engineering and emergency services. Expeditionary engineering consists of those capabilities Prime BEEF teams provide to establish, sustain, and recover bases, while emergency services includes fire emergency services (FES), EOD, and EM activities.

(1) Expeditionary Engineering

(a) Air Force expeditionary engineering capability consists of civil engineer activities to establish, sustain, and recover airfields, and conduct force beddown operations, infrastructure maintenance, and base sustainment activities. It focuses on operating and/or maintaining aircraft arresting systems, airfield lighting, heavy equipment, airfield surfaces, roads, and temporary, semi-permanent, or permanent facilities; and includes the specialized capabilities of operating/maintaining aircraft arresting systems, and power generation and distribution systems. Teams perform light horizontal and vertical construction; provide pest management and environmental services; provide overall bare base master planning, design, and contract support, to include specialized augmentation at echelons above wing level; and conduct base recovery after attack, to include ADR and repairs to facilities and infrastructure systems.

(b) A specialized Air Force expeditionary engineering capability inherent in Prime BEEF is offered by the civil engineer maintenance, inspection, and repair team (CEMIRT). CEMIRT consists of experts in electronic industrial controls, electrical/electronic equipment, system integrators, and electrical systems that provide remote monitoring and control of core utility equipment and systems, such as dispersed emergency backup generator sets, water/wastewater systems, and electrical distribution equipment. CEMIRT provides intermediate and depot-level repair support on power generation, electrical distribution, and aircraft arresting systems and technical support for heating, ventilation, and air conditioning systems.

(c) Another specialized Air Force expeditionary engineering capability inherent in Prime BEEF is offered by APE teams. APE teams conduct structural evaluations of airfields around the world. APE teams perform routine and emergency evaluations using an array of lab and field equipment and state-of-the-art modeling software to help evaluate the strength and viability of airfields and determine the types of aircraft and number of takeoffs and landings the airfields can support.

(d) Other examples of specialized Air Force expeditionary engineering capabilities available through Prime BEEF are engineering command and control, base master planning, project programming and design, construction project/contract management, and construction quality assurance. These capabilities are available at the wing/base level, but can be used to support higher echelons (i.e., major command, numbered air force, or JTF levels). These specialized engineering capabilities are provided by established Prime BEEF staff augmentation team (S-Team) force packages, or tailored Prime BEEF force packages to meet the mission requirement. Established S-Team force packages include:

1. Civil engineer S-Teams made up of 10 professionally registered engineering officers plus two senior enlisted personnel,

2. Fire protection S-Teams made up of three senior enlisted firefighters,

3. Civil engineer staff nuclear, biological, chemical, and conventional theater/joint staff support teams with two senior enlisted personnel,

4. Prime BEEF engineering assistance teams made up of three enlisted engineering assistants for surveying, drafting, and other engineer assistance as required.

(2) Emergency Services

(a) FES provides incident management, fire prevention, and protection to minimize loss to lives, property, and the environment occurring throughout all phases of military operations. Included are fire suppression, hazard mitigation, rescue, mitigation or containment of releases of HAZMAT, and emergency medical responses. FES is capabilities-based, tailored to specific missions and geographic locations, and based upon environmental and threat conditions for different locations. During contingencies, firefighters are the primary installation emergency response team, responsible for supporting the commander's requirement to launch and recover sorties. When Air Force firefighters are deployed in support of major operations where Air Force beddown and sustainment support is unavailable, the supported command, Service, or agency must provide logistical sustainment requirements.

(b) EOD provides the capability to mitigate or defeat the hazards presented by enemy or friendly employment of explosive ordnance, to include IEDs, explosive remnants of war, UXO, chemical, biological, radiological, nuclear, and high-yield explosives (CBRNE), WMD, and incendiary material. The Air Force provides distinctive EOD expertise to protect the mission, resources, and the environment in airfield operations, ground combat, homeland operations, defense support to civil authorities, and worldwide contingencies. EOD is a high demand capability that can be employed alone or as part of an Air Force, joint, interagency, or MNF to support CCDR objectives. Air Force EOD forces are primarily postured to support airbase operations, with primary missions to support sortie generation and force protection by eliminating explosive threats to airfield operations. Priority employment is in support of base security zones (BSZs) and EOD missions outside of the BSZ in support of air operations or land battlespace enabling freedom of maneuver.

An important EOD mission, independent of air operations, is weapons technical intelligence (WTI). WTI includes investigating explosive events in order to capture bomb emplacers, identify bomb builders, and unravel extremist networks. EOD plays a pivotal role during WTI in the safe handling of military, commercial, and homemade explosives; assessing weapons and devices; and preserving forensic evidence from rendered safe devices, post-blast scenes, and cache discoveries. EOD provides a critical capability to rapidly disseminate and share critical threat information and targeting opportunities.

(c) EM personnel provide theater and in-garrison EM, CBRN, passive defense and response expertise working within the air operations center, JTF, or in-garrison emergency operations center. EM personnel are responsible for CBRN defense operations, coordination of incident management efforts, hazard identification/plotting, CBRN warning and reporting system, and establishing a COP for the commander. Additionally, EM personnel integrate counter-CBRN, force protection, critical infrastructure protection, antiterrorism, and medical requirements as they relate to all hazards incident response and recovery operations. EM provides detection, identification, and sampling capabilities for CBRN and HAZMAT incidents, and expertise in decontamination operations for personnel equipment, vehicles, aircraft, and other resources.

## 4. RED HORSE Capabilities

a. RED HORSE units are self-sustaining heavy construction forces that contain organic, self-sustaining, logistical support, and special construction capabilities. These units execute heavy horizontal and vertical construction projects; site development; construction and repair of runways, taxiways, aprons, roads, and revetments; heavy earthwork; construction and repair of facilities and infrastructure; and water purification. RED HORSE capabilities include all of the functions of Prime BEEF teams, but are more focused on providing a heavy construction capability including the specialized engineering capabilities of water well drilling, small-scale explosive demolition, quarry operations, concrete/asphalt batch plant operations, concrete/asphalt paving, materials testing, large expedient facility erection, and the installation of specialized assets such as aircraft shelters, dome shelters, clamshells, and expanded shelters.

b. RED HORSE teams are capable of being deployed in a hub-and-spoke operation. This hub-and-spoke concept centers on primary and secondary beddown echelons which support specialized construction teams tailored to individual project requirements. The concept is to deploy the entire squadron, including augmentees, to a single AOR along with the appropriate equipment and vehicles. As the COMAFFOR establishes work requirements and priorities, the squadron will deploy teams to accomplish projects. They can be organized as squadrons or groups, depending on the mission. RED HORSE typically reports to a numbered air force in peacetime. During wartime, they are utilized as a theater asset reporting directly to the COMAFFOR and not tied to a particular base or weapon system. OPCON remains within Air Force channels, regardless of the type of operation supported.

c. Specialized RED HORSE capability is offered by Airborne RED HORSE flights to conduct expedient repairs to airfield surfaces and evaluate supporting infrastructure for potential COMAFFOR follow-on forces. This capability is used in Level III threat

environments when supported by security forces personnel, special operations, or other combat forces. Airborne RED HORSE forces can be deployed by airdrop, air-insertion, or air-delivery. Fundamental capabilities for Airborne RED HORSE flights include initial site survey assessment, UXO clearing, assess site for CBRNE materials, removal/demolition of obstructions, expedient force protection construction, repair airfield surfaces for limited airlift operations, install contingency airfield lighting, test for potable water sources, and perform pavement evaluations. Airborne RED HORSE engineers can be augmented by EOD and/or FES personnel to clear small areas of UXO and EHs, provide limited firefighting, rescue, and provide medical services.

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# ANNEX D TO APPENDIX B
## MARINE CORPS ENGINEER ORGANIZATIONS AND CAPABILITIES

### 1. General

The MAGTF is the Marine Corps' principal organization for all missions across the range of military operations. MAGTFs are balanced, combined arms forces consisting of four organic elements: the CE, ACE, GCE, and logistics combat element (LCE). MAGTFs range in size from a MEF, Marine expeditionary brigade (MEB), Marine expeditionary unit (MEU), to a special purpose marine air-ground task force (SPMAGTF). A MEF has a Marine division as the GCE, a Marine air wing as the ACE, and a Marine logistics group as the LCE. A MEB has a regiment as the GCE, a Marine air group as the ACE, and a combat logistics regiment as the LCE. A MEU has a battalion as the GCE, a squadron as the ACE, and a combat logistics battalion as the LCE. The element sizes that make up a SPMAGTF vary according to mission. Depending on mission assigned, MAGTFs of MEF and MEB size may be augmented by NCF. When this occurs, the NCF forms a separate (or 5th) element of the MAGTF. Engineers are organic to each of the four elements of a MAGTF. See Figure B-D-1.

### 2. Engineers in the Command Element

Engineers within the CE provide advice and guidance to the MAGTF commander and coordinate the overall engineer efforts of the MAGTF. CE engineers work closely with

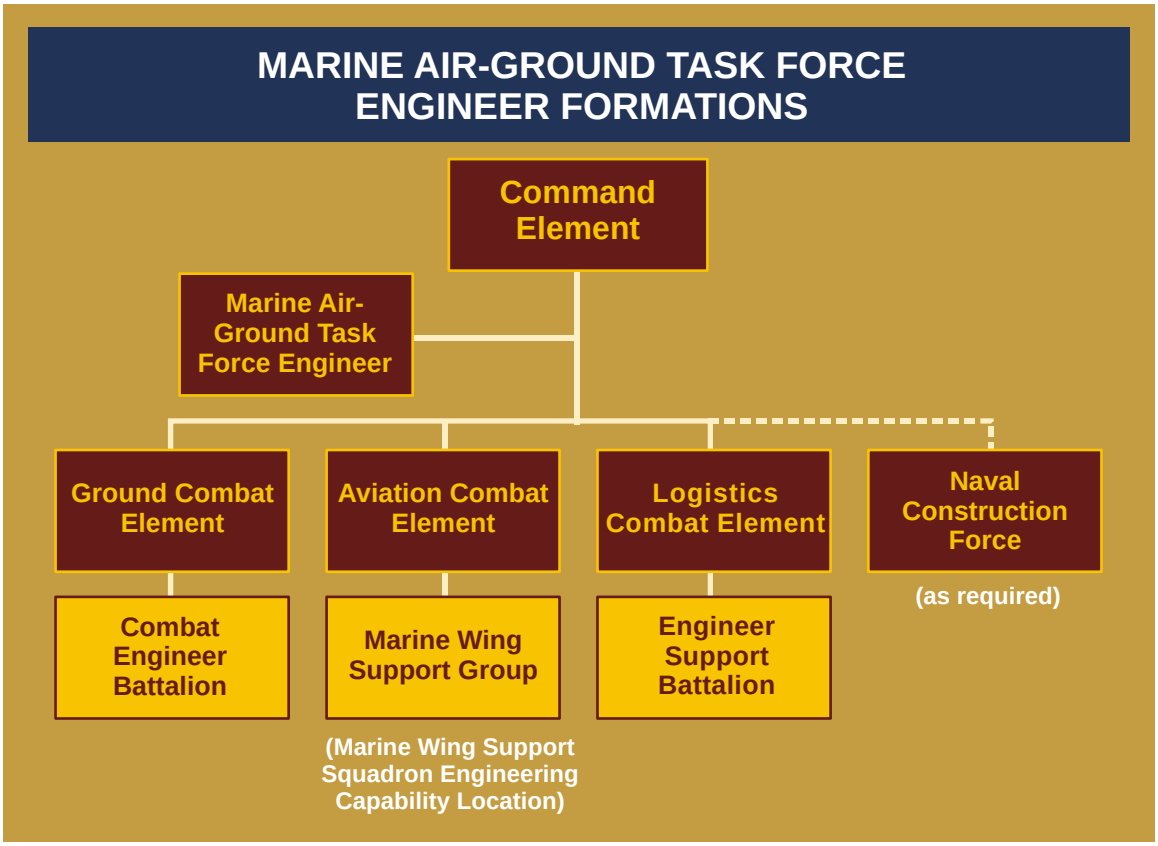


**Figure B-D-1. Marine Air-Ground Task Force Engineer Formations**

other staff sections to integrate engineer considerations and requirements into all phases of planning and execution.

### 3. Engineers in the Aviation Combat Element

A MWSG is organic to each Marine aircraft wing. The MWSG is an HQ element that has subordinate MWSSs. The MWSS provides the following AGS functions: internal airfield communications; EAF services; aircraft rescue and firefighting; aircraft and ground refueling EOD; motor transport; field messing; medical; CBRN defense; security and law enforcement; air base commandant functions to include ABGD; and organic and support unit personnel training. These functions allow the ACE to project its assets ashore and generate sorties at a rate beyond that capable from sea-based platforms. AGS is compatible with Navy aircraft and can support and accommodate Army rotary-wing aircraft and most Air Force aircraft. The three main categories of engineer services provided by the engineer company of the MWSS are general engineering services, utilities, and material handling and heavy equipment services. The engineer company provides a host of general engineering services necessary to support the ACE during operations. They include: engineer reconnaissance; construction and maintenance of mission-essential base camp requirements; technical and equipment assistance for erection and construction of prefabricated structures; development, improvement, and maintenance of airfield and air base drainage systems; camouflage expertise; technical expertise in assessing bomb damage and providing the personnel and equipment necessary to perform ADR; limited mine detection capability; limited combat engineer services; construction, improvement, and maintenance of vertical/takeoff and landing and vertical/short takeoff and landing facilities; soils engineering; and soil stabilization and dust mitigation. The MWSS can be reinforced by MAGTF ESBs or NCF as necessary to perform missions such as constructing airstrips in excess of 900 feet. Generally, four MWSSs compose the MWSG. The MWSS is composed of an HQ company, airfield operations company, engineer company, and motor transport company.

### 4. Engineers in the Ground Combat Element

A CEB is organic to the Marine division. The CEB mission is to enhance the mobility, countermobility, and survivability of the division through combat and limited general engineering support. CEB tasks include: engineer reconnaissance; emplacing obstacle systems; breaching operations; mine/countermine; demolitions; limited combat road and trail construction and maintenance; temporary vertical and horizontal construction; and provide provisional infantry. A CEB contains a headquarters and service (H&S) company, engineer support company, and three or four combat engineer companies. A mobile assault company provides armored bridging, mechanized breaching, and mobile route reconnaissance and clearance capabilities in order to enhance the mobility of the Marine division.

### 5. Engineers in the Logistics Combat Element

The ESB is organic to the LCE. The ESB provides general support to the MAGTF by providing combat engineering and limited general engineering, bulk liquid (fuel and water), and utility support. ESB tasks include: combat engineering support; standard and non-

standard bridging; mine/countermine; demolitions; EOD; handling, storing, and dispensing bulk fuel and water; water purification; engineer reconnaissance and survey; construction and maintenance of base camps to include survivability; horizontal and vertical construction; laundry and shower services; mobile electric power; refrigeration; expedient road construction, repair, and maintenance; drafting and surveying; obstacle emplacement; breaching operations; and EAF construction. The ESB can reinforce either the MWSS or CEB to support specific requirements that exceed organic ACE or GCE engineer capabilities. The ESB works in concert with the NCF to provide comprehensive engineer support to the MAGTF. The ESB is composed of an H&S company, engineer support company, bridge company, EOD company, bulk fuel company, and two or three combat engineer companies.

### 6. Seabee Support to the Marine Air-Ground Task Force

The Navy typically provides a NMCB from the NCF to enhance the MAGTF through complementary, not duplicative, general engineering support. NMCB tasks include: construction of pre-engineered buildings, bunkers, towers, ammunition supply points, concrete and masonry buildings; surveying and drafting; materials testing; well drilling operations; rapid runway repair; bulk liquid distribution and storage; forward arming and refueling point sites; water purification; horizontal construction such as paved and unpaved roads; MSR maintenance; EAFs; asphalt and concrete runways; parking areas; beach improvements; and installation of both standard and non-standard bridging.

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# ANNEX E TO APPENDIX B
## MATRIX OF SERVICE ENGINEER CAPABILITIES

The Matrix of Service Engineer Capabilities lists engineer capabilities by Service. The intent is to provide the JFC and his staff a snapshot of Service-specific engineer capabilities across the range of military operations. Capabilities are provided by the unit types listed under each Service in the matrix. The unit types are either specifically designated or are specialized capabilities not inherent in the designated unit types. Additionally, the matrix identifies if a capability is primary or secondary to a Service. A primary capability (designated as "P" in the matrix Figure B-E-1) is one in which the ability to perform the function is organic to the unit and is a specified task within the unit mission. The unit is also equipped or trained to accomplish the task. A secondary capability (designated as "S" in the matrix of Figure B-E-1) is one in which the unit has a limited ability (training, expertise, equipment) to accomplish the task. The task is either an implied task within the mission of the unit, or is specified as a secondary role for the unit. The matrix does not provide a standard formula for the integration of Service engineer elements and their capabilities within joint force operations. The JFC and his staff must consult with the joint force engineer for advice on engineer capability integration and interoperability. For additional information on Service engineer capabilities, roles, and missions, refer to the previous chapters of this publication or the respective Service's publication for engineering.

| MATRIX OF SERVICE ENGINEER CAPABILITIES | | | | |
|---|---|---|---|---|
| | **USMC** | **NAVY** | **ARMY** | **USAF** |
| | These reflect the highest USMC engineer capability. Applies to all 4 unit types unless noted. Key: 1 = CEB 2 = ESB 3 = MWSS 4 = Specialized | These reflect the highest USN engineer capability. Applies to all 7 unit types unless noted. Key: 1 = NMCB 2 = UCT 3 = CBMU 4 = NCFSU 5 = PHIBCB 6 = Specialized 7 = NAVFAC | These reflect the highest USA engineer capability. Applies to the preponderance of both baseline types unless noted. Key: 1 & 2 are Baseline 1 = Combat 2 = Construction 3 = Specialized 4 = Tech Expertise (USACE) | These reflect the highest USAF engineer capacity. Applies to all 4 unit types unless noted. Key: 1 = Prime BEEF 2 = RED HORSE 3 = Specialized 4 = Tech Expertise (AFCEE, AFCESA) |
| **Combat Engineering Capabilities** | | | | |
| **Baseline** | | | | |
| Conduct Engineer Reconnaissance | P | S | P | N |
| Employ Specialized Demolitions | P[1,2,3] | S | P[1] | N |
| Provide Technical Engineer Advice | P | S | P | N |
| Fight as Infantry/Engineers | S/S[1] | N/S | P[1,2(-)] | N/N |

**Figure B-E-1. Matrix of Service Engineer Capabilities**

| MATRIX OF SERVICE ENGINEER CAPABILITIES | | | | |
|---|---|---|---|---|
| | **USMC** | **NAVY** | **ARMY** | **USAF** |
| | These reflect the highest USMC engineer capability. Applies to all 4 unit types unless noted. Key: 1 = CEB 2 = ESB 3 = MWSS 4 = Specialized | These reflect the highest USN engineer capability. Applies to all 7 unit types unless noted. Key: 1 = NMCB 2 = UCT 3 = CBMU 4 = NCFSU 5 = PHIBCB 6 = Specialized 7 = NAVFAC | These reflect the highest USA engineer capability. Applies to the preponderance of both baseline types unless noted. Key: 1 & 2 are Baseline 1 = Combat 2 = Construction 3 = Specialized 4 = Tech Expertise (USACE) | These reflect the highest USAF engineer capacity. Applies to all 4 unit types unless noted. Key: 1 = Prime BEEF 2 = RED HORSE 3 = Specialized 4 = Tech Expertise (AFCEE, AFCESA) |
| Perform Complex Demolition Operations | P[1,2,3] | P | P[1,2,3] | N |
| Perform Explosive Ordnance Disposal Activities | P[2,3] | N | P[1] | N |
| | | | | |
| **Mobility** | | | | |
| Breach Obstacles | P[1,2] | N | P[1] | N |
| Construct Combat Roads and Trails | P[1] S[2] | S | P | N |
| Assault Bridging | P[1] | S[1] | P[1] | N |
| Clear Mines | P[1] S[2] | N | P[1] | N |
| Clear Helicopter Landing Zones | P[1,2,3] | S | P | N |
| Initial Beach Improvement | P[1] S[2] | P | P | N |
| Build/Repair Expedient Airstrip/Landing Zone | P[2,3] | P | P | N |
| | | | | |
| **Countermobility** | | | | |
| Place Mines | P[1,2] | N | P[1] | N |
| Plan/Install Obstacles and Barriers | P[1,2,3] | N | P[1,2(-)] | N |
| | | | | |
| **Survivability** | | | | |
| Construct Field Fortifications | P | S | P | N |
| **General Engineering Capabilities** | | | | |
| **Baseline** | | | | |
| Conduct Engineer Reconnaissance/Site Survey | P[2,3] | P | P | P |
| Surveying and Drafting | P[2,3] | P | P[2,3,4] | P |
| Plan and Estimate Projects | P | P | P[1,2,3,4] | P |
| Engineering Design | P[2] S[3] | P | P[2,3,4] | P |
| Provide Technical Engineer Advice | P[2,3] | P | P | P |
| Project Management | S | P | P[1,2,3,4] | P |
| Fight as Infantry | S[1,2,3] | S | P[1,2(-)] | N |

**Figure B-E-1. Matrix of Service Engineer Capabilities**

| MATRIX OF SERVICE ENGINEER CAPABILITIES | | | | |
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| Infrastructure Damage Assessment and Repair | $S^{2,3}$ | P | P | $P^{1,2,3}$ |
| Disaster Preparedness | $S^{2,3}$ | P | P | $P^{1,2}$ |
| Environmental Protection | $S^{2,3}$ | S | P | $P^{1,4}$ |
| Hazardous Materials Waste Management | N | S | P | $P^{1}$ |
| Tactical Bridging | $P^{1}$ | $S^{1}$ | $P^{1}$ | N |
| Fixed/LOC Bridging | $S^{1}$ | $P^{1}$ | $P^{1}$ | N |
| Provide Real Estate Services | S | N | $P^{2,4}$ | $S^{4}$ |
| | | | | |
| **Base Camps** | | | | |
| Plan/Construct/Repair/ Maintain Base Camps (0-6 months) | $P^{2,3}$ | P | P | $P^{1,2}$ |
| Plan/Construct/Repair/ Maintain Base Camps (6-12 months) | $P^{2,3}$ | P | P | $P^{1,2}$ |
| Plan/Construct/Repair/ Maintain Base Camps (> 12 months) | $P^{2,3}$ | P | P | $P^{1}$ |
| Construct Logistic Support Bases | $P^{2}$ | P | P | $P^{2}$ |
| Construct/Improve/Maintain Logistic Support Area | $P^{2}$ | P | $S^{2}$ | $S^{2}$ |
| Construct Semi-Permanent Staging/Marshalling Areas | S | P | P | $P^{1,2}$ |
| Provide Structural Firefighting Support | $S^{3}$ | N | $P^{3}$ | $P^{1}$ |
| Erect Pre-Engineered Structures | $P^{2,3}$ | P | P | $S^{1}$ $P^{2}$ |
| Erect Field Hospitals | $S^{2}$ | P | P | $S^{2}$ |
| | | | | |
| **Infrastructure** | | | | |
| Vertical/Horizontal Construction | $P^{2,3}$ | P | $P^{2,3}$ | $P^{1,2}$ |
| Asphalt Placement Operations | N | P | $P^{3}$ | $P^{2}$ |

**Figure B-E-1. Matrix of Service Engineer Capabilities**

| MATRIX OF SERVICE ENGINEER CAPABILITIES | | | | |
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| Operate Base Central Power Plant | N | P | P[3] | P[1] |
| Provide Tactical Water/Hygiene | P[2,3] | P[3] | N | P[1,2] |
| Provide Tactical Electrical Supply | P[2,3] | P[3] | P[2,3] | P[1,2] |
| Develop Sewage and Water Systems | N | P | P | P[1,2] |
| Bulk Fuel Support | P[2,3] | P | P[3] | S[2] |
| Concrete Placement/Paving Operations | P[2,3] | P, S[2,3] | P[1,2,3] | P[2] |
| | | | | |
| **Airfields** | | | | |
| Build/Repair/Maintain Expeditionary Airfield/Landing Zone | P[2,3] | P | P | P[1,2,3] |
| Perform Airfield Damage Repair | P[2,3] | S | P | P[1,2] |
| Perform Rapid Runway Repair | P[3] | P | P | P[1,2] |
| Improve/Sustain Airfields | P[2,3] | P | P | P[1] |
| Construct Aircraft Revetment/Dispersal Sites | P[3] | P | P[2,3] | P[2] |
| Provide Aircraft Crash/Fire/Rescue Support | P[3] | S | P[3] | P[1] |
| Install and Maintain Airfield Lighting/Navigating Systems | P[3] | N | P[2,3] | P[1,2] |
| Install, Certify, and Maintain Aircraft Arresting Barriers | P[3] | P[7] | P[2,3,4] | P[1,2] |
| Airfield Planning | P[3] | P[6] | P[2,3,4] | P[1,2] |
| | | | | |
| **Seaports** | | | | |
| Perform Pile Driving Operations | N | P | P | N |
| Construct/Repair Port/Waterfront Structures | N | P | P | N |
| Over-the-Shore Causeway | N | P | P | N |
| Underwater Construction/Maintenance | N | P | P[3] | N |

**Figure B-E-1. Matrix of Service Engineer Capabilities**

| MATRIX OF SERVICE ENGINEER CAPABILITIES | | | | |
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| Provide Technical Bulk Fuel Storage/Dispersing (Over-the-Shore) | N | P | P[3] | N |
| Perform Light Salvage/Recovery Operations | N | S[2,6] | S[3] | N |
| Perform Dredging Operations | N | S[7] | S[4] | N |
| | | | | |
| **Lines of Communications** | | | | |
| Improve Beaches | P[2] | P | P | N |
| Construct/Repair/Reinforce Standard/Non-Standard Bridges | P[2] | P | P | N |
| Concrete Batch Plant Operations | N | P | P[3] | P[2] |
| Asphalt Batch Plant Operations | N | P | P[3] | P[2] |
| Perform Quarry Operations | N | P | P[3] | P[2] |
| Perform Rock Crusher Operations | N | P | P[3] | P[2] |
| Airfield Pavement Evaluation and Certification | S[3] | N | P[2,3,4] | P[3] |
| Drill Wells | N | P | P[2,3,4] | P[2] |
| Provide Fixed Site Material Handling Equipment Services | P[2,3] | N | P[2,3] | N |
| Provide Contingency Contracting Services | N | P[6] | P[2,4] | S[2] P[4] |
| Construct Roads | P[2] | P[1,7] | P[1,2,4] | P[1,2] |
| Construct Pipelines | P[2] | P[1,2,5,7] | P[2,3,4] | P[1,2] |
| Construct Railbeds | N | P[1,7] | P[2,4] | N |
| **Geospatial Engineering Capabilities** | | | | |
| Provide Existing Data for Operational Environment Visualization | N | P[7] | P[3,4] | P |
| Develop/Manage Georeferenced Terrain Information | N | P[7] | P[3,4] | P[1,2] |

**Figure B-E-1. Matrix of Service Engineer Capabilities**

| MATRIX OF SERVICE ENGINEER CAPABILITIES | | | | |
|---|---|---|---|---|
| | **USMC** | **NAVY** | **ARMY** | **USAF** |
| | These reflect the highest USMC engineer capability. Applies to all 4 unit types unless noted. Key: 1 = CEB 2 = ESB 3 = MWSS 4 = Specialized | These reflect the highest USN engineer capability. Applies to all 7 unit types unless noted. Key: 1 = NMCB 2 = UCT 3 = CBMU 4 = NCFSU 5 = PHIBCB 6 = Specialized 7 = NAVFAC | These reflect the highest USA engineer capability. Applies to the preponderance of both baseline types unless noted. Key: 1 & 2 are Baseline 1 = Combat 2 = Construction 3 = Specialized 4 = Tech Expertise (USACE) | These reflect the highest USAF engineer capacity. Applies to all 4 unit types unless noted. Key: 1 = Prime BEEF 2 = RED HORSE 3 = Specialized 4 = Tech Expertise (AFCEE, AFCESA) |
| Provide Terrain Analysis | S[1,2,3] | P[6] | P[3,4] | P[1,2] |
| Provide Standard/Non-Standard Geospatial Products and Services | N | P[7] | P[3,4] | P[1,2] |
| Provide Port/Water Bathymetric Services | N | P[7] | P[3,4] | N |

**Legend**

**P = Primary capability:** Organic within the unit, specified task within the mission of the unit. Trained and/or equipped to accomplish this capability.
**S = Secondary capability:** Unit has a limited ability (training, expertise, and equipment) to accomplish the task. Implied task for the unit. Task specified as a secondary role for the unit.
**N = Not a capability of this organization.**

**- = Limited capacity within identified unit.**

Note: Contractors are being asked to perform many of the general engineering tasks listed above.

**Acronym List**

| | |
|---|---|
| AFCEE | Air Force Center for Engineering and the Environment |
| AFCESA | Air Force Civil Engineering Support Agency |
| CBMU | construction battalion maintenance unit |
| CEB | combat engineer battalion |
| ESB | engineer support battalion |
| LOC | line of communications |
| MWSS | Marine wing support squadron |
| NAVFAC | Naval Facilities Engineering Command |
| NCFSU | naval construction force support unit |
| NMCB | naval mobile construction battalion |
| PHIBCB | amphibious construction battalion |
| Prime BEEF | Prime Base Engineer Emergency Force |
| RED HORSE | Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer |
| UCT | underwater construction team |
| USA | United States Army |
| USACE | United States Army Corps of Engineers |
| USAF | United States Air Force |
| USMC | United States Marine Corps |
| USN | United States Navy |

**Figure B-E-1. Matrix of Service Engineer Capabilities**

# APPENDIX C
## CONTRACT CONSTRUCTION AGENTS

### 1. General

a. The DOD construction agents are the USACE, NAVFAC, or other approved DOD activity such as AFCEE (see DODD 4270.5, *Military Construction*). These organizations and their contractors are a powerful force multiplier, allowing military engineers to concentrate on engineering missions in high-threat areas. USACE and NAVFAC also provide the JFC with a significant engineering capability to be leveraged in joint operations. USACE and NAVFAC are the principal organizations to plan, design, construct, and acquire (lease or buy) facilities and real estate. AFCESA and AFCEE also have the authority to design and construct projects to support joint and Air Force requirements. Inherent in their mission support capabilities is a planning and engineering capability for theater advanced base and infrastructure development. These organizations also maintain in-depth expertise in engineering research and development.

b. **Responsibilities.** The responsibilities of the DOD construction agents include the design, award, and management of construction contracts for projects associated with the peacetime MILCON program. Overseas, USACE, NAVFAC, and the Air Force are assigned specific geographical areas under DODD 4270.5, *Military Construction* (see Figure C-1). Related to these responsibilities is the leasing of real estate.

c. **Construction Contracting in Contingencies.** The CCDR may also use USACE, NAVFAC, and where approved, AFCEE as contingency CCAs for design, award, and management of construction contracts in support of military operations. For geographical areas where there is no designated DOD construction agent, the CCDR will usually designate a CCA for support in a contingency. USACE and NAVFAC also provide facilities planning, contract administration, and technical engineering support to JFCs (e.g., advanced base master planning, geospatial engineering, force-protection engineering, environmental engineering, and cold-weather mobility). AFCEE provides planning, contract administration, and technical engineering support to JFCs and critical oversight and execution support to Air Force contingency MILCON programs overseas.

### 2. United States Army Corps of Engineers

a. **USACE is the Army activity assigned responsibility to execute the following Army and DOD mission areas:**

(1) Engineering and design.

(2) Contract construction.

(3) Real estate acquisition.

(4) Technical assistance.

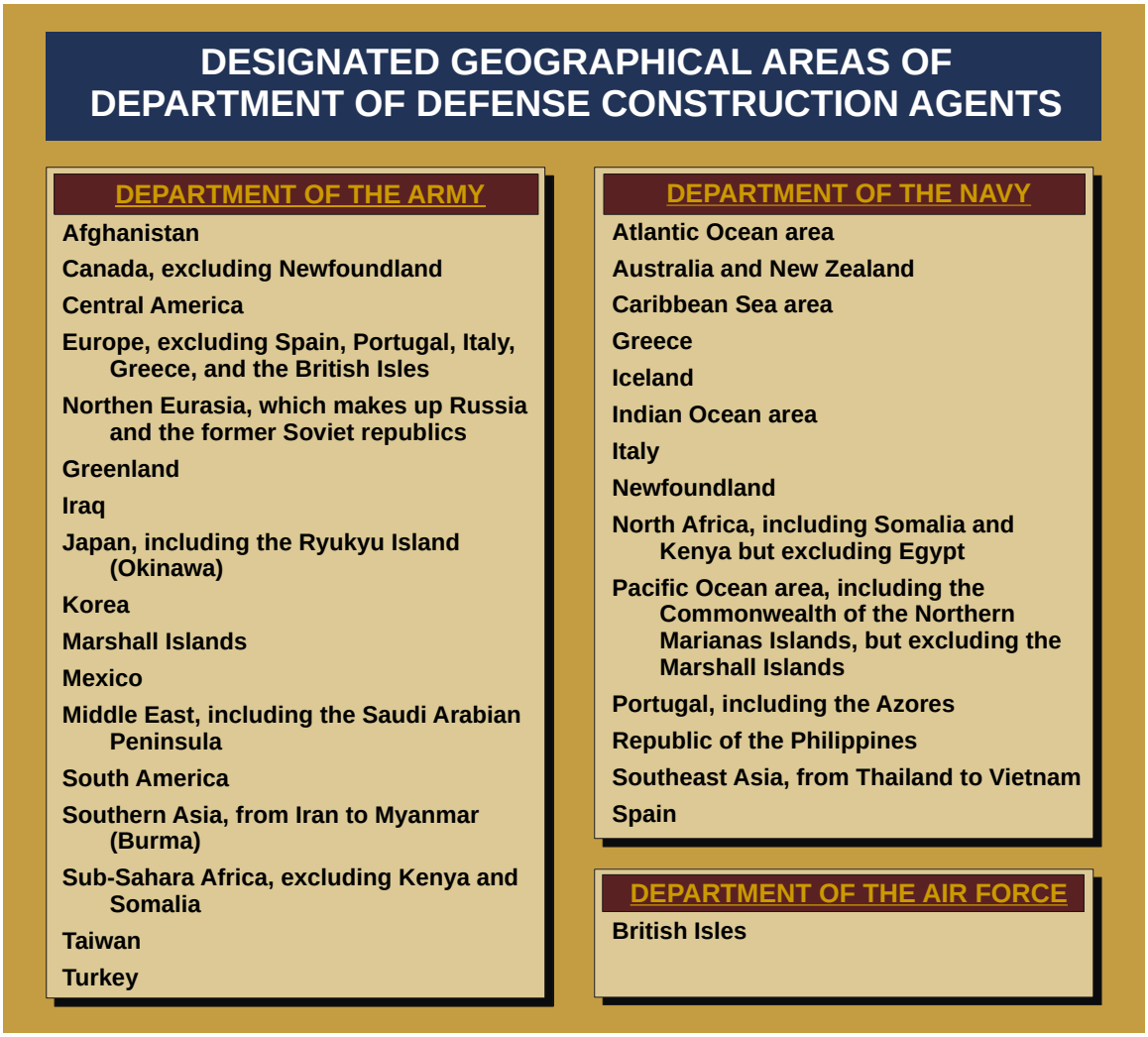


**Figure C-1. Designated Geographical Areas of Department of Defense Construction Agents**

(5) Geospatial engineering support.

(6) The Army's civil works program.

b. **Organization.** USACE's subordinate commands are organized geographically and functionally. There are three major organizational structures.

(1) **Divisions.** The division is the major subordinate C2 organization for USACE. The division commander provides executive direction to and management of the subordinate district commands. The division's orientation is regional and provides broad interface with regional interests and management of division-wide programs (see Figure C-2).

(2) **Districts.** The district command is the operating arm of the division. All USACE districts in the United States have civil works responsibilities. In the United States, their boundaries are delineated along major watershed basins and their work lines are set on

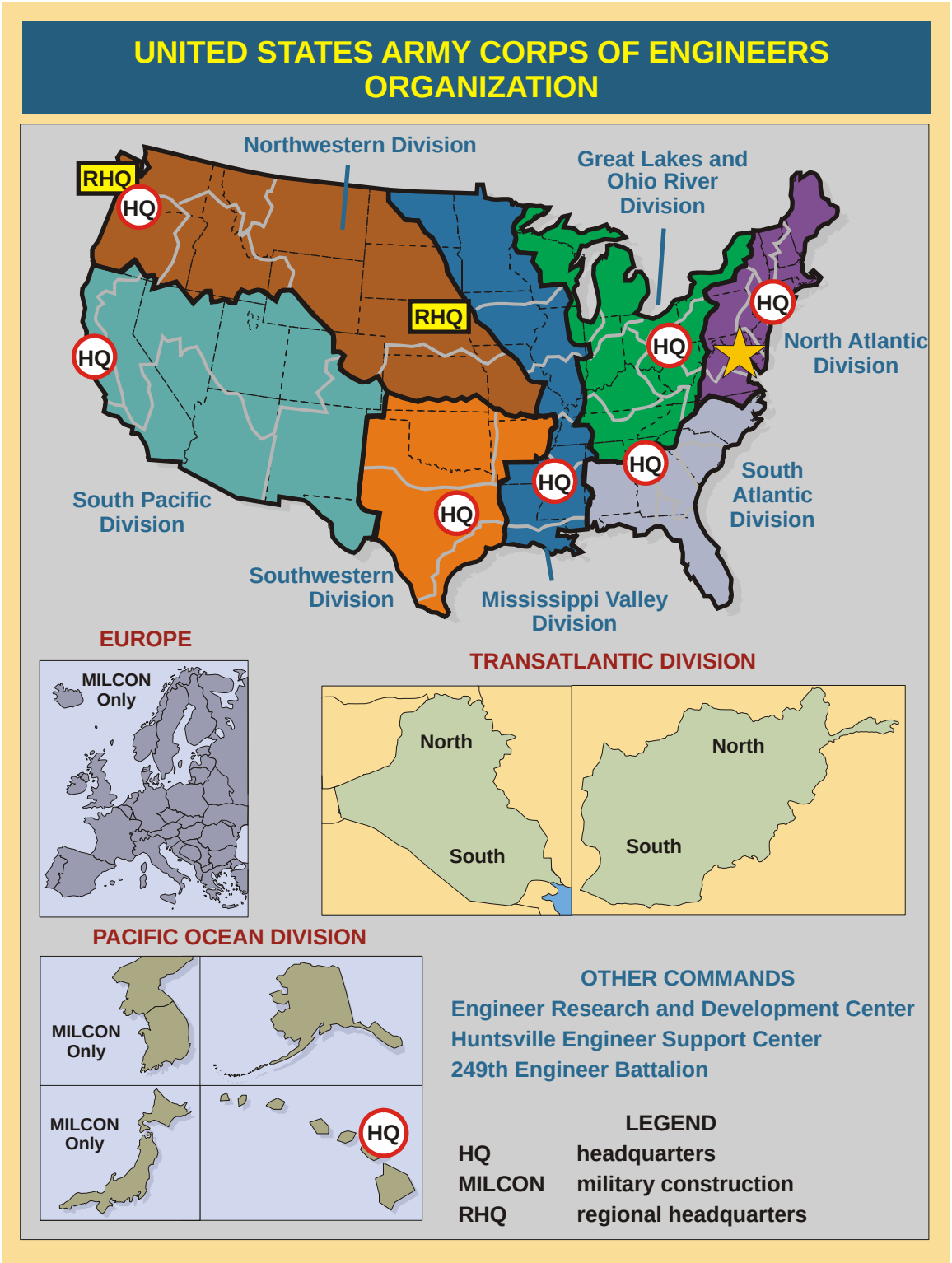


**Figure C-2. United States Army Corps of Engineers Organization**

state boundaries. In addition, some of the districts also have military execution responsibilities. The districts maintain in-house core capabilities in planning, engineering, construction, operations, project management, and contract administration.

(3) **Laboratories.** The Engineer Research and Development Center (ERDC) is the USACE's distributed research and development command headquartered in Vicksburg, Mississippi. ERDC consists of the following seven unique laboratories:

(a) Coastal and Hydraulics Laboratory, Vicksburg, Mississippi.

(b) Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.

(c) Construction Engineering Research Laboratory, Champaign, Illinois.

(d) Environmental Laboratory, Vicksburg, Mississippi.

(e) Geotechnical and Structures Laboratory, Vicksburg, Mississippi.

(f) Information Technology Laboratory, Vicksburg, Mississippi.

(g) Topographic Engineering Center, Alexandria, Virginia.

c. **Military Support.** USACE designs and constructs military facilities and supports military installations worldwide. The military engineering expertise of the Corps is focused on the engineering required to plan, design, and construct military facilities, and the environmental engineering necessary to execute DOD installation environmental restoration projects. USACE maintains specialized expertise in its laboratories and centers for cold weather engineering, remote sensing and imagery, force protection design, airfield design, weapons effects (e.g., support for operational targeting—assess the target, recommend appropriate weapon systems, and attack profile), terrain analysis for mobility and countermobility, geospatial engineering, security systems engineering, environmental management, and environmental engineering. USACE's 249th Engineer Battalion (Prime Power) can conduct power assessments and install generators to provide emergency power.

d. **Contingency Operations Support.** USACE initially provides support to CCDRs and subordinate JFCs through assigned LNOs who define requirements. HQ USACE will task support as necessary.

### 3. Naval Facilities Engineering Command

a. **NAVFAC Mission.** NAVFAC is the Navy's global shore facilities manager. It is an Echelon II systems command reporting to the Chief of Naval Operations (CNO). NAVFAC provides acquisition and technical support to the operating forces of the Navy. It is headquartered on the Washington Navy Yard in Washington, DC, with facilities engineering commands (FECs) located at naval stations throughout the world. NAVFAC provides

contingency services, which support both adaptive planning and CAP, and technical engineering services to the operating and expeditionary forces of the Navy, Marine Corps, and other joint forces.

(1) **NAVFAC Business Lines.** NAVFAC delivers its services through six business lines:

(a) Capital improvements,

(b) Environmental,

(c) Asset management,

(d) Public works,

(e) Expeditionary programs, and

(f) Contingency engineering.

(2) **NAVFAC Organization.** NAVFAC is commanded by a US Navy Civil Engineer Corps rear admiral who is also designated as the Chief of Civil Engineers and the Chief Operating Officer for the Naval Expeditionary Combat Enterprise. NAVFAC's global component command organization is comprised of two subordinate HQ commands (NAVFAC Atlantic and NAVFAC Pacific) and 10 FECs.

b. **NAVFAC Atlantic and Pacific.** NAVFAC Atlantic and Pacific are Echelon III commands headquartered on the east and west coasts (see Figure C-3). They oversee NAVFAC products and services within each fleet's operational AOR. They also provide centralized production of specialized engineering services beyond the organic capability of the regional commands at the Echelon IV level. Both commands provided contingency engineering support and each is designated by DOD as a CCA for the Navy's GCCC and GCSC program.

c. **NAVFAC Vertical and Horizontal Roles and Responsibilities.** With regard to vertical roles, NAVFAC Atlantic and Pacific (Echelon III) are the immediate superior in command for the FECs (Echelon IV) within their OA. NAVFAC Atlantic and Pacific and the specialty centers (Echelon III) report to NAVFAC HQ (Echelon II). NAVFAC Atlantic and Pacific coordinate priorities with the FECs in their OA based on fleet and CNIC priorities. The FEC (Echelon IV) commands are the primary point for delivery of client products and services. With regard to horizontal roles, NAVFAC HQ (Echelon II) is the primary manager and NAVFAC Atlantic and Pacific (Echelon III) coordinate responsibilities among the FECs (Echelon IV) within their AOR. The NAVFAC Specialty Centers (NFESC, Naval Facilities Expeditionary Logistics Center [NFELC], and Navy Crane Center) provide support (coordinated with business and support lines) to NAVFAC commands and to supported commands. NAVFAC programming and budgeting are fully coordinated at Echelon II. NAVFAC Atlantic and Pacific perform both budget formulation and budget execution within their OA. Echelon IV commands submit general fund requirements and

Navy working capital fund budget formulations through their respective Echelon III commands. Budget issues are worked as a team through all echelons.

d. **Naval Facilities Engineering Commands (see Figure C-4).** FECs are located around the globe and are Echelon IV commands aligned to each Navy region. FECs are the single provider of all NAVFAC products and services for Navy and Marine Corps clients in their geographic OA/region. FECs are OPCON/additional duty to the Navy regional commander and are primary duty/ADCON to the respective NAVFAC Atlantic or Pacific Command. They play a significant role in contingency operations through globally dispersed subordinate organizations such as OICC, ROICCs, and public works department facilities

| Echelon IV/Fleet/Navy Crane Center/Global Contingency Construction Alignment | | | | |
|---|---|---|---|---|
| **GCC** | **NCC** | **Navy Operational Forces** | **Navy Regions** | **NAVFAC Component Commands** |
| CDR, US Pacific Command (CDRUSPACOM) | COMUSPACFLT (Tailored MOC) | CDR, Third Fleet (MOC)<br>CDR, Seventh Fleet (MOC) (JFMCC-PACIFIC) | | NAVFACPAC |
| | | | CNR Hawaii | FEC Hawaii |
| | | | CNR Marianas | FEC Marianas |
| | | | CNR Japan | FEC Far East |
| | | | CNR Korea | |
| | | | NRAC Singapore | |
| CDR, US Northern Command (CDRUSNORTHCOM) | COMUSFLTFORCOM (Tailored MOC) | CDR, Second Fleet (MOC) | | NAVFACLANT |
| | | | CDR NDW | FEC Washington |
| | | | CNR Mid-Atlantic | FEC Mid-Atlantic |
| | | | CNR Southeast | FEC Southeast |
| | | | CNR Southwest | FEC Southwest |
| | | | CNR Northwest | FEC Northwest |

**Figure C-3. Echelon IV/Fleet/Navy Crane Center/Global Contingency Construction Alignment**

| Echelon IV/Fleet/Navy Crane Center/Global Contingency Construction Alignment | | | | |
|---|---|---|---|---|
| **GCC** | **NCC** | **Navy Operational Forces** | **Navy Regions** | **NAVFAC Component Commands** |
| | | | CNR Midwest | FEC Midwest |
| CDR, US European Command | COMUSNAVEUR | CDR, Sixth Fleet (COMSIXTHFLT) (MOC) (JFMCC-EUROPE) | CNR Europe | FEC Europe/ Southwest Asia |
| CDR, US Central Command | COMUSNAVCENTCOM | CDR, Fifth Fleet (MOC) (JFMCC-CENTRAL) | CNR Southwest Asia | |
| CDR, US Southern Command | COMUSNAVSO (Tailored MOC) | CDR, Fourth Fleet (MOC) | | NAVFACLANT FEC Southeast |
| CDR, US Africa Command | US Naval Forces Africa; fleet level command: Task Force 80. | COMSIXTHFLT (MOC) | | NAVFACLANT FEC Europe/ Southwest Asia |

**Legend**

| | |
|---|---|
| CDR | commander |
| CNR | Commander, Navy Region |
| COMUSFLTFORCOM | Commander, United States Fleet Forces Command |
| COMUSNAVCENTCOM | Commander, United States Naval Forces Central Command |
| COMUSNAVEUR | Commander, United States Naval Forces Europe |
| COMUSNAVSO | Commander, United States Naval Forces Southern Command |
| COMUSPACFLT | Commander, United States Pacific Fleet |
| FEC | facilities engineering command |
| GCC | geographic combatant commander |
| JFMCC | Joint Force Maritime Component Command |
| MOC | maritime operations center |
| NAVFAC | Naval Facilities Engineering Command |
| NAVFACLANT | Naval Facilities Engineering Command Atlantic |
| NAVFACPAC | Naval Facilities Engineering Command Pacific |
| NCC | Navy component commander |
| NDW | Naval District Washington |
| NRAC | Naval Research Advisory Committee |

**Figure C-3. Echelon IV/Fleet/Navy Crane Center/Global Contingency Construction Alignment.**

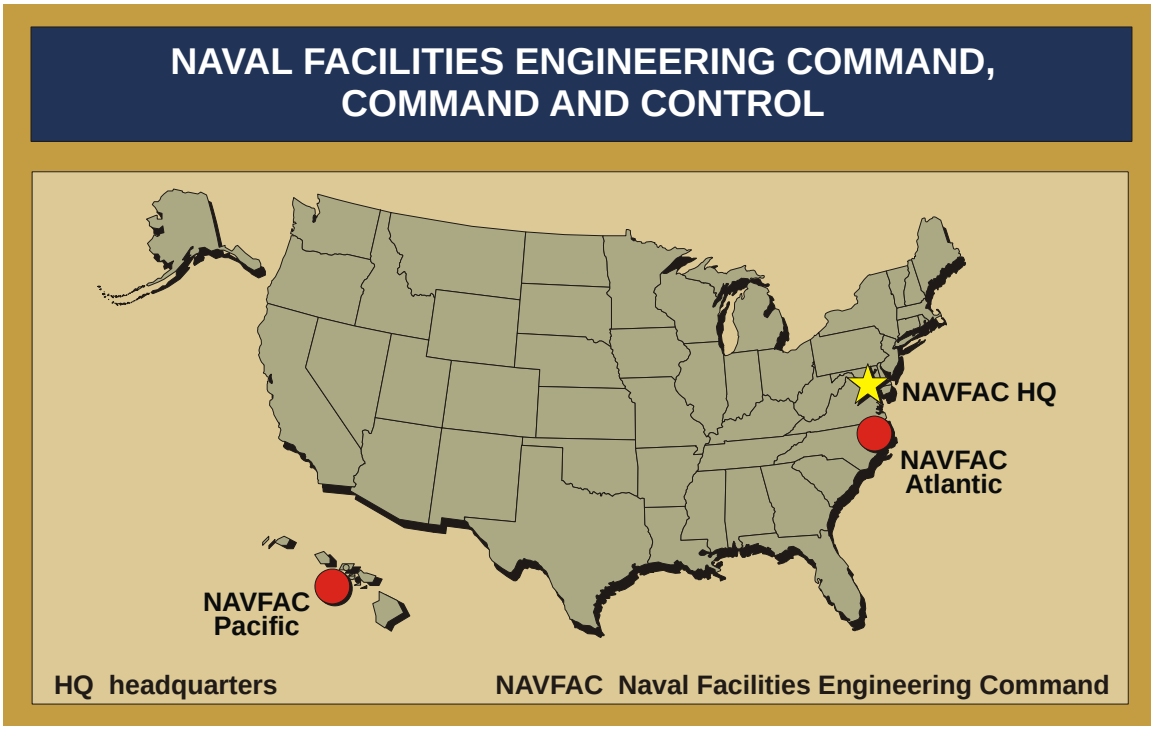


**Figure C-4. Naval Facilities Engineering Command, Command and Control**

engineering and architecture department. They are capable of providing construction contract support, real estate support and they also manage the Navy's GCCC and GCSC contract programs after award.

e. **NAVFAC Specialty Centers (see Figure C-5)**

(1) **Naval Facilities Engineering Service Center.** NFESC is an Echelon III command located in Port Hueneme, California, with a detachment in Washington, DC. The NFESC provides specialized engineering and technical expertise and serves as a research consultant to operational forces in the following areas:

(a) Contingency engineering,

(b) Amphibious and expeditionary systems,

(c) Logistics C2,

(d) Explosive safety and blast mitigation,

(e) Ordnance facilities,

(f) Utilities and energy,

(g) Environmental engineering,

(h) Ocean engineering,

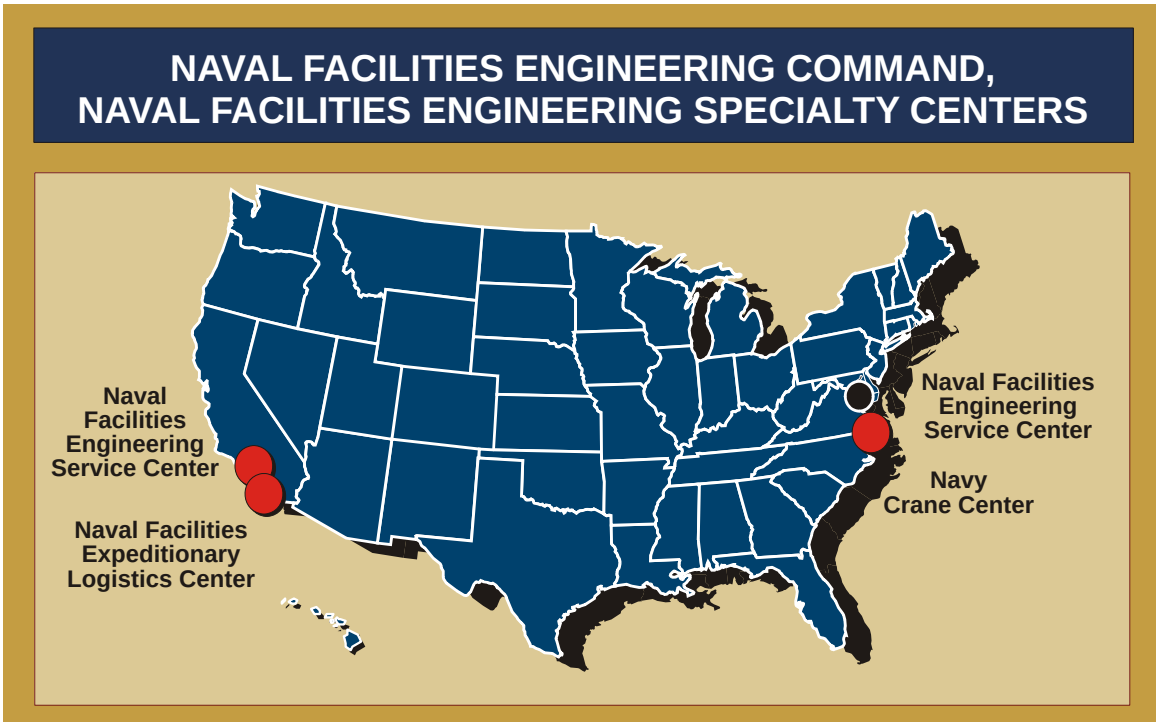


**Figure C-5. Naval Facilities Engineering Command, Naval Facilities Engineering Specialty Centers**

(i) Shore facilities engineering, and

(j) Force protection services.

(2) **Naval Facilities Expeditionary Logistics Center.** NFELC is an Echelon III command located in Port Hueneme, California, that provides overarching asset management and expeditionary logistics support, and is responsible for life-cycle management of the equipment, materials, and training required to enable the readiness of the NCF and other expeditionary units. Specific support to the NCF includes the following:

(a) Management and maintenance of the Seabee TOA.

(b) Communication and information technology development.

(c) Management of prepositioned war reserve material and stock for the NCF.

(d) Primary procurement of the Navy's inventory of automotive and construction equipment.

(e) Management of the MUSE program.

(f) Sealift support.

(3) **Navy Crane Center.** The Navy Crane Center mission is to establish and maintain a safe and effective weight handling program for the Navy's shore activities

worldwide. It also provides engineering acquisition, technical support, training, and evaluation services for the safe operation of NCF crane assets.

(4) **Naval Facilities Engineering Command Support of Contingency Operations.** NAVFAC is capable of providing a forward element dedicated to support the GCC or JTF for contingency operations. NAVFAC has elements designed to provide deployed facilities engineering and construction contracting capabilities. Linked to the rest of the global interdependent NAVFAC organization, by way of reachback, these elements are capable of delivering the complete range of NAVFAC products and services to support contingency operations in most threat environments worldwide. The following organizational elements directly support component commanders for planning and execution of contingency operations:

(a) The CERT assesses damaged facilities and environmental disasters and implements repairs and response to restore essential operational requirements in support of a contingency response mission. CERTs are task-organized to meet the needs of specific situations and are staffed with subject matter experts as required by the mission. The most common operational environment for a CERT is within DOD installations after a significant natural or man-made disaster. CERTs may respond to events outside DOD installations worldwide on a case-by-case basis. CERTs may also individually augment staffs to assist with management of funding and execution of design, construction, leasing, and other engineering functions during a contingency mission. CERTs support the CNO's emergency management plan, CNIC's command EM programs, and any other contingency missions tasked to NAVFAC.

(b) The contingency OICC is an RC unit that provides technically competent engineering personnel for contingency and CAP, construction management, OPORD/OPLAN support, engineering support plan development, environmental, real estate, and facilities contract management. The contingency OICC provides GCC/component commander and theater/expeditionary support deploying as a unit, a standing CERT, or via the individual augmentee program.

*Refer to NTTP 4-04.3,* Naval Contingency Engineering Operations*, for further information on NAVFAC support to contingency engineering operations.*

### 4. Air Force Center for Engineering and the Environment

AFCEE is a field operating agency of the Air Force Civil Engineer. It provides Air Force leaders with the comprehensive and diverse expertise needed to support the warfighter by protecting, preserving, restoring, developing, and sustaining the nation's environmental and installation resources. AFCEE employs more than 500 civilian and military personnel and is partnered with numerous, nationally respected and capable contractors. Their multi-billion dollar contracting capacity covers the entire range of environmental and construction management services. AFCEE Capital Investment Management Execution Divisions manage MILCON housing and environmental programs, contingency operations and support of non-Air Force organizations.

a. AFCEE Technical Division provides technical expertise, develops environmental restoration execution strategies, and finds the most effective technical and contractual approaches.

b. AFCEE Capital Investment Management Division houses the MILCON program management office (PMO) and has oversight over the Atlantic and Pacific regional management offices. The MILCON PMO manages all capital improvement work, including design and construction of MILCON and military housing projects.

c. AFCEE Environmental Restoration Division is the PMO responsible for the Air Force environmental restoration program

d. AFCEE Contingency Construction Division provides critical oversight and execution support to Air Force and CCMD contingency MILCON programs overseas.

e. Regional environmental offices serve as advocates for the Air Force before the local, state, regional, and federal authorities that legislate and enforce environmental regulations and laws. These offices also represent the DOD and the Air Force as regional environmental coordinators in the EPA agency regions.

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# APPENDIX D
## ENVIRONMENTAL CONSIDERATIONS

### 1. General

While complete protection of the environment will not always be possible due to its competition with other risks that the commander must assess, planning must carefully and continuously address the full range of environmental considerations in joint operations. This appendix describes many of the roles and responsibilities for integration of environmental considerations. It presents environmental requirements that a commander must meet in both domestic and foreign training and operations, although many of the environmental compliance requirements do not apply outside the United States. The aim of this appendix is to make environmental considerations a constant part of a commander's training, planning, and operations while at the same time using established procedures and capabilities to implement that integration for the commander. Environmental considerations include the spectrum of environmental-related media, resources, programs, or effects that may impact on, or are affected by, the training, planning, and execution of military operations. Factors include, but are not limited to: environmental compliance, pollution prevention and conservation, protection of flora and fauna, protection of historical and cultural sites to include their relationship to CMO, and the health of personnel.

*For a more in-depth discussion of environmental considerations, refer to the multi-Service manual, FM 3-34.5/Marine Corps Reference Publication (MCRP) 4-11B,* Environmental Considerations.

### 2. Environmental Roles and Responsibilities

a. **CCDR and Subordinate Joint Force Commander.** JFCs are responsible for integration of environmental considerations during training, planning, and the conduct of operations. JFCs demonstrate proactive environmental leadership during all phases of joint operations across the range of military operations. JFCs instill an environmental ethic in subordinate commands and promote awareness of environmental considerations throughout the joint force. JFCs identify specific organizational responsibilities and specific joint force environmental requirements. These responsibilities should have clearly defined goals, strategies, and measures of success. JFCs should ensure compliance with US law, including with all applicable domestic environmental laws; relevant country-specific final governing standards; the DOD Overseas Environmental Baseline Guidance Document (OEBGD); relevant international agreements; environmental considerations annexes to relevant OPLAN, OPORD, or other operational directives; and any other environmental requirements that apply to the operation. For subordinate commanders, most of this will be articulated in the HQ OPLAN/OPORD, or covered by unit SOPs. The goal of compliance is to minimize potential adverse impacts on human health and the environment while maximizing readiness and operational effectiveness. Although the engineer is the staff proponent for integration of environmental considerations, all members of the staff have a role in integrating environmental considerations and many must include guidance for these considerations in their respective JOPES annexes/appendices as demonstrated in Figure D-1.

| JOINT OPERATION PLANNING AND EXECUTION SYSTEM ANNEXES AND APPENDICES WITH SIGNIFICANT ENVIRONMENTAL CONSIDERATIONS | | | |
|---|---|---|---|
| **Joint Operation Planning and Execution System (JOPES) Location** | **Proponent Staff** | **Principal Staff and Special Capabilities** | **Comments** |
| Annex A | J-3 (Operations) | All, primarily engineer, surgeon, and civil affairs | Ensure elements to perform critical environmental missions are included in the task organization, especially engineer, medical, and civil affairs. Time-phased force and deployment data sequence may be critical to perform missions in a timely fashion. |
| Annex B, Appendix 1 | J-2 (Intelligence) | All, primarily engineer, surgeon, and civil affairs | Environmental priority intelligence requirement may include information on planned base camps and other sites. |
| Annex B, Appendix 4 | J-2 (Intelligence) | Fire support element, engineer, civil affairs, staff judge advocate | Cultural considerations and the environmental effects of specific targeting must be addressed. |
| Annex C, Appendix 2 | Chemical Officer | Staff judge advocate, surgeon | Use of riot control agents and herbicides require integration of environmental considerations. |
| Annex C, Appendix 8 | Engineer | Chemical officer, explosive ordnance disposal | Clearing of hazards for air base operability may have environmental considerations. |
| Annex C, Appendix 13 | Engineer | Explosive ordnance disposal, chemical officer | Clearing of unexploded ordnance for base camps and other similar sites may be necessary. |
| Annex D, Appendix 1 | J-4 (Logistics) | Engineer, surgeon | Petroleum, oils, and lubricants always have significant embedded environmental considerations. |
| Annex D, Appendix 2 | J-4 (Logistics) | Engineer, surgeon | Water sampling, well site selection and preparation contain environmental considerations. |
| Annex D, Appendix 6 | Engineer | J-4 (Logistics), civil affairs, surgeon, staff judge advocate | The engineer support plan must integrate environmental considerations. |
| Annex E, Appendix 4 | Staff Judge Advocate | J-3 (Operations), J-4 (Logistics), fire support element, engineer | This includes those considerations associated with the environmental laws. |

**Figure D-1. Joint Operation Planning and Execution System Annexes and Appendices with Significant Environmental Considerations**

| JOINT OPERATION PLANNING AND EXECUTION SYSTEM ANNEXES AND APPENDICES WITH SIGNIFICANT ENVIRONMENTAL CONSIDERATIONS | | | |
|---|---|---|---|
| **Joint Operation Planning and Execution System (JOPES) Location** | **Proponent Staff** | **Principal Staff and Special Capabilities** | **Comments** |
| Annex F | Public Affairs Officer | Civil affairs, staff judge advocate, surgeon, engineer | Environmental considerations will be of concern for the public affairs officer. |
| Annex G | Civil Affairs | Engineer, surgeon, staff judge advocate | Civil affairs covers the spectrum of environmental considerations although it has a special focus on civil considerations. |
| Annex L | Engineer | J-4 (Logistics), staff judge advocate, surgeon | Civil affairs, engineering, legal, medical implications, J-2 and other intelligence activities and may involve all members of the joint environmental management board. |
| Annex M | Engineer | J-2 (Intelligence), J-3 (Operations), J-4 (Logistics), any staff requiring geospatial information to support planning | Geospatial information for base camps and other similar sites needs to be identified in this annex. Geospatial information is important in identifying past environmental contamination and other health and safety threats and in identifying sensitive cultural and natural resources for protection. |
| Annex Q | Surgeon | | Numerous places throughout with environmental considerations embedded besides Appendices 6 and 10. |

**Figure D-1. Joint Operation Planning and Execution System Annexes and Appendices with Significant Environmental Considerations**

b. **Combatant Command and Subordinate Joint Force Engineer.** The joint force engineer (as the staff proponent for the integration of environmental considerations) is responsible for providing guidance to the JFC on environmental considerations in planning and executing joint operations. The staff engineer advises the commander and staff (in conjunction with the SJA, surgeon, and others) on environmental issues. Working with other staff officers, the engineer determines the impact of operations on the environment, the corresponding effect of the environment on service members, and integrates environmental considerations into the decision-making process. The engineer may function as the chairman of the JEMB and is the integrator for the writing, publishing, and updating of annex L (Environmental Considerations). The engineer works primarily with the J-4 and the surgeon in performing site assessments for installations, facilities, base camps, and other sites. The engineer and the SJA advise the commander on the necessity for environmental assessments to meet HN, EO 12114, *Environmental Effects Abroad of Major Federal Actions*, or OPORD/OPLAN requirements. All EBSs are coordinated through the engineer and with the

surgeon to synchronize the performance of an EHSA whenever possible at the time it is completed. The engineer is also responsible for advising the J-2 on significant environmental factors and ensuring these impacts are integrated into the JIPOE process. As a member of the targeting cell, the engineer integrates environmental considerations into the process of target nomination, incorporating legal/CA expertise as appropriate. Coordination for geospatial products and potential EOD support for the clearing of base camps (or other locations) is done through the engineer.

c. **Combatant Command and Subordinate Joint Force Staff Judge Advocate.** The CCMD and subordinate joint force SJA advise the commander and staff on legal matters, including legal advice relating to environmental laws, regulations, treaties, relevant international conventions, and the law of armed conflict concerning collateral damage to the environment. The SJA also interprets existing SOFAs and may assist in the drafting of additional agreements, supplements, and amendments to the SOFA. The SJA provides legal advice on environmental assessment requirements and receives and processes civilian claims resulting from environmental damage. The SJA provides legal advice to the commander on how to deal with important HN historic and cultural sites, and environmentally sensitive natural areas. The SJA assists other members of the joint force staff and DOD agencies in negotiating transit agreements in advance of the actual deployment, to permit the transit of regulated (hazardous) wastes for disposal in an environmentally sound manner. The SJA provides legal advice on EBS requirements, participates in the development of any EBS exemptions as they may apply, and processes claims resulting from environmental damage. The SJA helps other staff officers to understand the legal aspects involved in their respective specialties and areas of concern for environmental considerations as they develop their respective annexes. Prior to operations, environmental lawyers assist in the planning process by providing legal advice concerning environmental reviews and environmental requirements in the area of operations and by reviewing plans to ensure they address environmental law and policy agreements. The environmental plan should address certification of local water sources, waste management, hazardous material management, protection of flora and fauna, archeological and historic preservation, the base field spill plan, and policies and responsibilities to protect the environment. Environmental lawyers ensure that an environmental survey is completed to provide a baseline against which later claims for damage may be assessed. SJAs coordinate with the organization's environmental team and CA section as well as with the DOS country team and local environmental legal authorities.

d. **Combatant Command and Subordinate Joint Force Surgeon.** The CCDR and subordinate joint force surgeon are responsible for regional health matters and services (e.g., preventive medicine and occupational health) to the joint force. Priorities include water vulnerability assessment support, sanitation, waste disposal (e.g., hazardous and infectious waste), health risk assessment, environmental health sampling and surveillance, and vector control to protect human health and welfare within the OA. The surgeon advises on the health threat, including environmental, endemic, and epidemic diseases. The surgeon also has direct access to environmental, preventive medicine, and public health services. The surgeon provides health risk assessment guidance (e.g., base camps selection) to support the commander's risk management decision-making process. The surgeon relates environmental hazards to the environmental health of service members. The commander and the unit staff

may call on the surgeon to assist in determining the public health implications of damage to critical environmental resources. The surgeon is responsible for planning and ensuring the implementation of EHSAs, whenever possible, in conjunction with EBSs, of base camps and similar sites.

e. **Joint Force Public Affairs Officer.** The joint force public affairs officer (PAO) coordinates with appropriate staff and commanders to plan and accomplish public affairs efforts in support of mission objectives. Public perceptions of environmental threats may be more significant to mission accomplishment than the threat itself. In this role, the PAO coordinates with the plans directorate and CA personnel to ensure the commander has taken all appropriate cultural and environmental considerations into account. Communication activities should be fully integrated in command operational planning and execution processes, so that there is consistency in intent or effect between command actions and information disseminated about those actions. The PAO advises the commander and staff on methods of conveying information to and responding to information from the public. When deployed overseas, the PAO coordinates with appropriate staff and commanders to plan and execute public affairs efforts in support of mission objectives. In the US, various environmental laws require public involvement. The PAO identifies and prepares plans for meeting these requirements. The joint force PAO coordinates with appropriate staff and commanders to plan and accomplish public relations efforts in support of mission objectives. Special attention should be given to potentially sensitive environmental issues associated with a joint operation. The joint force PAO will be a significant participant in public outreach efforts and should participate in development of and be aware of assigned responsibilities in environmentally related OPLANs.

*For additional information on other joint force PAO responsibilities, refer to JP 3-61,* Public Affairs.

f. **Joint Force J-4.** As the principal staff officer for coordinating the logistic integration of supply, maintenance, and services for the command, the joint force J-4 oversees many functions with a potential for generating HW. The J-4 also establishes procedures for reducing and controlling HAZMAT. He recommends command policies for solid waste and HAZMAT/HW disposal. The J-4 is responsible for all aspects of HAZMAT and regulated HW management to include minimizing use, storage, transportation, disposition, and return to home station of excess materials. In this capacity, the J-4 will coordinate closely with DLA early and throughout the operation. The J-4 also recommends command policies for pollution prevention and, in coordination with the J-3, oversees the preparation of spill prevention and response plans. The J-4 coordinates the SJA and other appropriate staff officers to ensure that current environmental considerations (such as water or soil contamination), epidemiological surveys, and disease risk assessments have been completed, are sustained, and comply with legal requirements. The J-4 ensures that the data has been recorded for future review and potential remediation consideration.

g. **Joint Force J-3.** The J-3 is the principal staff officer for all matters concerning training, operations, and plans. It is the J-3's responsibility to ensure that any significant collateral environmental damage caused by command-directed operations is understood and approved by the commander during the decision-making process. Geopolitical concerns that

include architectural and cultural issues, and force health protection issues, must be integrated into OPLANs/OPORDs and CONPLANs. The J-3 establishes and supervises the command training programs to include environmental skill and awareness training that supports the unit mission. The J-3 also ensures that the unit protects and maintains training areas. As the overall ground manager and planner of troop movements, bivouacking, and quartering, the J-3 understands and considers environmental vulnerabilities and the associated force health protection during operations. Placement of base camps and other such sites is of critical concern to the J-3 and some environmental considerations may be as important as the considerations of force protection. The J-3 may assign special missions to tactical units to secure and safeguard critical environmental resources, such as wastewater treatment plants in urban areas in order to mitigate risks to and from the environment, or cultural locations such as museums/sacred sites. When appropriate, the J-3 prepares counterterrorism and security plans to combat possible environmental sabotage. The J-3 exercises coordination staff responsibility over the staff engineer (if it is not a separate staff element) in the preparation and implementation of an EBS for each base camp or similar site. The J-3 ensures that the data has been recorded for future review and potential remediation consideration.

h. **Joint Force J-2.** As the staff officer responsible for conducting JIPOE and defining and characterizing the OA, the J-2 is responsible for incorporating significant environmental factors and integrating intelligence requirements associated with environmental considerations. The staff engineer, surgeon, SJA, J-4, and other staff elements generally provide these environmental factors. Environmental considerations will generate IRs and some of those (to include intelligence on base camp locations) may even become PIRs during the planning process to ensure Service members are not placed in hazardous sites.

i. **Joint Environmental Management Board.** A JEMB may be established by the CCDR or subordinate JFC for a joint operation in order to integrate the environmental protection efforts of all participating components under a single authority and to ensure unity of effort for environmental protection activities. The JEMB can be chaired by the CCDR, deputy commander, chief of staff, or subordinate joint force engineer, and includes representatives from each Service component and joint force staff representatives as necessary (e.g., legal, occupational health, preventive medicine, intelligence, safety, comptroller, planning, operations, and logistics). The JEMB should participate in the operation planning process by ensuring that baseline environmental surveys are conducted and updated when appropriate and identifying exemptions and management requirements to the JFC. The JEMB assists the JFC in establishing the joint force environmental policies, practices, procedures, and priorities and providing oversight of environmental protection standards and compliance. Establishment of a dedicated and appropriately staffed environmental engineering staff that is supported with expertise from other joint force staff members (e.g., legal and medical) may obviate the need for a JEMB in smaller operations. It may be appropriate to create this board early in the planning process to support mission analysis. It may also be necessary/desirable to maintain it on a permanent basis to support sustainment of operations. The JEMB can be used to assist the commander with environmentally related risk management.

j. **Unit Commanders.** Unit commanders are responsible for complying with the applicable environmental requirements and guidance established by the JFC in the OPLAN or OPORD. Unit commanders should keep the JFC and staff informed of conditions that may result in noncompliance with the requirements or guidance associated with environmental considerations. That certain environmental considerations may not be able to be implemented during one portion of an operation, or in one part of an OA, does not justify failure to implement them at other times and locations within an OA. Operational necessity should never become a blanket excuse for excluding environmental considerations and protection of the environment.

k. **Unit-Level Points of Contact.** Unit commanders should appoint and train a unit-level point of contact for communication of environmental information with the joint force engineer and/or JEMB, as required. The unit level point of contact should be the unit commander's advisor on environmental considerations and perform these functions in a fashion similar to that of a unit safety officer. The environmental point of contact should be knowledgeable in both preventing adverse environmental impacts and responding to environmental incidents.

l. **Other DOD Environmental Structures, Governmental Agencies, or Nongovernmental Organizations.** During operations, such as those involving responses to disasters or support to civilian governmental agencies (e.g., cleanup of major oil or hazardous substance spills), the JFC may have to work with other DOD or governmental agencies or NGOs to ensure successful completion of the operation. Where appropriate, these representatives should be a part of the environmental planning process. The JFC may also consider their participation as ad hoc members of the JEMB.

## 3. Environmental Requirements

In general, environmental requirements can be divided into overseas requirements and requirements applicable in the United States and its territories, although some US environmental requirements may have extraterritorial application. For example, EO 12114, *Environmental Effects Abroad of Major Federal Actions,* establishes requirements for environmental studies for activities conducted overseas, somewhat similar to the environmental analysis requirements regarding operations conducted within the United States mandated by the National Environmental Policy Act. The joint force SJA should be consulted to determine extraterritorial applicability and to confirm the applicability of other environmental requirements.

a. **Requirements Applicable within the United States.** All joint operations within the United States and its territories and possessions generally are required to be conducted in compliance with applicable federal, state, and local environmental laws and regulations and under the planning authorities of US Northern and Pacific Commands. A number of federal statutes establish environmental requirements that may impact joint operations. The President may exempt federal activities from compliance with most environmental requirements for up to a year at a time if an exemption would be in the paramount interests of the US. Absent a war or other exigent circumstances, however, it is highly unlikely that Presidential exemptions will be granted excusing federal facilities from complying with

federal, state, or local environmental requirements. Many US environmental laws allow for national security exemptions for specified activities, but only upon action by the President. These exemptions are rarely granted and should be coordinated up the chain of command before they are relied upon. Legal counsel should always be consulted to determine applicable requirements.

b. **Requirements Applicable in Overseas Areas.** Joint operations in areas outside US territory will be conducted IAW US law, applicable treaties, conventions, international agreements (to include basing agreements), final governing standard (FGS) or the OEBGD, unified CCMD directives, annex L (Environmental Considerations) of the OPLAN or OPORD, and other environmental requirements or command guidance that apply to the operation. In the absence of definitive environmental guidance within applicable international agreements, JFCs should establish guidance in the OPLAN and/or OPORD that will protect force health, limit adverse public health impacts, consider the US liability, and be consistent with mission goals. In addition to requirements contained in international agreements, the following references provide guidance and requirements that may impact joint operations beyond US territory and, as appropriate and applicable, should be considered in developing annex L (Environmental Considerations) to an OPLAN or OPORD. Annex L should be viewed as a living document to be updated with changes in mission, operational maturity, and improved environmental intelligence and information. The OEBGD may be a valuable source and reference document for the development of environmental standards for joint operations.

(1) **DODD 6050.7,** ***Environmental Effects Abroad of Major Department of Defense Actions.*** This directive implements EO 12114, *Environmental Effects Abroad of Major Federal Actions,* which provides definitions of key terms, establishes review procedures, and describes documentation requirements for the environmental impact analysis process. DODD 6050.7 provides specific categorical exclusions and general exemptions for procedural and other requirements in conducting environmental assessments (e.g., actions taken by or pursuant to the direction of the President or a cabinet officer when the action occurs in the course of armed conflict).

(2) **DODI 4715.5,** ***Management of Environmental Compliance at Overseas Installations.*** This instruction establishes environmental compliance standards for protection of human health and the environment at DOD installations in foreign countries and provides for designation of DOD environmental executive agents (EEAs). DODI 4715.5 requires development and maintenance of an OEBGD. DODI 4715.5 does not apply to off-installation operational and training deployments. However, the OEBGD may be a valuable source and reference document for development of additional environmental standards for joint operations.

(3) **DODI 4715.8,** ***Environmental Remediation Policy for DOD Activities Overseas.*** This instruction implements policy, assigns responsibilities, and prescribes procedures for remediation of environmental contamination on or away from DOD installations or facilities that was caused by DOD operations outside the United States. DODI 4715.8 does not specifically apply to operations connected with actual or threatened

hostilities, security assistance programs, peacekeeping missions, or relief operations. However, it may provide valuable information that could be used in operational planning.

(4) **Air Force Handbook 10-222, Volume 4, *Environmental Guide for Contingency Operations*.** This handbook presents practices that can minimize adverse impacts to human health and the environment and facilitate compliance during contingency operations. These strategies are designed to reduce or eliminate negative impact on mission accomplishment caused by health hazards and regulatory noncompliance. It outlines these strategies for exercises, deployments, contingency operations, and armed conflict within the United States, at overseas DOD installations, and at overseas non-DOD installations.

(5) **FM 3-34.500/MCRP 4-11B, *Environmental Considerations.*** This manual provides guidance for applying environmental considerations during planning, training, and during the conduct of contingency operations.

(6) **NWP 4-11, *Environmental Protection*.** This publication provides guidance to Navy operational commanders and their staffs for maritime operations during peacetime, contingency operations, and war. It provides guidance on the development of a nautically focused annex L (Environmental Considerations) to an OPLAN or OPORD.

c. **HN Agreements and SOFAs.** These are bilateral or multilateral agreements that affect the conduct of military operations within HNs. Although in the past these agreements have not always addressed environmental protection, HNs have recently reflected greater concern with environmental issues associated with military operations within their borders. Joint forces are expected to comply with these agreements.

d. **The Overseas Environmental Baseline Guidance Document and Environmental Final Governing Standards.** The OEBGD specifies criteria and management practices for environmental compliance at DOD installations at overseas locations. It is designed to protect human health and the environment and reflects generally accepted environmental standards applicable to DOD installations, facilities, and actions in the United States. It also incorporates requirements of US law that apply to DOD installations and activities outside the United States and its territories. Designated DOD EEAs (see Attachment 3 to DODI 4715.5, *Management of Environmental Compliance at Overseas Installations*) use the OEBGD to develop and update country-specific FGSs for all DOD components. To develop and update the FGS, the EEAs compare OEBGD standards with the requirements of applicable international agreements (e.g., SOFAs) and relevant local, regional, and national HN standards. The EEAs normally incorporate in the FGSs those standards that provide more protection to human health and the environment. The OEBGD applies in countries where no FGSs have been established. Neither FGSs nor the OEGBD apply to the operations of US military vessels, the operations of US military aircraft, or to off-installation operational and training deployments. The FGSs or the OEBGD in countries where no FGSs exist apply to support functions for US military vessels and aircraft. Although the OEBGD and FGSs are not applicable to the operation of US military vessels, the operations of US military aircraft, or to off-installation operational and training deployments, they provide valuable information for environmental planning and can aid the conduct of joint operations.

e. **International Regulations, Treaties, and Conventions.** An increasing number of environmental international regulations, treaties, and conventions apply to joint military operations. For example, management and processing of HW for disposal overseas may be affected by the Basel Convention, an international agreement governing the transboundary shipment and disposal of HW. Another international convention that may impact a joint operation is the London Dumping Convention that precludes the dumping at sea of wastes generated ashore. The International Convention for the Prevention of Pollution from Ships will affect maritime operations. The JFC should consult the joint force SJA regarding these requirements and their potential impact on operations.

f. **Law of Armed Conflict.** The law of armed conflict is derived from treaties and international agreements to which the US is a party and applicable customary international law. It establishes certain limits on the means and methods of warfare that could impact upon general engineering operations. JP 3-60, *Joint Targeting*, addresses how the principles in the law of armed conflict are to be observed to avoid unnecessary damage to the environment and to avoid excessive incidental civilian injuries. The joint force SJA can provide specific advice on the applicability of the law of armed conflict.

## 4. Environmental Planning

a. **Need for Environmental Planning.** By considering environmental issues early in the planning process, the JFC may continue to achieve operational objectives while minimizing the impact on human health and the environment. Failure to consider the environmental impacts of all activities may adversely affect the operation. Potential effects include delaying operation commencement, limited future use of exercise or HN areas, and adverse public opinion, potentially impacting the success of an operation. Commanders should make environmental considerations an integral part of the mission planning and operational decision-making process. In joint operations, it is important that all Services implement these requirements in a consistent manner. JFCs develop, publish, and update environmental policies and procedures in annex L (Environmental Considerations) to the OPLAN or OPORD that will minimize the impact of environmental health effects on an operation and the operational effects on the environment. By early assessment of environmental considerations, commanders may become aware of the potential environmental effects or impacts of mission accomplishment while alternatives still exist to address mitigating actions. By planning early, the JFC and joint force staff will be aware of the environmental requirements, and will be able to plan more efficiently and act accordingly. Furthermore, careful and visible attention to environmental considerations in the conduct of a military operation can assist in shaping a positive image both internationally and domestically.

b. **Elements of Environmental Planning.** The joint force staff should plan the operation to achieve mission objectives while minimizing environmental impact and observing environmental requirements. Although not all of the following elements will be applicable to all operations (e.g., some, such as identification of alternatives to obtaining objectives, are not required for operations overseas), they may prove helpful in the planning process.

(1) Identification of operational objectives and the activities that are proposed to obtain these objectives, including logistics and identification of HAZMAT that may be used.

(2) Identification of potential alternative means of obtaining operational objectives. Alternatives may include new technologies or systems that minimize impacts on the environment.

(3) Identification of the environmental requirements applicable to the operational area.

(4) Identification of adverse environmental health and environmental impacts that may result from conducting the operation.

(5) Establishment of formal relationships and coordination with other disciplines that have roles in environmental planning and operations (e.g., medical, legal, intelligence, CA).

(6) Identification of possible environmental contingencies that may occur during the operation, such as accidental spills.

(7) Determination of how an environmental contingency would affect the environment in the OA and how it could be prevented or mitigated should it occur.

(8) Determination of the environmental and operational risk associated with the operation. If risks are unacceptable, identify alternatives that will mitigate associated risks.

(9) Early coordination with applicable agencies to negotiate applicable agreements to allow for the unimpeded transit of HAZMAT or HW by military and contracted assets for environmentally sound treatment or disposal IAW international agreements.

(10) Determination of contractor status, to include privileges, liabilities, and immunities in support of the operation.

(11) Identification of organic environmental resources and reachback capabilities.

c. **Key Environmental Planning Factors.** JFCs should consider environmental and force health protection during each phase of an operation. In planning and conducting joint operations, regardless of geographic location, commanders should give appropriate consideration to the following:

(1) Legal requirements and constraints.

(2) Cultural, historic, and religious factors.

(3) Environmentally sensitive ecosystems to include endangered or threatened species and marine mammals.

(4) Potential preexisting environmental health risks to the force.

(5) Potential environmental terrorism against the force.

(6) Targeting considerations to avoid damage to cultural, historic, or religious sites.

(7) Site selection for base camps and other facilities.

(8) Camp closure and site remediation.

(9) Management of HAZMAT and POL and disposal of HW.

(10) Spill prevention, containment, and response.

(11) Transportation, storage, and disposal of medical and infectious waste.

(12) Water and wastewater management.

(13) Pollution prevention and recycling efforts to reduce waste generation and logistic efforts.

(14) Potential remediation of contaminated areas.

(15) Environmental requirements pertaining to sensitive site exploitation and associated liabilities of operations.

(16) Environmental controls pertaining to construction operations.

(17) Noise abatement.

(18) Air emissions.

d. **Environmental Risk Management.** Environmental risk management is the process of assessing, detecting, and controlling the environmental risk arising from operational actions and balancing environmental risk with mission benefits and gains. Knowledge of the environmental factors is key to planning and decision making. With this knowledge, leaders can promote operational success, quantify environmental risks, detect problem areas, reduce the possibility of injury or death to military personnel and affected civilian populations, reduce property damage, and ensure that operations are consistent with environmental requirements. The JFC should integrate environmental risk management into the overall planning of operations in the same fashion as other risks. For additional information on risk management see the multi-Service FM 3-100.12, MCRP 5-12.1C, NTTP 5-03.5, and Air Force Tactics, Techniques, and Procedures (AFTTP) 3-2.34, *Risk Management*.

## 5. Environmental Contingencies

a. **Oil and Hazardous Substance Spills.** The laws and policies that control oil and hazardous substances protect water, soil, and air from harmful levels of contamination. Joint forces should ensure that they minimize environmental contamination from oil and hazardous substances. JFCs should complete an oil and hazardous substance spill contingency plan for an operation as part of annex L (Environmental Considerations) to an

OPLAN or OPORD prior to commencing joint operations. Spill contingency plans should address prevention procedures and practices, spill reporting, initial control and recovery actions, cleanup actions, and C2 responsibilities. The plans should also address the availability and location of equipment (to include personal protective equipment) for control and cleanup, safety and health of personnel, and training.

b. **Environmental Noncompliance.** During an operation, environmental noncompliance or delay in assessment may occur due to machinery and equipment breakdown or malfunction, enemy actions, or the inadvertent or willful disregard or violation of environmental requirements by force or contractor personnel. Failure to take prompt and appropriate action may endanger human health and safety, and exacerbate the consequences of the incident, e.g., increased cost to remediate, negative press, adverse diplomatic consequences, diverting JTF resources. Annex L (Environmental Considerations) to an OPLAN or OPORD should address such environmental contingencies, including reporting requirements.

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# APPENDIX E
## CONTINGENCY AUTHORITIES AND FUNDING

### 1. Introduction

a. Participating in joint engineering boards and engineer-related working groups, as required.

(1) Figure E-1 provides a general view of the funding and potential command relationships that engineers might encounter in a given theater. Every element in the figure has an engineer cell. If there is no theater HQ, the JTF engineer will coordinate with the component engineers on BOS-I and construction projects. The CCMD engineer receives construction project requests from the components and advocates them to the Office of the Secretary of Defense for eventual approval by Congress. The theater or JTF engineer may also have a direct line to the CCMD engineer due to the C2 relationship established in the theater. However, construction projects still require support of the components, since the components commands receive the money from DOD. Figure E-1 is not meant to be authoritative but rather illustrative. This is merely an example of the relationships that the engineers must maintain in order to ensure accurate and efficient project approval.

(2) The special operations task force will have Title 10, USC, requirements that are funded by the theater, whether through the JTF or the theater HQ. For special operations forces-specific requirements, they will receive funding from the special operations component command.

b. It is especially important that engineers understand contingency authorities and the associated funding. These are the tools that set the conditions for success during contingency operations and provide the basis for legal spending to fund DOD personnel and activities in support of contingency operations. Contingency operations comprise a very large portion of the operations conducted by joint forces.

c. This appendix is intended as a basic introduction to contingency authorities and funding. However, the information in this appendix is subject to change due to changes in legislation, policy, or regulation. The reader should consult with legal and resource management personnel for the latest definitive guidance.

### 2. Legal Personnel

Legal personnel can provide invaluable advice and guidance on authorities and sources of funding for general engineering activities in a variety of situations. From the earliest stages of planning, execution, and redeployment, legal professionals play a vital role in preparing the JOA by identifying and assisting in the resolution of legal and political constraints, and provide relevant and responsive readiness programs to the individual general engineering members.

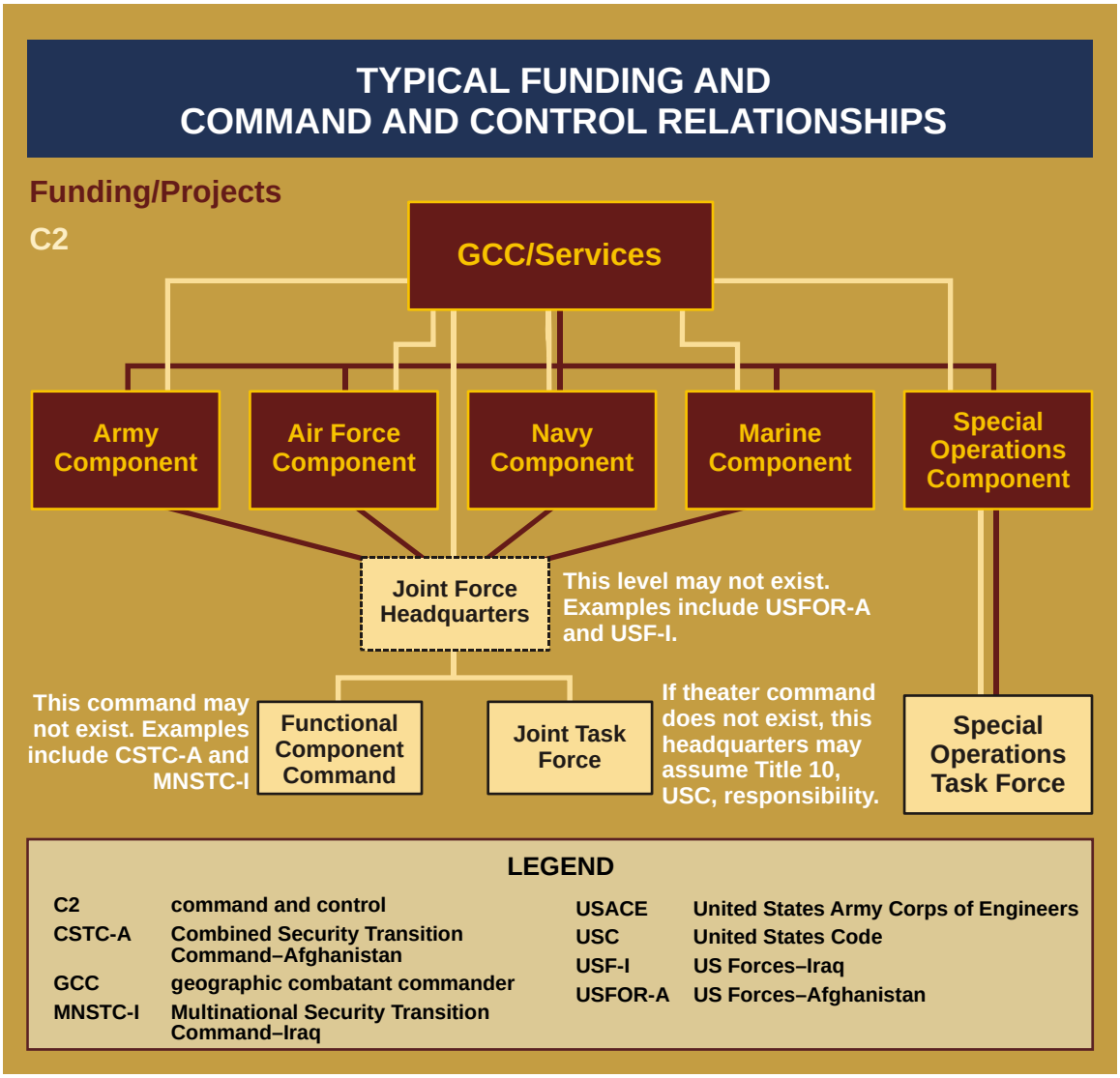



**Figure E-1. Typical Funding and Command and Control Relationships**

## 3. Types of Authorizations and Sources of Funding

a. Services are generally authorized to use annual O&M funds for minor construction projects costing not more than $750,000 ($1.5 million to correct a life, safety, or health threatening condition [Title 10, USC, Section 2805, "Unspecified Minor Construction"]). This is a peacetime provision, applicable during contingencies and emergencies; however, "life threatening" is generally considered a safety issue vice an emergency in the context of contingency operations. During combat or designated contingency operations, O&M may be used to fund construction projects exceeding these thresholds under certain circumstances with appropriate authorization. The JFC must consult with the SJA before making a determination to use O&M in such a case.

b. Several broad authorities have been established under Title 10, USC, that enable the JFC to carry out contingency construction, including procuring materials for construction by

military forces and the funding of civilian contracts. Figures E-2 and E-3 depict decision trees for the contingency construction funding options.

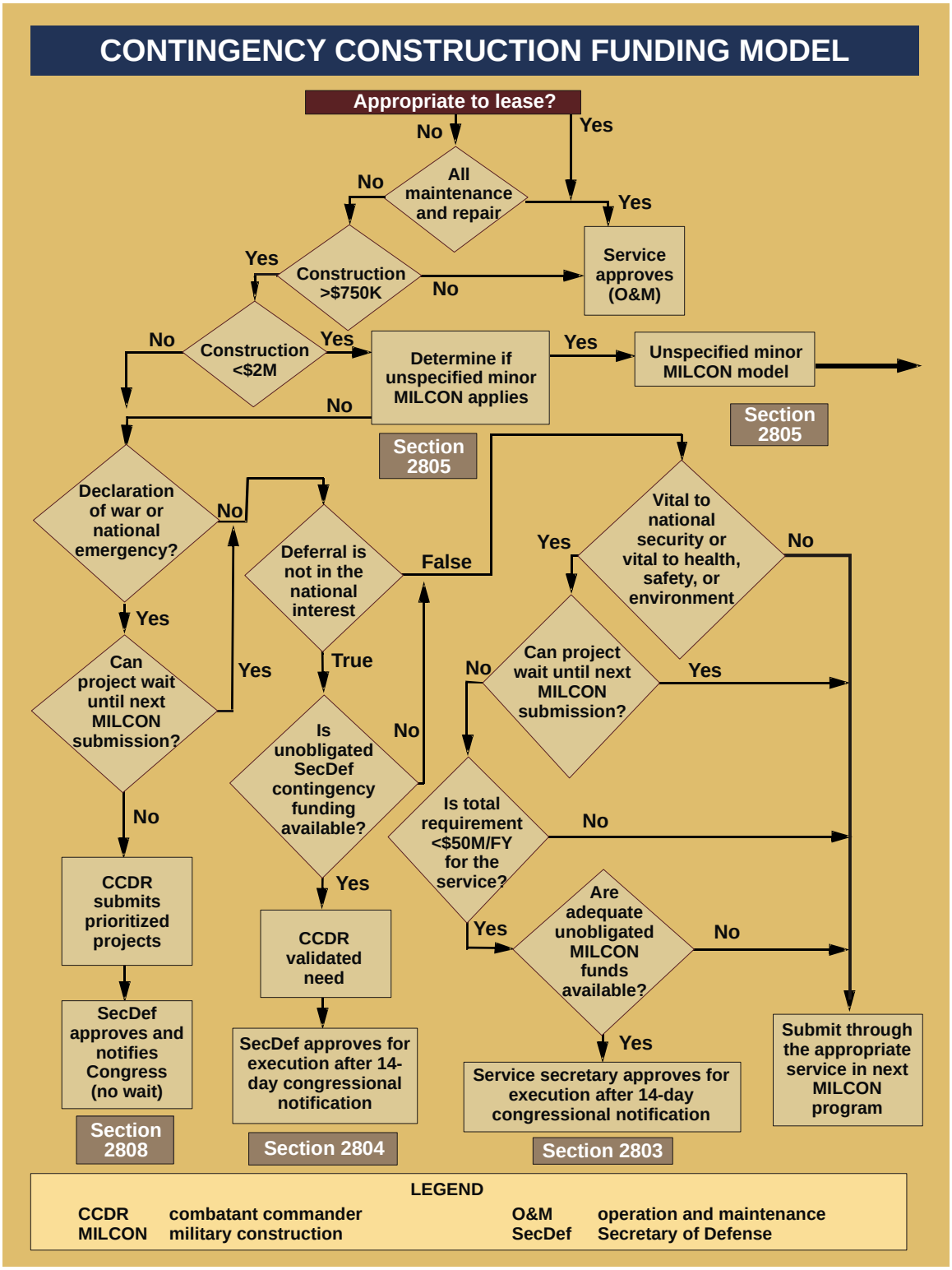



**Figure E-2. Contingency Construction Funding Model**

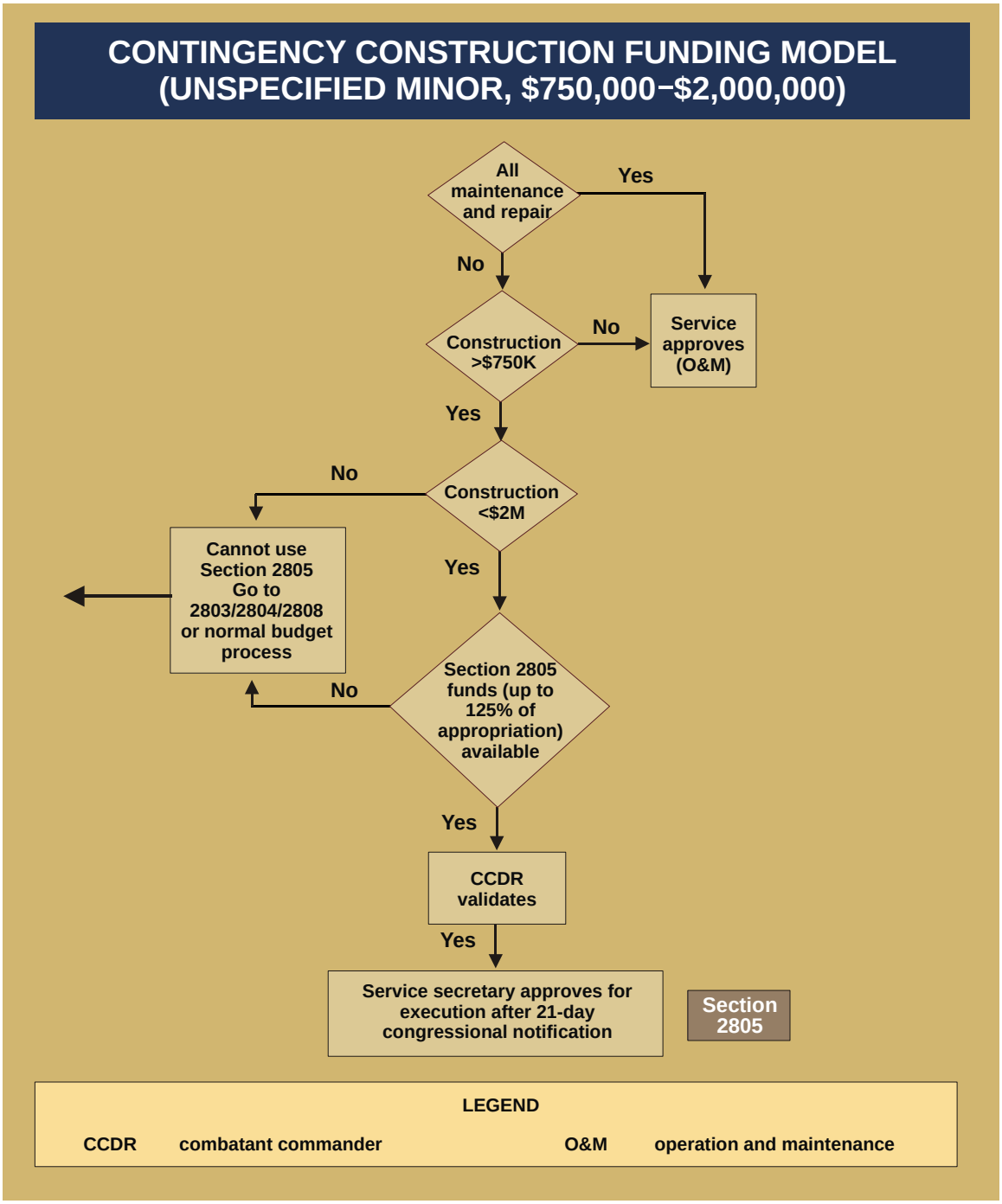



**Figure E-3. Contingency Construction Funding Model (Unspecified Minor, $750,000-$2,000,000)**

(1) Title 10, USC, Section 2803, "Emergency Construction," authorizes each Service to use $50 million per year of appropriated, but not obligated MILCON funds for projects that cannot wait for the normal MILCON submission procedures. Projects must comply with a 21-day congressional notice and wait period before proceeding (7 days for electronic notification [Title 10, USC, Section 480]). Generally, a previously congressionally approved project must be canceled to free the $50 million.

(2) Title 10, USC, Section 2804, "Contingency Construction," authorizes SecDef a specific MILCON line item amount for contingency construction projects that cannot wait for the normal MILCON program submission process. A project must comply with a 14-day congressional notice and wait period before proceeding (7 days for electronic notification [Title 10, USC, Section 480]). Generally, funding for this section is limited to less than $10 million per year.

(3) Title 10, USC, Section 2805, "Unspecified Minor Construction," authorizes each Service to carry out unspecified minor MILCON projects. Projects must be less than $2 million each or $3 million to correct a life, health, or safety condition. Projects greater than $750,000 require a congressional notice and wait period before proceeding.

(4) Title 10, USC, Section 2808, "Construction Authority in the Event of a Declaration of War or National Emergency," authorizes SecDef to undertake MILCON projects that are necessary to support the use of the armed forces for the war or national emergency within the total amount of funds that have been appropriated for MILCON that have not been obligated. Congress must be notified of each project, but there is no wait requirement before the project may begin.

(5) Title 10, USC, Section 2811, "Repair of Facilities," authorizes SecDef and Military Department secretaries to use available O&M funds to carry out repair of facilities. Repair projects over $7.5 million require congressional notification.

(6) CCDRs do not need specific authority to request projects under Title 10, USC, Sections 2803 and 2804. To gain approval for a project under either authority, it is necessary to provide the appropriate Service secretary or SecDef with a justification of need, estimated costs, and source of funding.

(7) Title 10, USC, Section 166(a), "Combatant Commander Initiative Fund (CCIF)" authorizes the use of funds for CCMDs to react to unexpected contingencies and opportunities. CJCSI 7401.01(Series) describes the use of funds and how they can be used for HCA, to include urgent and unanticipated humanitarian relief and reconstruction assistance. Requests for use of CCIF funds should be carefully evaluated to ensure they comply with the intent of CCIF prior to submission.

c. Other Authorities and Sources of Funding. Other authorities may be used for executing MILCON projects in support of a JFC. Some of them are listed below:

(1) Title 10, USC, Section 2350(j), "Burden Sharing Contributions by Designated Countries and Regional Organizations," authorizes SecDef, after consultation with the Secretary of State, to accept burden sharing cash contributions from any country or regional organization designated for certain purposes of the DOD, including MILCON. SecDef, and Military Department secretaries with approval from SecDef, may carry out MILCON, subject to the 21-day congressional notice and wait requirement, except in cases of declared war or national emergency. For additional information, see DOD Financial Management Regulation (DOD 7000.14-R), Volume 12, Chapter 24.

(2) Title 22, USC, Section 2357, "Furnishing of Services and Commodities." Subject to Presidential approval, this section of the USC may provide for DOD restoration of HN civil infrastructure. This provision of law allows any USG agency to provide goods and services to friendly countries and NGOs on an advance-of-funds or reimbursable basis.

(3) Title 22, USC, Section 2769, "Foreign Military Construction Sales." HN military facilities may be restored under the foreign military sales provisions of this authority.

(4) Title 22, USC, Section 1535, "Agency Agreements." This section allows USG agencies to support each other, provided that the supported agency has the funds and authority to do the work requested.

(5) Title 10, USC, Section 401, "Humanitarian and Civic Assistance Provided in Conjunction with Military Operations." In HCA facilities projects, the JFC and joint force engineers may work with HN government agencies to repair or improve infrastructure and public facilities. These authorized and funded projects are designed to provide assistance to the HN populace in conjunction with a military operation or exercise. The operation or exercise is usually planned well in advance and is not usually planned in response to disasters, although HCA activities have been executed following disasters. Specific engineer activities for which HCA funds can be used include the construction of rudimentary surface transportation systems, well drilling, construction of basic sanitation facilities, and rudimentary construction and repair of facilities.

(6) Title 22, USC, Section 2292, "General Provisions for International Disaster Assistance." In disaster operations, the UN and the DOS OFDA may generate funded requirements for DOD assistance. FHA programs focus on the use of DOD excess property, emergency transportation support, disaster relief, or other support to alleviate urgent needs resulting from a disaster or catastrophe in a host country. While other elements of the joint force are focused on immediate FHA, general engineering planning may focus on projects that provide immediate shelter for dislocated civilians. The joint force engineers must work in a close relationship with the representatives of the HN and US country team.

(7) Title 22, USC, Section 2318, "Special Authority to Drawdown Defense Articles and Services." Drawdown authority is a means to respond to unforeseen military emergencies or humanitarian relief situations. There are annual limitations on the value of articles and services that may be drawn down in any fiscal year.

(8) **Department of Defense Directive 5100.46, Foreign Disaster Relief.** Normally, DOD components may participate in foreign disaster relief operations only after DOS makes a determination that such relief shall be provided. This directive does not prohibit, however, a military commander at the immediate scene of a foreign disaster from undertaking disaster relief operations without prior approval of the ambassador or chief of mission when the emergency time is of the essence and when humanitarian considerations make it advisable to do so.

# APPENDIX F
## REFERENCES

The development of JP 3-34 is based upon the following primary references.

### 1. General

a. Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal.

b. EO 12088, *Federal Compliance with Pollution Control Standards.*

c. EO 12114, *Environmental Effects Abroad of Major Federal Actions.*

d. National Environmental Policy Act.

e. National Response Framework.

f. Title 10, USC.

g. Title 22, USC.

h. Title 31, USC.

### 2. Department of Defense

a. DODD 3000.5, *Stability Operations.*

b. DODD 4270.5, *Military Construction.*

c. DODD 5100.1, *Functions of the Department of Defense and its Major Components.*

d. DODD 5100.46, *Foreign Disaster Relief.*

e. DODD 5530.3, *International Agreements.*

f. DODD 6050.7, *Environmental Effects Abroad of Major Department of Defense Actions.*

g. DODI 4165.3, *Department of Defense Facilities Classes and Construction Categories.*

h. DODI 4715.5, *Management of Environmental Compliance at Overseas Installations.*

i. DODI 4715.8, *Environmental Remediation Policy for DOD Activities Overseas.*

j. DODI 4715.9, *Environmental Planning and Analysis.*

k. DOD 4715.05-G, *Overseas Environmental Baseline Guidance Document (OEBGD).*

### 3. Chairman of the Joint Chiefs of Staff

a. CJCSI 3901.01B, *Requirements for Geospatial Information and Services.*

b. CJCSM 3122.01A, *Joint Operation Planning and Execution System (JOPES), Volume I, Planning, Policies, and Procedures.*

c. CJCSM 3122.03C, *Joint Operation Planning and Execution System (JOPES), Volume II, Planning Formats .*

d. JP 1, *Doctrine for the Armed Forces of the United States.*

e. JP 1-02, *Department of Defense Dictionary of Military and Associated Terms.*

f. JP 2-0, *Joint Intelligence.*

g. JP 2-01, *Joint and National Intelligence Support to Military Operations.*

h. JP 2-03, *Geospatial Intelligence Support to Joint Operations.*

i. JP 3-0, *Joint Operations.*

j. JP 3-02, *Amphibious Operations.*

k. JP 3-07.2, *Antiterrorism.*

l. JP 3.07.3, *Peace Operations.*

m. JP 3-08, *Interorganizational Coordination During Joint Operations.*

n. JP 3-10, *Joint Security Operations in Theater.*

o. JP 3-11, *Operations in Chemical, Biological, Radiological, and Nuclear (CBRN) Environments.*

p. JP 3-13.4, *Military Deception.*

q. JP 3-15, *Barriers, Obstacles, and Mine Warfare for Joint Operations.*

r. JP 3-16, *Multinational Operations.*

s. JP 3-18, *Joint Forcible Entry Operations.*

t. JP 3-22, *Foreign Internal Defense.*

u. JP 3-27, *Homeland Defense.*

v. JP 3-28, *Civil Support.*

w. JP 3-29, *Foreign Humanitarian Assistance.*

x. JP 3-60, *Joint Targeting.*

y. JP 3-61, *Public Affairs.*

z. JP 4-0, *Joint Logistics.*

aa. JP 4-01.6, *Joint Logistics Over-the-Shore (JLOTS).*

bb. JP 5-0, *Joint Operation Planning.*

cc. JP 6-0, *Joint Communications System.*

## 4. Service Publications

a. Air Force Doctrine Document (AFDD) 2-4, *Combat Support.*

b. AFDD 2-4.4, *Airbase Establishment and Mission Generation.*

c. AFDD 10-4, *Operational Planning.*

d. AFTTP 3-4X, *Environmental Considerations in Contingency Operations.*

e. Air Force Handbook 10-222, Volume 4, *Environmental Guide for Contingency Operations.*

f. Air Force Instruction 10-404, *Base Support and Expeditionary Planning.*

g. Army Tactics, Techniques, and Procedures (ATTP) 3-34.20, *Explosive Hazards Operations.*

h. ATTP 3-34.40, *General Engineering.*

i. FM 3-34, *Engineer Operations.*

j. FM 3-34.3, *Survivability.*

k. FM 3-34.5/MCRP 4-11B, *Environmental Considerations.*

l. FM 3-34.39, *Camouflage, Concealment, and Deception.*

m. FM 3-34.170/Marine Corps Warfighting Publication (MCWP) 3-17.4, *Engineer Reconnaissance.*

n. FM 3-34.230, *Topographic Operations.*

o. FM 3-90.4, *Combined Arms Mobility Operations.*

p. FM 3-90-8, *Combined Arms Obstacle Integration.*

q. FM 3-100.12/MCRP 5-12.1C/AFTTP 3-2, *Risk Management.*

r. FM 20-32, *Mine/Countermine Operations.*

s. FM 100.38, *UXO Multiservice Procedures for Unexploded Ordnance Operations.*

t. MCWP 3-17, *MAGTF Engineer Operations.*

u. MCWP 3-17.2, *MAGTF Explosive Ordnance Disposal.*

v. *Multi-Service Tactics, Techniques, and Procedures for Explosive Ordnance Disposal in a Joint Environment.*

w. NTRP 4-04.2.1, *Doctrinal Reference for the Naval Construction Force.*

x. NTTP 4-04.3, *Naval Contingency Engineering Operations.*

y. NWP 4-04, *Naval Civil Engineering Operations.*

z. NWP 4-04.1M/MCWP 4-11.5, *Seabee Operations in the MAGTF.*

aa. NWP 4-11, *Navy Environmental Protection Doctrine.*

bb. Office of the Chief Naval Operations Instruction 3501.93 Series, *Projected Operational Environment (POE) and Required Operational Capabilities (ROC) for Naval Beach Groups and their Elements.*

cc. NTRP 4-04.2.13/FM 3-34.469/Air Force Manual 32-1072, *Water-Well Drilling Operations.*

# APPENDIX G
## ADMINISTRATIVE INSTRUCTIONS

### 1. User Comments

Users in the field are highly encouraged to submit comments on this publication to: Joint Staff J-7, Deputy Director, Joint and Coalition Warfighting, Joint and Coalition Warfighting Center, ATTN: Joint Doctrine Support Division, 116 Lake View Parkway, Suffolk, VA 23435-2697. These comments should address content (accuracy, usefulness, consistency, and organization), writing, and appearance.

### 2. Authorship

The lead agent for this publication is the US Army. The Joint Staff doctrine sponsor for this publication is the Director for Logistics (J-4).

### 3. Supersession

This publication supersedes JP 3-34, *Joint Engineer Operations,* 12 February 2007.

### 4. Change Recommendations

a. Recommendations for urgent changes to this publication should be submitted:

TO: CSA WASHINGTON DC//DAMO-SSP//
JOINT STAFF WASHINGTON DC//J7-JEDD//

b. Routine changes should be submitted electronically to the Deputy Director, Joint and Coalition Warfighting, Joint and Coalition Warfighting Center, Joint Doctrine Support Division and info the lead agent and the Director for Joint Force Development, J-7/JEDD.

c. When a Joint Staff directorate submits a proposal to the CJCS that would change source document information reflected in this publication, that directorate will include a proposed change to this publication as an enclosure to its proposal. The Services and other organizations are requested to notify the Joint Staff J-7 when changes to source documents reflected in this publication are initiated.

### 5. Distribution of Publications

Local reproduction is authorized and access to unclassified publications is unrestricted. However, access to and reproduction authorization for classified JPs must be in accordance with DOD 5200.1-R, *Information Security Program.*

### 6. Distribution of Electronic Publications

a. Joint Staff J-7 will not print copies of JPs for distribution. Electronic versions are available on JDEIS at https://jdeis.js.mil (NIPRNET), and http://jdeis.js.smil.mil (SIPRNET), and on the JEL at http://www.dtic.mil/doctrine (NIPRNET).

b. Only approved JPs and joint test publications are releasable outside the CCMDs, Services, and Joint Staff. Release of any classified JP to foreign governments or foreign nationals must be requested through the local embassy (Defense Attaché Office) to DIA, Defense Foreign Liaison/IE-3, 200 MacDill Blvd., Joint Base Anacostia-Bolling, Washington, DC 20340-5100.

c. JEL CD-ROM. Upon request of a joint doctrine development community member, the Joint Staff J-7 will produce and deliver one CD-ROM with current JPs. This JEL CD-ROM will be updated not less than semi-annually and when received can be locally reproduced for use within the combatant commands and Services.

# GLOSSARY

## PART I—ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ABGD | air base ground defense |
| ACE | aviation combat element (MAGTF) |
| ADC | area damage control |
| ADCON | administrative control |
| ADR | airfield damage repair |
| AETF | air and space expeditionary task force |
| AFCAP | Air Force contract augmentation program |
| AFCEE | Air Force Center for Engineering and the Environment |
| AFCESA | Air Force Civil Engineering Support Agency |
| AFDD | Air Force doctrine document |
| AFTTP | Air Force tactics, techniques, and procedures |
| AGS | aviation ground support |
| AOR | area of responsibility |
| APE | airfield pavement evaluation |
| APOD | aerial port of debarkation |
| ATTP | Army tactics, techniques, and procedures |
| | |
| BCT | brigade combat team |
| BII | base information infrastructure |
| BOS | base operating support |
| BSZ | base security zone |
| | |
| C2 | command and control |
| CA | civil affairs |
| CAP | crisis action planning |
| CBMU | construction battalion maintenance unit |
| CBRN | chemical, biological, radiological, and nuclear |
| CBRNE | chemical, biological, radiological, nuclear, and high-yield explosives |
| CCA | contract construction agent |
| CCD | camouflage, concealment, and deception |
| CCDR | combatant commander |
| CCIF | Combatant Commander Initiative Fund |
| CCMD | combatant command |
| CE | command element (MAGTF) |
| CEB | combat engineer battalion |
| CEMIRT | civil engineer maintenance, inspection, and repair team |
| CERT | contingency engineering response team |
| CJCSI | Chairman of the Joint Chiefs of Staff instruction |
| CJCSM | Chairman of the Joint Chiefs of Staff manual |
| CMCB | civil-military coordination board |
| CMO | civil-military operations |
| CMOC | civil-military operations center |

| | |
|---|---|
| CNIC | Commander, Navy Installations Command |
| CNO | Chief of Naval Operations |
| COA | course of action |
| COMAFFOR | commander, Air Force forces |
| CONOPS | concept of operations |
| CONPLAN | concept plan |
| CONUS | continental United States |
| COP | common operational picture |
| CP | command post |
| CS | civil support |
| CSB (MEB) | combat support brigade (maneuver enhancement brigade) |
| CSS | combat service support |
| | |
| DCMA | Defense Contract Management Agency |
| DJTFAC | deployable joint task force augmentation cell |
| DLA | Defense Logistics Agency |
| DOD | Department of Defense |
| DODD | Department of Defense directive |
| DODI | Department of Defense instruction |
| DOS | Department of State |
| DTED | digital terrain elevation data |
| | |
| EAF | expeditionary airfield |
| EBS | environmental baseline survey |
| ECC | engineer coordination cell |
| ECES | expeditionary civil engineer squadron |
| EEA | environmental executive agent |
| EH | explosive hazard |
| EHCC | explosive hazards coordination cell |
| EHSA | environmental health site assessment |
| EM | emergency management |
| EO | executive order |
| EOD | explosive ordnance disposal |
| EPA | Environmental Protection Agency |
| ERDC | Engineer Research and Development Center |
| ESB | engineer support battalion |
| ESP | engineer support plan |
| ET | electronics technician |
| | |
| FACE | forward aviation combat engineering |
| FEC | facilities engineering command |
| FEMA | Federal Emergency Management Agency |
| FES | fire emergency services |
| FEST | forward engineer support team |
| FET | facility engineer team |
| FFE | field force engineering |

| | |
|---|---|
| FGS | final governing standard |
| FHA | foreign humanitarian assistance |
| FM | field manual (Army) |
| FRTP | fleet response training plan |
| GCC | geographic combatant commander |
| GCCC | global contingency construction contract |
| GCCS | Global Command and Control System |
| GCE | ground combat element (MAGTF) |
| GCSC | global contingency service contract |
| GCSS | Global Command Support System |
| GEOINT | geospatial intelligence |
| GI&S | geospatial information and services |
| GIS | geographic information system |
| H&S | headquarters and service |
| HAZMAT | hazardous materials |
| HCA | humanitarian and civic assistance |
| HDO | humanitarian demining operations |
| HF | high frequency |
| HN | host nation |
| HNS | host-nation support |
| HNSA | host-nation support agreement |
| HQ | headquarters |
| HW | hazardous waste |
| IAW | in accordance with |
| IED | improvised explosive device |
| IGO | intergovernmental organization |
| INLS | Improved Navy Lighterage System |
| IR | information requirement |
| ISA | international standardization agreement |
| ISB | intermediate staging base |
| ISR | intelligence, surveillance, and reconnaissance |
| IT | information system technician |
| J-2 | intelligence directorate of a joint staff |
| J-3 | operations directorate of a joint staff |
| J-4 | logistics directorate of a joint staff |
| JCMEB | joint civil-military engineering board |
| JDOMS | Joint Director of Military Support |
| JECC | joint enabling capabilities command |
| JEMB | joint environmental management board |
| JEPES | joint engineer planning and execution system |
| JFC | joint force commander |
| JFLCC | joint force land component commander |

| | |
|---|---|
| JFUB | joint facilities utilization board |
| JIACG | joint interagency coordination group |
| JIPOE | joint intelligence preparation of the operational environment |
| JLOC | joint logistics operations center |
| JLOTS | joint logistics over-the-shore |
| JMD | joint manning document |
| JOA | joint operations area |
| JOC | joint operations center |
| JOPES | Joint Operation Planning and Execution System |
| JOPP | joint operation planning process |
| JP | joint publication |
| JRSOI | joint reception, staging, onward movement, and integration |
| JTCB | joint targeting coordination board |
| JTF | joint task force |
| JTFCEM | joint task force contingency engineering management |
| LCE | logistics combat element (MAGTF) |
| LNO | liaison officer |
| LOC | line of communications |
| LOGCAP | logistics civil augmentation program |
| LOTS | logistics over-the-shore |
| LZ | landing zone |
| MAGTF | Marine air-ground task force |
| MCRP | Marine Corps reference publication |
| MCWP | Marine Corps warfighting publication |
| MEB | Marine expeditionary brigade |
| MEF | Marine expeditionary force |
| MEU | Marine expeditionary unit |
| MHE | materials handling equipment |
| MILCON | military construction |
| MMAC | military mine action center |
| MNF | multinational force |
| MNFC | multinational force commander |
| MPF | maritime pre-positioning force |
| MSR | main supply route |
| MUSE | mobile utilities support equipment |
| MWSG | Marine wing support group |
| MWSS | Marine wing support squadron |
| NATO | North Atlantic Treaty Organization |
| NAVFAC | Naval Facilities Engineering Command |
| NBG | naval beach group |
| NBVC | Naval Base Ventura County |

| | |
|---|---|
| NCF | naval construction force |
| NCR | naval construction regiment |
| NEO | noncombatant evacuation operation |
| NFELC | Naval Facilities Expeditionary Logistics Center |
| NFESC | Naval Facilities Engineering Service Center |
| NGA | National Geospatial-Intelligence Agency |
| NGO | nongovernmental organization |
| NIPRNET | Nonsecure Internet Protocol Router Network |
| NMCB | naval mobile construction battalion |
| NRF | National Response Framework |
| NTRP | Navy tactical reference publication |
| NTTP | Navy tactics, techniques, and procedures |
| NWP | Navy warfare publication |
| | |
| 1NCD | 1st Naval Construction Division |
| O&M | operation and maintenance |
| OA | operational area |
| OEBGD | Overseas Environmental Baseline Guidance Document |
| OFDA | Office of US Foreign Disaster Assistance |
| OICC | officer in charge of construction |
| OPCON | operational control |
| OPDS | offshore petroleum discharge system |
| OPLAN | operation plan |
| OPORD | operation order |
| | |
| PA | primary agency |
| PAO | public affairs officer |
| PHIBCB | amphibious construction battalion |
| PIR | priority intelligence requirement |
| PMO | program management office |
| POL | petroleum, oils, and lubricants |
| Prime BEEF | Prime Base Engineer Emergency Force |
| PWG | protection working group |
| | |
| RC | Reserve Component |
| RCEM | regional contingency engineering management |
| RED HORSE | Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer |
| ROICC | resident officer in charge of construction |
| RSOI | reception, staging, onward movement, and integration |
| RUF | rules for the use of force |
| | |
| SATCOM | satellite communications |
| SEA | Southeast Asia |
| Seabee | Navy construction engineer |
| SecDef | Secretary of Defense |

| | |
|---|---|
| SHF | super-high frequency |
| SIPRNET | SECRET Internet Protocol Router Network |
| SJA | staff judge advocate |
| SOFA | status-of-forces agreement |
| SOP | standard operating procedure |
| SPMAGTF | special purpose Marine air-ground task force |
| SPOD | seaport of debarkation |
| SRG | Seabee readiness group |
| S-Team | staff augmentation team |
| TACON | tactical control |
| TCEM | theater contingency engineering management |
| TDN | tactical data network |
| TEC | theater engineer command |
| TEMPER | tent extendible modular personnel |
| TETK | TeleEngineering Toolkit |
| TOA | table of allowance |
| TPFDD | time-phased force and deployment data |
| TTP | tactics, techniques, and procedures |
| UCT | underwater construction team |
| UFC | Unified Facilities Criteria |
| UHF | ultrahigh frequency |
| UN | United Nations |
| USACE | United States Army Corps of Engineers |
| USAID | United States Agency for International Development |
| USAMC | United States Army Materiel Command |
| USC | United States Code |
| USG | United States Government |
| USMC | United States Marine Corps |
| UTC | unit type code |
| UXO | unexploded ordnance |
| VHF | very high frequency |
| WMD | weapons of mass destruction |
| WTI | weapons technical intelligence |

## PART II—TERMS AND DEFINITIONS

**advanced base.** A base located in or near an operational area whose primary mission is to support military operations. (Approved for incorporation into JP 1-02 with JP 3-34 as the source JP)

**apron.** A defined area on an airfield intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling, parking, or maintenance. (Approved for incorporation into JP 1-02 with JP 3-34 as the source JP.)

**base complex.** None. (Approved for removal from JP 1-02.)

**base development (less force beddown).** The acquisition, development, expansion, improvement, construction and/or replacement of the facilities and resources of a location to support forces. (Approved for incorporation into JP 1-02.)

**building systems.** Structures assembled from manufactured components designed to provide specific building configurations. (Approved for incorporation into JP 1-02.)

**combat engineering.** Engineering capabilities and activities that closely support the maneuver of land combat forces consisting of three types: mobility, countermobility, and survivability. (Approved for incorporation into JP 1-02.)

**common servicing.** Functions performed by one Service in support of another for which reimbursement is not required. (Approved for incorporation into JP 1-02.)

**contingency engineering management organization.** An organization formed by the combatant commander, or subordinate joint force commander to augment their staffs with additional Service engineering expertise for planning and construction management. (Approved for incorporation into JP 1-02.)

**countermobility operations.** The construction of obstacles and emplacement of minefields to delay, disrupt, and destroy the enemy by reinforcement of the terrain. (JP 1-02. SOURCE: JP 3-34)

**crash rescue and fire suppression.** Extraction of aircrew members from crashed or burning aircraft and the control of related fires. (Approved for incorporation into JP 1-02.)

**Department of Defense construction agent.** The Corps of Engineers, Naval Facilities Engineering Command, or other such approved Department of Defense activity, that is assigned design or execution responsibilities associated with military construction programs, facilities support, or civil engineering support to the combatant commanders in contingency operations. (JP 1-02. SOURCE: JP 3-34)

**emergency repair.** The least amount of immediate repair to damaged facilities necessary for the facilities to support the mission. (Approved for incorporation into JP 1-02.)

**engineer support plan.** An appendix to the logistics annex or separate annex of an operation plan that identifies the minimum essential engineering services and construction requirements required to support the commitment of military forces. Also called **ESP.** (JP 1-02. SOURCE: JP 3-34)

**environmental baseline survey.** A multi-disciplinary site survey conducted prior to or in the initial stage of a joint operational deployment. Also called **EBS.** (Approved for incorporation into JP 1-02.)

**environmental cleanup.** None. (Approved for removal from JP 1-02.)

**environmental considerations.** The spectrum of environmental media, resources, or programs that may affect the planning and execution of military operations. (Approved for incorporation into JP 1-02.)

**environmental stewardship.** None. (Approved for removal from JP 1-02.)

**excess property.** None. (Approved for removal from JP 1-02.)

**exercise.** A military maneuver or simulated wartime operation involving planning, preparation, and execution that is carried out for the purpose of training and evaluation. (Approved for incorporation into JP 1-02.)

**explosive ordnance.** All munitions containing explosives, nuclear fission or fusion materials, and biological and chemical agents. (Approved for incorporation into JP 1-02.)

**explosive ordnance disposal.** The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded explosive ordnance. Also called **EOD.** (Approved for incorporation into JP 1-02.)

**explosive ordnance disposal unit.** Personnel with special training and equipment who render explosive ordnance safe, make intelligence reports on such ordnance, and supervise the safe removal thereof. (Approved for incorporation into JP 1-02.)

**facility.** A real property entity consisting of one or more of the following: a building, a structure, a utility system, pavement, and underlying land. (Approved for incorporation into JP 1-02 with JP 3-34 as the source JP.)

**facility substitutes.** Items such as tents and prepackaged structures requisitioned through the supply system that may be used to substitute for constructed facilities. (JP 1-02. SOURCE: JP 3-34)

**final governing standards.** A comprehensive set of country-specific substantive environmental provisions, typically technical limitations on effluent, discharges, etc., or a specific management practice. (JP 1-02. SOURCE: JP 3-34)

**force beddown.** The provision of expedient facilities for troop support to provide a platform for the projection of force. (Approved for incorporation into JP 1-02.)

**forward aviation combat engineering.** A mobility operation in which engineers perform tasks in support of forward aviation ground facilities. Also called **FACE.** (Approved for incorporation into JP 1-02.)

**general engineering.** Those engineering capabilities and activities, other than combat engineering, that modify, maintain, or protect the physical environment. Also called **GE.** (Approved for incorporation into JP 1-02.)

**geospatial engineering.** Those engineering capabilities and activities that contribute to a clear understanding of the physical environment by providing geospatial information and services to commanders and staffs. (Approved for incorporation into JP 1-02.)

**hardstand.** 1. A paved or stabilized area where vehicles are parked. 2. Open ground with a prepared surface used for the storage of materiel. (Approved for incorporation into JP 1-02.)

**joint facilities utilization board.** A joint board that evaluates and reconciles component requests for real estate, use of existing facilities, inter-Service support, and construction to ensure compliance with Joint Civil-Military Engineering Board priorities. Also called **JFUB.** (Approved for replacement of "Joint Facilities Utilization Board" in JP 1-02.)

**military construction.** Any construction, alteration, development, conversion, or extension of any kind carried out with respect to a military installation. Also called **MILCON.** (JP 1-02. SOURCE: JP 3-34)

**mobile mine.** A mine propelled to its laying position by propulsion equipment, such as a torpedo, that sinks at the end of its run placing the mine. (Approved for incorporation into JP 1-02.)

**naval construction force.** The combined construction units of the Navy that are part of the operating forces and represent the Navy's capability for advanced base construction. Also called **NCF.** (Approved for incorporation into JP 1-02.)

**operation and maintenance**. Maintenance and repair of real property, operation of utilities, and provision of other services such as refuse collection and disposal, entomology, snow removal, and ice alleviation. Also called **O&M.** (JP 1-02. SOURCE: JP 3-34)

**Overseas Environmental Baseline Guidance Document.** A set of objective criteria and management practices developed by the Department of Defense to protect human health and the environment. Also called **OEBGD.** (JP 1-02. SOURCE: JP 3-34)

**prime mover.** None. (Approved for removal from JP 1-02.)

**Rapid Engineer Deployable Heavy Operational Repair Squadron Engineer.** Air Force units wartime-structured to provide a heavy engineer capability that are mobile, rapidly deployable, and largely self-sufficient for limited periods of time. Also called **RED HORSE.** (Approved for replacement of "RED HORSE" and its definition in JP 1-02.)

**real property.** Lands, buildings, structures, utilities systems, improvements, and appurtenances, thereto that includes equipment attached to and made part of buildings and structures, but not movable equipment. (Approved for incorporation into JP 1-02.)

**relocatable building.** None. (Approved for removal from JP 1-02.)

**route classification.** Classification assigned to a route using factors of minimum width, worst route type, least bridge, raft, or culvert military load classification, and obstructions to traffic flow. (Approved for incorporation into JP 1-02 with JP 3-34 as the source JP.)

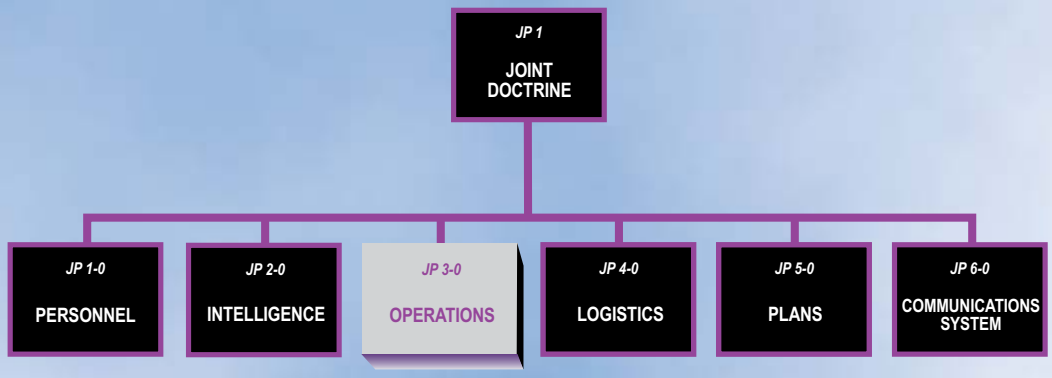
**survivability.** All aspects of protecting personnel, weapons, and supplies while simultaneously deceiving the enemy. (Approved for incorporation into JP 1-02.)

**topographic map.** None. (Approved for removal from JP 1-02.)

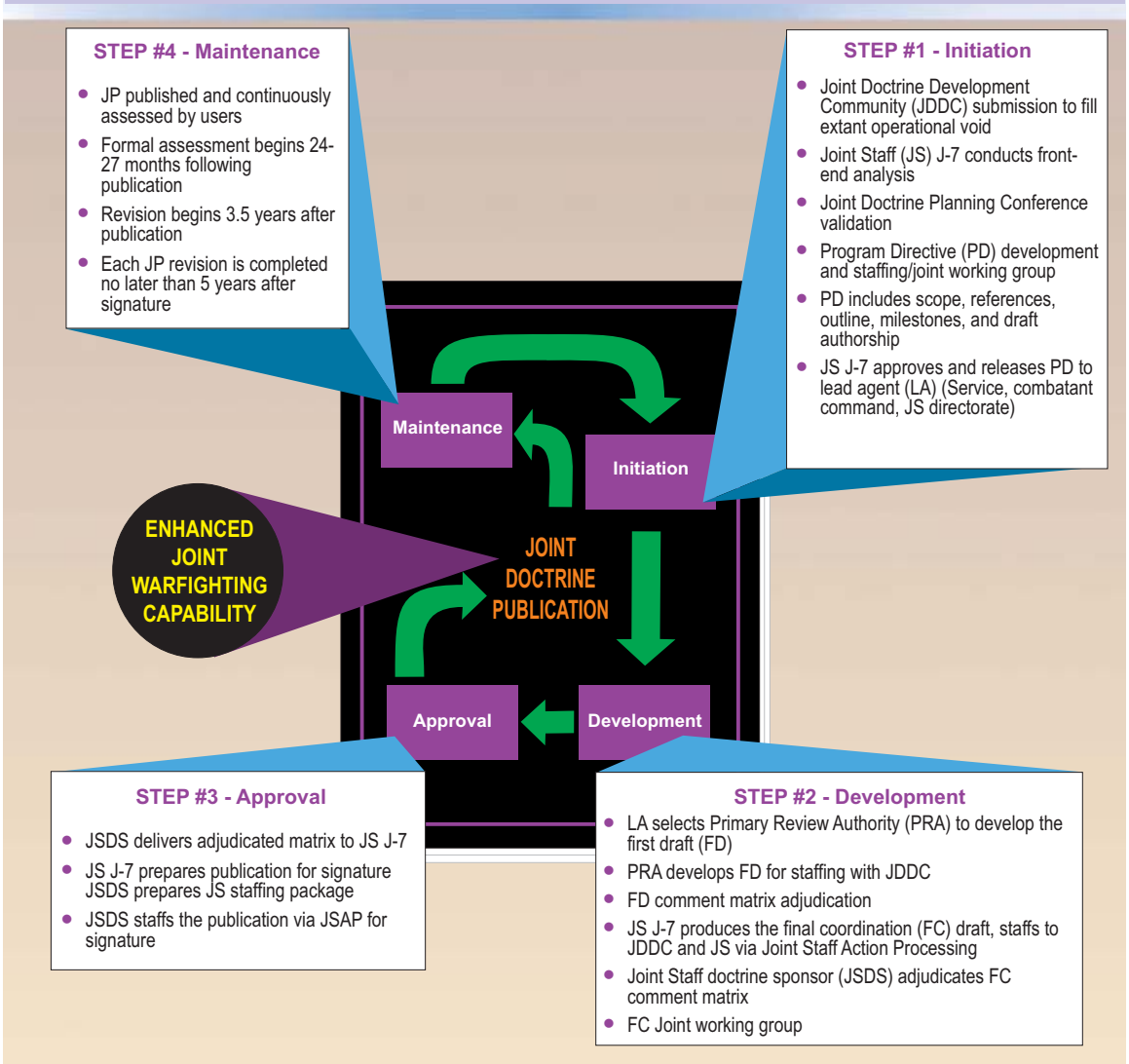
**underwater demolition.** The destruction or neutralization of underwater obstacles that is normally accomplished by underwater demolition teams. (Approved for incorporation into JP 1-02.)

**underwater demolition team.** A group of officers and enlisted specially trained and equipped to accomplish the destruction or neutralization of underwater obstacles and associated tasks. Also called **UDT.** (Approved for incorporation into JP 1-02.)

# JOINT DOCTRINE PUBLICATIONS HIERARCHY




All joint publications are organized into a comprehensive hierarchy as shown in the chart above. **Joint Publication (JP) 3-34** is in the **Operations** series of joint doctrine publications. The diagram below illustrates an overview of the development process:

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