Joint Publication 3-34

Engineer Doctrine for Joint Operations

5 July 2000

PREFACE

1. Scope

This publication provides the guidance and procedures necessary to plan, coordinate, and conduct timely and tailored joint engineer operations across the range of military operations.

2. Purpose

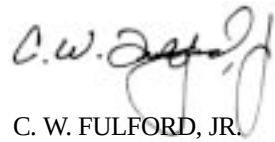
This publication has been prepared under the direction of the Chairman of the Joint Chiefs of Staff. It sets forth doctrine to govern the joint activities and performance of the Armed Forces of the United States in joint operations and provides the doctrinal basis for US military involvement in multinational and interagency operations. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders and prescribes doctrine for joint 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 joint force commander (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 mission.

3. Application

a. Doctrine and guidance established in this publication apply to the commanders of combatant commands, subunified commands, joint task forces, and subordinate components of these commands. These principles and guidance also may apply when significant forces of one Service are attached to forces of another Service or when significant forces of one Service support forces of another Service.

b. The guidance in this publication is authoritative; as such, this doctrine (or JTTP) 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 for the activities of joint forces 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.

For the Chairman of the Joint Chiefs of Staff:



C. W. FULFORD, JR.
Lieutenant General, US Marine Corps
Director, Joint Staff

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Role of Engineer Operations

Engineer operations are a significant force multiplier for the joint force commander (JFC).

Engineer operations support operational movement, maneuver, and force projection.

By shaping the conditions under which military forces must operate, engineer operations are a significant force multiplier for the joint force commander (JFC). In joint operations, engineer operations support the development of the battlespace for maneuver, enhance strategic and operational movement, and provide infrastructure for force projection. The total engineer force of military active and reserve, civilian, contractor, host nation, and allies and coalition partners constitutes the resources from which JFCs can draw upon to accomplish the engineer mission.

Engineer operations assist the joint force through three functions:

Combat engineering

General engineering

Topographic engineering

Service engineer capabilities are leveraged to support joint operations.

Engineer operations assist the joint force in achieving the assigned objectives and end state through three functions. **Combat engineering** enables the JFC to freely maneuver the joint force (mobility), attack the enemy's ability to maneuver (countermobility), and support force protection (survivability). **General engineering** provides for the facilities and infrastructure that play a critical role in shaping the battlespace and are essential to force projection for decisive operations. **Topographic engineering** provides the geospatial information and services, including analysis and visualization of the terrain within the operational area, that enhances the common operational picture within the theater. Engineer units of each Service maintain critical capabilities within each of these functions that may be combined or leveraged to support joint operations.

Command and Control of Engineer Operations

The JFC's engineer organization must achieve unity of effort.

When organizing joint force engineer assets, the JFC must consider how best to achieve unity of effort, centralized planning, and decentralized execution. JFCs establish **command relationships for engineer forces** based on the requirement for engineer missions to include establishing supporting relationships between components to accomplish required tasks. Simplicity and clarity of command relationships are paramount to efficient and effective use of engineer forces due to the varied nature of engineer tasks, units, and capabilities.

Simplicity and clarity of command relationships for engineer forces are paramount.

JFCs should establish command and control relationships that take advantage of engineer flexibility.

The JFC organizes assigned forces to most effectively use available resources. Engineer forces are adaptable and can be tailored to best meet mission requirements. JFCs should establish command and control relationships that take advantage of this flexibility.

Service component command structure is best suited when engineer forces are in direct support of Service component missions.

In a functional component command structure command relationships for engineer forces are based on engineer mission requirements.

In the Service component command organizational structure, Service component commanders maintain **operational control of their Service engineer forces.** This structure is best suited when engineer forces are in direct support of Service component missions. The JFC may direct engineer forces from one Service component to support another Service component for specific missions or tasks. The JFC may also organize to accomplish the mission using one or more functional component commands. In this organizational structure, the JFC establishes command relationships for engineer forces based on the requirement for engineer missions. The JFC also establishes appropriate relationships between components to accomplish the required tasks.

A subordinate joint task force may be established to better orchestrate engineer forces.

Engineer-intensive operations may require numerous engineer assets to complete a multitude of tasks. To **consolidate requirements and better orchestrate forces,** JFCs may establish a subordinate joint task force to control extensive engineer operations and/or missions. This option provides a coordinated approach for addressing engineer responsibilities.

JFCs should establish an engineer staff to coordinate the key engineer functions.

JFCs should establish a joint force engineer staff for engineering matters. **The joint force engineer staff coordinates combat engineering, general engineering, and topographic engineering** requirements needed to ensure mission success. When extensive coordination and project management are necessary, the combatant commander or subordinate JFC may

establish a contingency engineering management organization to assist the joint force engineer and staff. The engineer staff is also responsible for support to planning, operations, and intelligence. **JFCs may place engineers within the Operations Directorate, Logistics Directorate, or organize engineers as a special staff** depending on the focus of engineer effort in the joint operation. Topographic engineers may also be organized within the Intelligence Directorate.

Engineer Planning Considerations

Engineer planning is conducted at the strategic, operational, and tactical levels.

Engineer operations require engineering planning at all levels across the range of military operations. Engineer planners must determine the mobilization, deployment, employment, sustainment, and redeployment requirements of the combatant commander's concept of operations. Operational planning merges the operation plan of the joint force, specific engineer missions assigned, and available engineer forces. Tactical planning occurs primarily at the unit level specified to accomplish the task or mission. The Service components can also accomplish tactical planning.

The engineer staff should participate in all aspects of planning for joint operations.

Engineer planners should consider a wide range of requirements.

Involvement of the **engineer staff** in all aspects of planning is an absolute requirement in all phases of joint operations. When planning joint operations, engineer planners should consider a wide range of diverse requirements in preparation for required engineer support operations**. Key engineer planning considerations** include geospatial information, intelligence requirements, topographic engineer support, construction support, countermine operations, force protection, HN forces, multinational operations, interagency operations, contractor and/or host-nation support, materiel acquisition, operational phases, environmental considerations, and funding and resource management.

Early planning of engineer operations is essential to the successful engineer preparation of the operational area for joint operations.

Successful engineer support to the joint force requires early involvement of engineers in the planning process in all phases of joint operations. Understanding how engineers support the joint force and enhance air, land, and maritime operations provides the essential background for planning engineer operations. Early development of a **comprehensive plan for engineer operations** ensures the ready availability of engineer forces, equipment, and materiel in support of joint operations.

Conduct of Engineer Operations

Engineer operations enhance the commander's ability to conduct joint operations.

Engineer operations enhance the JFC's ability to conduct joint operations by maximizing force projection, enhancing the use of key terrain and infrastructure, and sustaining the force. **Engineer capabilities** enhance the JFC's capability to move, maneuver, and achieve objectives by efficiently using resources through **the three key engineering functions; combat engineering, general engineering, and topographic engineering.**

Combat engineering enhances operational movement, maneuver, and force protection.

General engineering improves infrastructure.

Topographic engineering provides terrain visualization.

Combat engineering enhances operational movement, maneuver, and force protection by facilitating mobility, countermobility, and survivability operations. **General engineering** encompasses the construction and repair of lines of communications, main supply routes, airfields, and logistic facilities to support joint military operations. **Topographic engineering** provides JFCs with terrain visualization, operational and tactical terrain analysis, digitized terrain products, nonstandard map products, and baseline survey data.

Engineer operations assist the joint force across the range of military operations.

Engineers assist in preparing the theater for military operations by providing **intelligence support,** necessary **facility and real estate acquisition,** and **improving theater access.** In military operations other than war, engineer operations play a significant role in **foreign humanitarian assistance, disaster relief, and humanitarian civic assistance.** In missions such as **noncombatant evacuation operations, enforcement of exclusion zones, enforcement of sanctions, and peace operations,** engineer operations may be required to provide infrastructure and base camp construction. In **combating terrorism,** engineer operations help reduce vulnerability of important assets. In **domestic support operations,** engineer operations provide disaster response in support of the Federal Response Plan. Engineer operations also facilitate the transition to **posthostilities operations.**

CONCLUSION

By shaping the conditions under which military forces must operate, engineer operations are a significant force multiplier for the JFC. Engineer operations assist the joint force in achieving the assigned objectives and end state through three critical functions: combat engineering, general engineering, and topographic engineering. Engineer operations support the

development of the battlespace for maneuver, enhance strategic and operational movement, and provide infrastructure for force projection. The implications of engineer operations should be considered in the JFC's plans for all phases of joint operations.

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CHAPTER I
JOINT ENGINEER FUNDAMENTALS

"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 Morison
History of US Naval Operations in World War II

1. The Role of Engineer Operations in Unified Action

Successful joint operations depend on how effectively commanders employ all resources across the entire range of military operations. Commanders must be able to visualize and create the best fit of all available forces to produce immediate effects and achieve the desired results. This integrated orchestration of all the instruments of national and multinational power is **unified action**. By shaping the conditions under which military forces must operate, engineer operations are a significant force multiplier for the joint force commander (JFC).

a. Within the context of the joint operational environment, engineer operations support the development of the battlespace for maneuver, enhance strategic and operational movement, and provide infrastructure for force projection. Engineer operations also provide support to logistic and sustainment operations (including environmental functions); create, update, and manage geospatial information, provide terrain visualization, construct protective fortifications, enhance quality of life, and prepare for termination operations and transition to posthostilities.

b. The JFC employs a broad mix of engineering capabilities to support the concept of operation. If the experiences of the Gulf War, Somalia, Haiti, Hurricane Andrew, and Bosnia are repeated in future military operations, engineer operations will include many Department of Defense (DOD) civilians, as well as the services of nongovernmental organizations (NGOs), private voluntary organizations (PVOs), international organizations (IOs), other US Government (USG) agencies, and contractors.

c. The total engineer force of military active and reserve, civilian, contractor, host nation (HN) and allies and coalition partners constitutes the primary resources commanders can draw upon to accomplish the engineer mission. Figure I-1 illustrates the role of engineers in unified action across the range of military operations as depicted in the universal joint task list.

2. Engineer Operations and the Principles of War

The nine principles of war guide warfighting at the strategic, operational, and tactical levels. The principles are the continuing foundation of joint doctrine. Engineer operations are an important combat

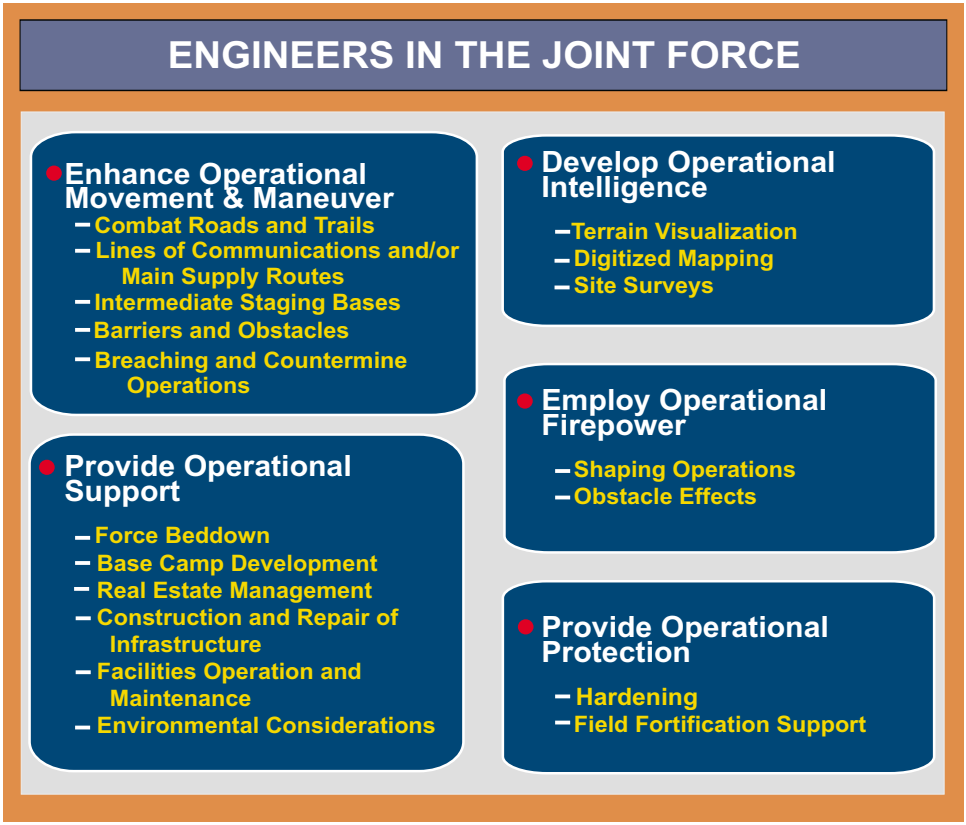

Figure I-1. Engineers in the Joint Force

multiplier for the JFC and enhance the ability to apply these principles to conduct joint operations.

a. **Objective. Direct every military mission toward a clearly defined, decisive, and attainable objective.** Commanders direct the use of available combat power toward clearly defined, attainable, and decisive goals. In joint operations, the joint force engineer develops an engineering estimate of supportability based on an analysis of how best to support the stated objectives and proposed courses of action (COAs). This analysis can greatly assist the JFC in accomplishing the assigned objectives during war and other contingency operations. The JFC then establishes the priorities and tasks for all engineer activities.

b. **Offensive. Seize, retain, and exploit the initiative.** Offensive action is the most effective and decisive way to attain a clearly defined common objective. Engineering operations enhance the mobility of the joint force to seize and hold the initiative while maintaining freedom of action to achieve decisive results.

c. **Mass. Concentrate the effects of combat power at the place and time to achieve decisive results.** Engineer operations enable the joint force to deploy and concentrate combat power by providing force projection infrastructure and shaping the battlespace without a loss of momentum.

d. **Economy of Force. Allocate minimum essential combat power to secondary**

efforts. Engineer forces must be judiciously employed and distributed on the battlefield. Allocating engineer resources to secondary missions such as limited attacks, defense, delays, deception, or even retrograde operations should be weighed against achieving mass elsewhere at the decisive point and time on the battlefield. Sometimes the most essential tasks to support the main effort include having engineers support secondary efforts to release combat power for the main effort. Because engineering resources are limited, JFCs should ensure that engineer operations concentrate on the most essential tasks in order to support the main effort.

e. **Maneuver. Place the enemy in a position of disadvantage through the flexible application of combat power.** Engineer operations support the JFC's scheme of maneuver by shaping the battlespace, e.g., enhancing mobility of friendly forces while degrading the mobility of enemy forces.

f. **Unity of Command. Ensure unity of effort under one responsible commander for every objective.** Engineers at all levels must ensure that their units are fully integrated into the joint force. Engineer operations require precise integration and synchronization to achieve the desired effects.

g. **Security. Never permit the enemy to acquire unexpected advantage.** Protection — a dynamic of combat power — enhances the fighting potential of a force so that the commander can apply it at the decisive time and place. Engineers play a major role in support of force protection, e.g., facility hardening, field fortification support, camouflage, concealment, and deception.

h. **Surprise. Strike at a time or a place or in a manner for which the enemy is unprepared.** Engineer operations supporting mobility and countermobility are designed to support the principle of surprise. Engineers provide the mobility to strike the enemy rapidly before they can react. Engineers also plan and execute obstacles to disrupt the enemy's tempo and freedom of maneuver.

i. **Simplicity. Prepare clear, uncomplicated plans and concise orders to ensure thorough understanding.** Engineer planners maintain simplicity by ensuring that task organizations and responsibilities allow for smooth transitions. Units are provided clear, concise mission taskings with maximum opportunity for centralized planning and decentralized execution.

3. Engineer Battlespace Functions

Engineer operations assist the joint force in achieving the assigned objectives and end state through three functions: combat engineering (mobility, countermobility, and survivability), general engineering, and topographic engineering (see Figure I-2). In concert with other elements of the joint force, these functions serve to shape the battlespace in which the joint force will operate.

a. **Combat Engineering.** The components of combat engineering are mobility, countermobility, and survivability.

- **Mobility.** Mobility is a quality and/or capability that enables the JFC to freely maneuver the joint force into advantageous positions. As a component of combat engineering, mobility encompasses operations ranging from countermine operations to the construction of combat roads and trails.

- **Countermobility.** Countermobility is the construction of obstacles designed to block, fix, turn, or disrupt the enemy force. These operations attack the enemy's ability to maneuver, adding depth in terms of space and time to the joint force operation. Joint Publication (JP) 3-15, *Joint Doctrine for Barriers,*

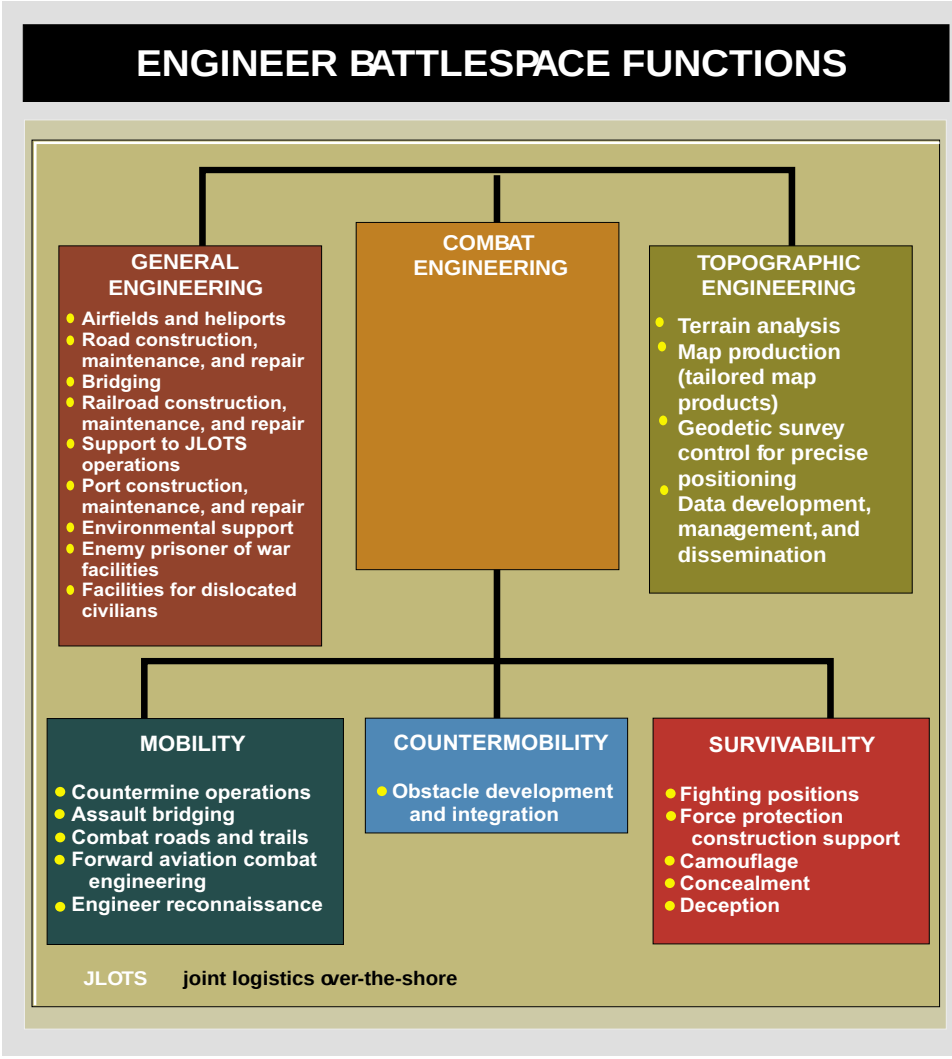

Figure I-2. Engineer Battlespace Functions

Obstacles, and Mine Warfare, identifies many specific operations available to the joint force to hinder the enemy's ability to maneuver. Countermobility tasks range in complexity from the emplacement of a minefield obstacle by sappers to the destruction of an enemy main supply route (MSR) through airpower.

- **Survivability.** Survivability includes all aspects of protecting personnel, equipment, and supplies throughout the operational area while simultaneously deceiving the enemy of the intentions of the joint force. Survivability operations range from employing camouflage, concealment, and deception to the hardening of facilities, command and control (C2) nodes, and critical infrastructure.

b. **General Engineering.** General engineering encompasses the construction and repair of lines of communications (LOCs), MSRs, airfields, utility systems, and logistic

Army "sappers" conduct breaching operations.

facilities to support joint military operations, and may be performed in direct support of combat operations such as battle damage repair. Facilities are fundamental to the success of force projection and the conduct of joint operations and play a critical role in shaping the theater battlespace and infrastructure to support the joint force. When facilities and real estate can be obtained through host-nation support (HNS), commercial leases, or through international agreements (e.g., status-of-forces agreements (SOFAs)), facilities acquisition and real estate management become an important component of general engineering for the JFC.

For further information on general engineering, see JP 4-04, Joint Doctrine for Civil Engineering Support.

c. **Topographic Engineering.** Topographic engineering support is provided based on requirements that are determined and validated by the geospatial information and services (GI&S) officer. Topographic engineering encompasses those tasks that provide geospatial information and services to commanders and staffs across the full range of military operations. Topographic engineering provides terrain analysis, terrain visualization, digitized terrain products, nonstandard map products, and baseline survey data, all of which contribute to a common operational picture within the joint force. The National Imagery and Mapping Agency (NIMA) digitizes and provides units with digital terrain and feature data. The topographic engineer can customize the standard NIMA products to meet particular operational requirements. This support is developed and provided during all phases of an operation throughout the theater in accordance with JP 2-03, *Joint Tactics, Techniques, and Procedures for Geospatial Information and Services Support to Joint Operations*.

4. Capabilities

a. **Military Capabilities.** Each Service has engineering units and capabilities to meet specific operational needs. The engineering capabilities of each Service component are rarely a perfect match to meet all joint force mission requirements. The JFC, with the assistance of the joint force engineer, must analyze mission requirements in order to determine optimal force tailoring to accomplish the mission.

- **Army Engineers.** Army engineers provide a full range of engineering

Marine engineers performing road and bridge construction.

capabilities to the JFC. The US Army maintains forces that have the capability to perform most operations within the engineer battlespace functions (combat, general, and topographic engineering). Generally, engineer units at the division level and below focus on mobility tasks with limited capability to conduct countermobility and survivability operations. Engineers at corps level and above reinforce the combat engineering capability within the division as well as retain various construction units that perform general engineering operations. Topographic engineering capabilities or access to special topographic products exist at brigade level and higher.

- **Navy Engineers.** Navy engineers have rapidly deployable units of various sizes and configurations. These units provide advanced base construction, battle damage repair, underwater and amphibious construction, and logistic facilities construction. Navy engineer units are tailorable to provide effective and efficient construction to enhance force sustainability for the JFC.

- **Marine Corps Engineers.** The US Marine Corps maintains engineer forces that perform combat engineering (mobility, countermobility, and survivability) and general engineering (e.g., expeditionary airfield construction, bulk petroleum operations, bulk water production, MSR improvements) to support Marine air-ground task forces (MAGTFs) across the range of military operations.

- **Air Force Engineers.** The Air Force maintains engineer forces organized as Prime Base Engineer Emergency Force (Prime BEEF) or RED HORSE units. These units provide support across the range of military operations. Capabilities include airfield construction, maintenance, repair, and sustainment operations, and other specialized functions such as explosive ordnance disposal (EOD), fire, and limited nuclear, biological, and chemical (NBC) detection and response capability. These units have limited combat engineering capabilities available to focus on the defense of deployed forces and base denial. Air Force engineering units can deploy either as part of an air expeditionary force (AEF) or as detached units operating in support of specific missions and operational taskings.

Air Force civil engineers engaged in base recovery training operations.

- **Construction Contracting.** The US Army Corps of Engineers (USACE) and the Naval Facilities Engineering Command (NAVFACENGCOM) also provide to the JFC a significant engineering capability to be leveraged in joint operations. USACE and NAVFACENGCOM are the Department of Defense's principal engineer organizations to plan, design, construct, and acquire (lease or buy) facilities and real estate. The Air Force also maintains limited capability in contract construction in contingencies, and facility and real estate acquisition in England, Turkey, Spain, and Israel. Inherent in their mission support capabilities is a planning and engineering capability for theater advanced base and infrastructure development. These organizations also maintain associated in-depth expertise in engineering research and development. Commanders of combatant commands (CINCs) may use USACE and NAVFACENGCOM to provide technical engineering assistance and as contingency contract construction agents (CCAs) for design and award of construction contracts in support of military operations.

b. **Other Capabilities.** In addition to US military engineering forces, the HN may have certain engineering capabilities specifically adapted to the local environment. Contractors and allied and coalition partner military engineers can provide valuable capabilities in an immature theater. This mixture of capabilities may change during the phases of an operation; therefore, they may require management across Service lines to ensure that the JFC has appropriate forces in place to conduct the mission. Due to their wide variety of expertise and funding resources, interagency organizations have capabilities that can be leveraged to support the joint force. Although they increase the resources engaged in a given operation, they also significantly increase and complicate the coordination necessary.

Specific Service capabilities are outlined in Appendix A, "Engineer Organizations," JP 3-33, Joint Force Capabilities*, and JP 4-04,* Joint Doctrine for Civil Engineering Support.

See JP 4-04, Joint Doctrine for Civil Engineering Support*, for information on specific engineering capabilities of governmental organizations, NGOs, PVOs, IOs, and contractors.*

For details on working with nonmilitary agencies, see JP 3-08, Interagency Coordination During Joint Operations.

5. Decisive Operations at Lower Costs

Engineering preparation of the battlespace sets the stage for subsequent decisive operations and provides to the JFC the potential to reduce the cost of achieving the desired operational and strategic end state (see Figure I-3). Specifically, adequate engineer preparation can **preserve US and allied resources** by capitalizing on existing infrastructure and constructing only those facilities critical to the operation. Expanding facilities and infrastructure capabilities at seaports of debarkation (SPOD) and aerial ports of debarkation (APOD) as well as improving MSRs for onward movement and integration of forces, equipment, and materiel will **facilitate logistic support and force buildup**. Engineer preparation can **minimize force footprints** through contingency contracting, e.g., the Army's Logistics Civilian Augmentation Program (LOGCAP), the Navy's Construction Capabilities Contract (CONCAP), and the Air Force Contract Augmentation Program (AFCAP), and real estate management activities for land and/or facility leases. Identifying intermediate staging bases (ISBs), making necessary improvements to LOCs and/or MSRs, and constructing combat roads and trails to facilitate throughput of forces will **ensure that needed resources are available for campaign execution**. Hardening of mission-critical facilities and construction of other field fortification support such as physical perimeter defense measures will **enhance force protection**. Engineer preparation will help **expedite decisive operations** by improving the JFC's situational awareness with expertise on barriers and obstacles, breaching and countermine operations, topographic support (e.g., terrain visualization, mapping and site surveys) and assisting the joint force Operations Directorate (J-3) with shaping operations on how best to employ operational firepower in order to limit damage to facilities potentially required for subsequent operations. Effective engineer preparation of the battlespace can also **support war termination and/or transition operations** by providing emergency repairs to utilities and infrastructure and enabling a smooth transition to follow-on forces, interagency organizations, and the HN.

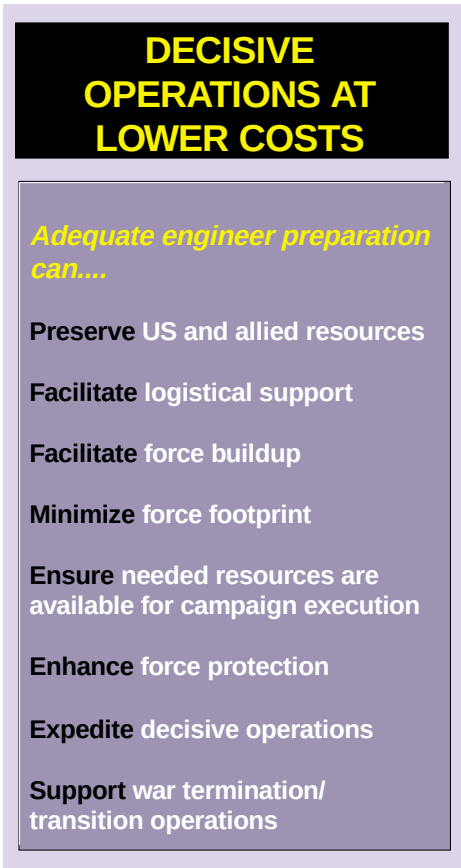

Figure I-3. Decisive Operations at Lower Costs

6. Conclusion

Engineering operations support the joint force via the engineer battlespace functions of combat, general, and topographic engineering. Through these functions, engineers are significant force multipliers for the JFC as they shape the battlespace by creating and improving necessary infrastructure. Topographic engineering

provides analysis and visualization of the terrain within the operational area that enhances the common operational picture. Engineer units of each Service maintain critical capabilities within each of the battlespace functions that may be combined or leveraged to support the joint force. Typically, in-theater engineering support requirements may exceed available engineering resources; therefore, it is essential that the proper combination of joint, contractor, and host and allied nation engineering capabilities is leveraged to most effectively assign tasks and meet the JFC's objectives.

ENGINEER SUPPORT BATTALIONS IN ACTION

(Marine Brigadier) General Krulak at the Direct Support Command dispatched an engineering team . . . to the west and north of Kibrit (Saudi Arabia) to begin surveying sites. He also placed all the command's earthmoving equipment on alert. As soon as General Boomer settled on the new breach plan, about 1130 on 6 February, he gave Krulak the go-ahead to build the new combat service support area. Within minutes, the 7th and 8th Engineer Support Battalions (REIN) departed Kibrit . . . The battalions' many feats of construction over the next 14 days included 38 kilometers of blastwall berm, which contained, among other things, the Marine Corps' largest-ever ammunition supply point, 151 cells in 768 acres; a 5,000,000 gallon fuel farm; and a naval hospital with 14 operating rooms. The complex also included two 5,700-foot dirt airstrips capable of handling C-130 transports.

SOURCE: ***US Marines in the Persian Gulf, 1990-1991***

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CHAPTER II
COMMAND AND CONTROL

"Warfare will continue to evolve and command and control processes, organization, and supporting systems will continue to change, but the basic concept of command and control will remain the key . . . More than ever before, a command and control system is crucial to success . . . ."

Fleet Marine Force Manual 3, *Command and Control*

1. Organization

JFCs organize joint forces to best accomplish the assigned mission based upon their concept of operations. The organization developed should be sufficiently flexible to meet the planned phases of the contemplated operation. JP 0-2, *Unified Action Armed Forces (UNAAF)*, states that JFCs may also conduct operations through the Service component commanders, or at lower echelons through Service force commanders. In addition, JFCs may establish functional component commands to conduct operations. These functional component commands may be appropriate when forces from two or more Military Services must operate in the same dimension or medium, or to accomplish a distinct aspect of the assigned mission. Most often, however, joint forces are organized with a combination of Service and functional component commands with operational responsibilities. The JFC's engineer organization must consider how best to achieve unity of effort, centralized planning, and decentralized execution for assigned engineer forces. Simplicity and clarity of command relationships of the engineer organization are paramount to the effective and efficient use of engineer forces due to the varied nature of engineer tasks, units, and capabilities.

Joint command relationships are discussed in detail in JP 0-2, Unified Action Armed Forces (UNAAF).

2. Command and Control Options

The JFC organizes assigned forces to most effectively use available resources. Engineering forces are extremely adaptable and can be tailored to best meet mission requirements. Therefore, the different options presented in this chapter for C2, derived from lessons learned, are designed to take advantage of this flexibility. In addition, the structure that is developed is likely to change as the operation matures. Possible organizational structures are depicted in Figure II-1.

a. **Service Component Command.** Under this organizational option, Service component commanders normally maintain operational control (OPCON) over their Service engineer forces. This concept is illustrated in the top portion of Figure II-1. This structure maintains traditional command relationships and is best used when the JFC chooses to conduct operations through the Service component commanders and engineer forces are used in direct support of Service component missions. A Service component command may be delegated tactical control (TACON) of engineer forces of another Service in order to accomplish assigned missions or tasks. In addition, the JFC may establish support relationships between subordinate commanders to aid, protect, complement, or sustain another force. Navy engineer forces may be attached OPCON to

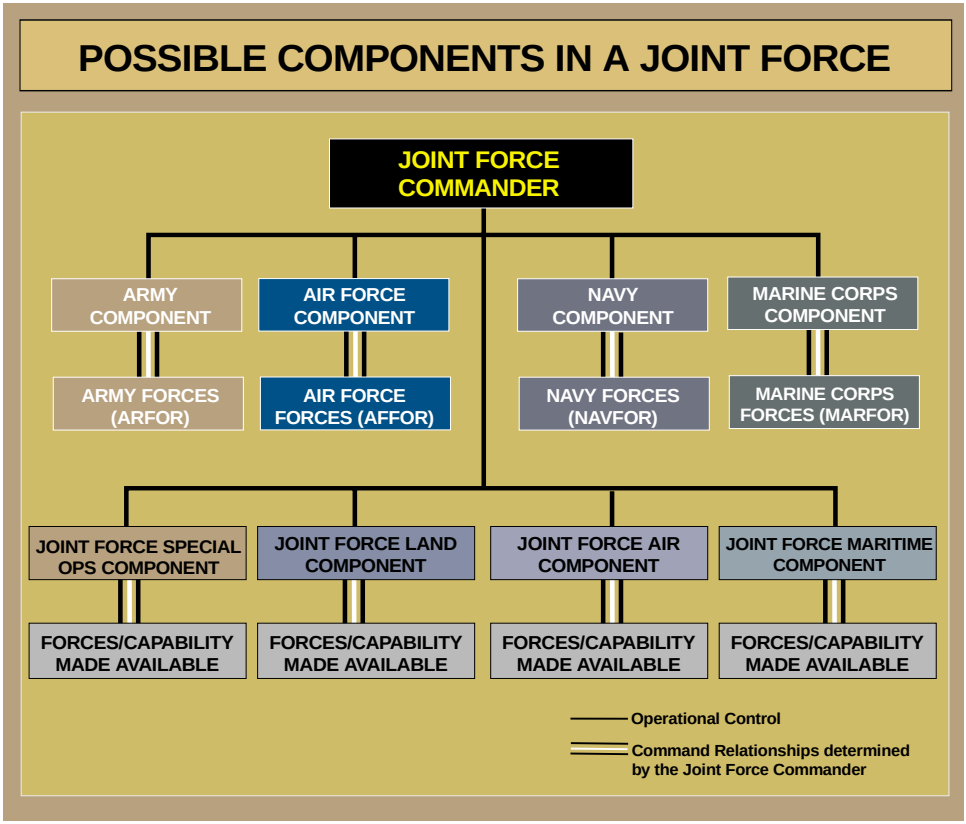


Figure II-1. Possible Components in a Joint Force

the Marine component commander for engineer support.

b. **Functional Component Command.** The JFC may also organize to accomplish the mission using one or more functional component commands. This concept is illustrated in the lower portion of Figure II-1. Using this organization, the JFC establishes command relationships for engineer forces based on the requirement for engineer missions. The JFC is responsible for establishing appropriate relationships between components to accomplish required tasks. For example, Air Force or Navy engineers may be attached TACON to the joint force land component commander. In this case, engineer units may be controlled by a component other than their own Service and respond directly to the supported component's requirements. Use of general engineering forces either in direct support 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 will not normally be responsible for providing common logistic support (e.g., beddown construction) to the joint force. When the joint force air component commander (JFACC) does not have engineer forces assigned, the JFACC will coordinate for this support through the component forces. Similarly, when the joint force special operations component commander (JFSOCC) does not have engineer forces assigned, the JFSOCC will also coordinate through the component forces for engineer support requirements.

c. **Subordinate Joint Task Force.** Some joint force operations are extremely engineer-intensive, requiring numerous engineer assets

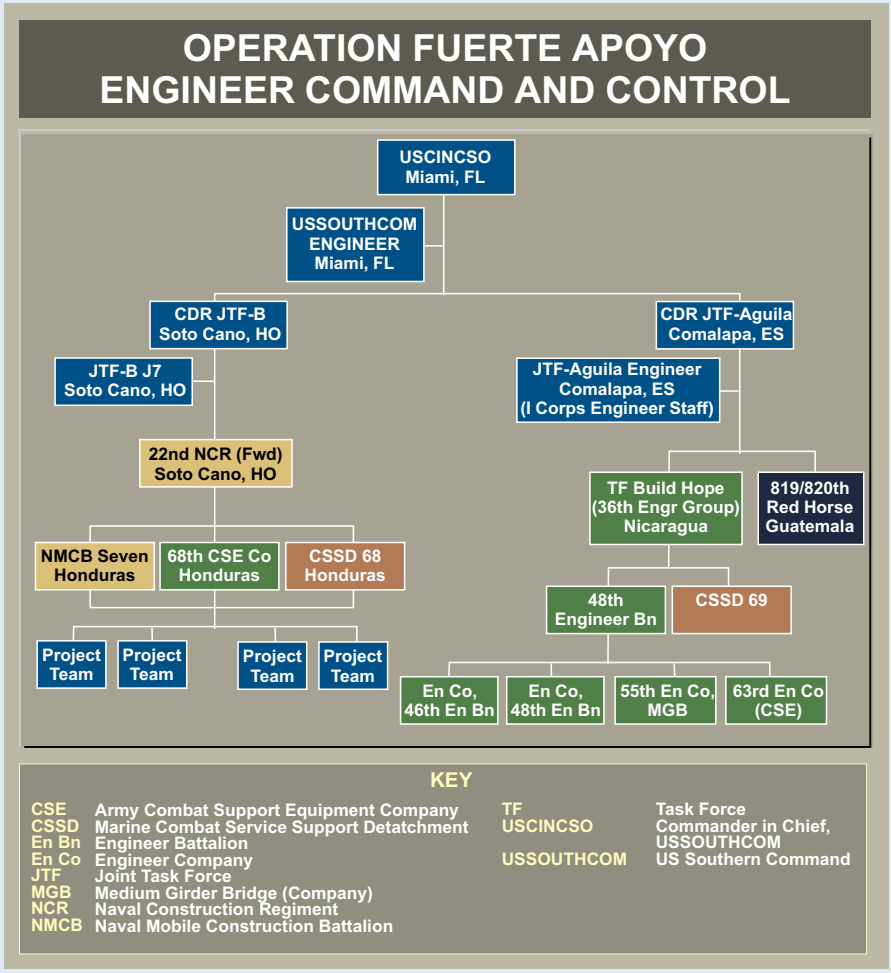
to complete a multitude of tasks required to accomplish the mission. To consolidate requirements and better orchestrate forces, the JFC may opt to establish a subordinate joint task force (JTF) to control extensive engineer operations and/or missions. This option provides a coordinated approach to address engineer responsibilities. The JFC designates the military engineer capabilities that will be made available for tasking and the appropriate command relationships. Engineer forces could be attached OPCON, TACON, or in a supporting relationship, 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 engineer assets from the various Services. If the subordinate JTF is to provide a common support capability, it will require a specific delegation of directive authority from the combatant commander for the common support capability that is to be provided.

OPERATION FUERTE APOYO ENGINEER COMMAND AND CONTROL

In late October 1998, Hurricane Mitch slammed into Central America, severely affecting the region from Costa Rica to Southern Mexico. High winds and excessive rain caused wide scale flooding, landslides, and destruction to regional infrastructure. Bridges and roads were washed out, leaving large areas and populations isolated and unreachable except by helicopter. Housing was destroyed, leaving an estimated two million people homeless. Honduras and Nicaragua were the most heavily impacted, with El Salvador and Guatemala also receiving heavy infrastructure damage.

USCINCSOUTH's mission was to employ multiple JTFs to conduct disaster relief operations in support of US relief efforts in the Central American region in order to mitigate near-term human suffering and accelerate long-term regional recovery. The combatant commander decided to employ two ground based, task organized joint task forces (JTFs) to support disaster relief operations. The first was JTF-Bravo, already on the ground and operating from Soto Cano Air Base, Honduras. JTF-Bravo was reinforced with aviation, engineering, and medical elements and was responsible for disaster relief and humanitarian assistance (DR/HA) operations in Honduras. The second, JTF Aguila, was built around an Army Corps Support Group headquarters, augmented by engineering and medical units, and based at the international airport in El Salvador. JTF Aguila was responsible for DR/HA operations in El Salvador, Nicaragua, and Guatemala.

Priority of effort for the engineers focused on emergency repair of critical lines of communication, repair of critical infrastructure nodes, and then key humanitarian civic assistance projects. Developing an effective command and control structure for the engineering units was a significant challenge due to the extensive engineering effort required over four countries. Where there was an established joint headquarters (JTF-Bravo in Honduras), forces were needed quickly to give JTF-Bravo immediate engineering capability. Consideration was given to units that could deploy to Honduras the fastest since Honduras was the most devastated country and was designated as the highest priority for disaster relief. In this instance, the units were a Navy construction engineer (SEABEE) air detachment followed by the remainder of the SEABEE battalion, an Army combat support equipment company (CSE),



and a Marine combat service support detachment (CSSD) which included a bridge platoon and water purification units. All US military engineers in Honduras worked for JTF-Bravo, with its existing small J-7 engineer staff. As the forces began to flow in, JTF-Bravo requested US Southern Command (USSOUTHCOM) to either augment their staff or send a headquarters element to provide command and control of the engineer forces. USSOUTHCOM identified the requirement to the US Atlantic Command, and The Commander in Chief, Atlantic Fleet was tasked to form a naval construction regiment (NCR) headquarters element. The naval mobile construction battalion commander assumed the duties as the NCR commander. As the forces were drawn down and the SEABEE battalion was redeployed, the NCR was stood down as well and overall control of the remaining engineer forces (Marine bridge platoon, water purification units, and the Army CSE Company) was given to the Marine CSSD. JTF-Bravo was also required to provide command and control of all disaster relief forces in Central America until the new task force, JTF Aguila, was stood up. This consisted primarily of assessment teams in Nicaragua, El Salvador, and Guatemala.

A different approach was taken for JTF Aguila, which was newly established in El Salvador to provide command and control for the efforts in a joint operations area (JOA) that included Guatemala, Nicaragua, and El Salvador. Since this JTF was being created from scratch, there was much more concern about providing sufficient command and control of the engineer forces, so an engineer group headquarters was requested to take control of the engineer forces being assigned to the JTF. The engineer group ended up with an Army combat heavy engineer battalion, an Air Force RED HORSE squadron, an Army medium girder bridge (MGB) Company, an Army CSE Company, and water purification units assigned to the JTF. It was anticipated that the engineer group headquarters would be used to maintain command and control of all engineer effort in the JOA, while the combat heavy battalion and RED HORSE squadron, which initially deployed to Nicaragua and Guatemala respectively, would be assigned to subordinate task forces. The JTF commander did not organize his forces that way. Because operations and missions were organized by country, with the bulk of the effort in Nicaragua, the JTF Aguila commander decided to further organize all his engineer forces into subordinate task forces. He retained his own small engineer staff element, which was a cell from the Army's I Corps staff, established the RED HORSE squadron in Guatemala as the nucleus of a task force in Guatemala, and used the 36th Engineer Group as the subordinate task force headquarters for the main effort in Nicaragua. In both cases, the engineer unit headquarters, with some augmentation, formed the nucleus of task forces that included medical, aviation, and other combat support and combat service support elements.

SOURCE: USSOUTHCOM Engineer Staff
March 1999

d. **Command, Control, Communications, and Computers (C4) Support for Engineer Forces.** How engineer forces will be supported with C4 systems for effective C2 is an essential consideration for the JFC and the joint force engineer. Engineer forces have organic C4 capabilities within Service channels up to their component headquarters. When operating in a joint environment, engineer units retain their organic C4 capabilities, but may also require additional support from their Service component, other Service components, or the joint force C4 Systems Directorate. Specific C4 requirements will depend on the C2 arrangement of the engineer forces within the joint force, mission tasking, and geographic location in the operational area. The following description of capabilities may be helpful in developing the C4 concept for engineer forces supporting the joint force.

- Air Force engineer forces' C4 requirements beyond unit level capability are provided by deployed installation communications elements. These communications elements are embodied in the Base Information Infrastructure (BII). Developed as part of the Air Force's Expeditionary Aerospace Force concept, BII packages are scalable, modular communications support packages that offer deployed personnel access to such standard services as secure and unsecure telephones/facsimiles, Unclassified but Sensitive Internet Protocol Router Network (NIPRNET) and/or SECRET Internet Protocol Router Network (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 Global Command and Control System (GCCS), Joint Operation Planning and Execution System (JOPES), and other intelligence, surveillance, and reconnaissance systems necessary for mission planning and operations.

- Army engineers use the Army GCCS (GCCS-A) at corps level and above, and the Army Battle Command System (ABCS) at corps and below. The Maneuver Control System, a sub-function of the ABCS, is used down to the divisional battalion level to accomplish C2. At the brigade level and below, Army engineers rely on organic communication assets that include encrypted frequency modulation, satellite, facsimile, phone and digitized tactical e-mail. When operating in a joint force, Army engineers rely on organic communications capability. The GCCS-A affords engineers access to JOPES and the ability to communicate with the JFC's headquarters and other elements of the joint force.

- Naval Construction Force (NCF) engineers have sufficient capability to perform all internal C4 operations and to communicate with subordinate, adjacent, and higher headquarters. Naval construction regiments can maintain voice communications with subordinate units and higher authority by telephone, very high frequency (VHF), high frequency (HF), and limited ultra high frequency (UHF). They can transmit data and achieve limited NIPRNET and SIPRNET access via UHF or satellite phone. Battalion level units have internal client and/or server tactical data network computer systems and can transmit information and achieve limited NIPRNET and SIPRNET connectivity via UHF or satellite phone. When operating in a joint force, NCF engineers rely on organic communications capability but may also require additional support.

- Marine Corps engineers have sufficient capability to perform all internal C4 operations and to communicate with subordinate, adjacent, and higher headquarters at the division level and below. Marine Corps engineer units can maintain voice communications with subordinate units and higher authority by secure telephone, VHF, HF, and limited UHF. They can transmit data and achieve limited NIPRNET and SIPRNET access via UHF satellite communications. Marine Corps engineers have access to the GCCS at the Marine expeditionary force (MEF) level and above. When operating in a joint force, Marine Corps engineers rely on organic communications capability but may also require additional support.

3. Engineer Staff

The JFC should establish a joint force engineer staff for engineering matters. When a functional component command employs forces from more than one Service, the staff should reflect each Service represented. Because of the engineering requirements through all phases of operations across the battlespace, the joint force engineer should have an understanding of the commander's intent. The engineer staff coordinates combat engineering, general engineering, and topographic engineering (with the GI&S officer) requirements needed to ensure joint force mission success. The engineer staff is not only responsible for facilities, real estate, and environmental considerations, but is also responsible for support to planning, operations, intelligence, and special functions as discussed below. A notional engineer staff is depicted in Figure II-2, and key engineer staff functions are noted in Figure II-3.

a. **Plans.** The engineer staff participates in the planning process through representation on the joint planning staff (e.g., Plans Directorate, joint planning group). The engineer planner addresses all potential engineer requirements during the planning process.

b. **Operations.** The engineer staff monitors the deployment, employment, mission, and redeployment status of major subordinate Service component engineer forces. The primary focus of engineer operations is to achieve the commander's intent through combat engineering, general engineering, and topographic engineering operations. The engineer staff works directly with the operations staff (e.g., representation in the Joint Operations Center). It provides engineer representation on the Joint Targeting Coordination Board (JTCB) to prevent destruction of key infrastructure essential to future operations and provides guidance on emplacing obstacles, barriers, and mines.

See JP 3-0, Doctrine for Joint Operations, *JP 2-01.1,* Joint Tactics, Techniques, and Procedures for Intelligence Support to Targeting, *and JP 3-35,* Joint Doctrine for Deployment and Redeployment Operations, *for details.*

c. **Intelligence.** Throughout the intelligence cycle, the engineer staff assists the Intelligence Directorate (J-2) in coordinating intelligence requirements and providing geospatial products 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, and joint force legal staffs should coordinate for the use of

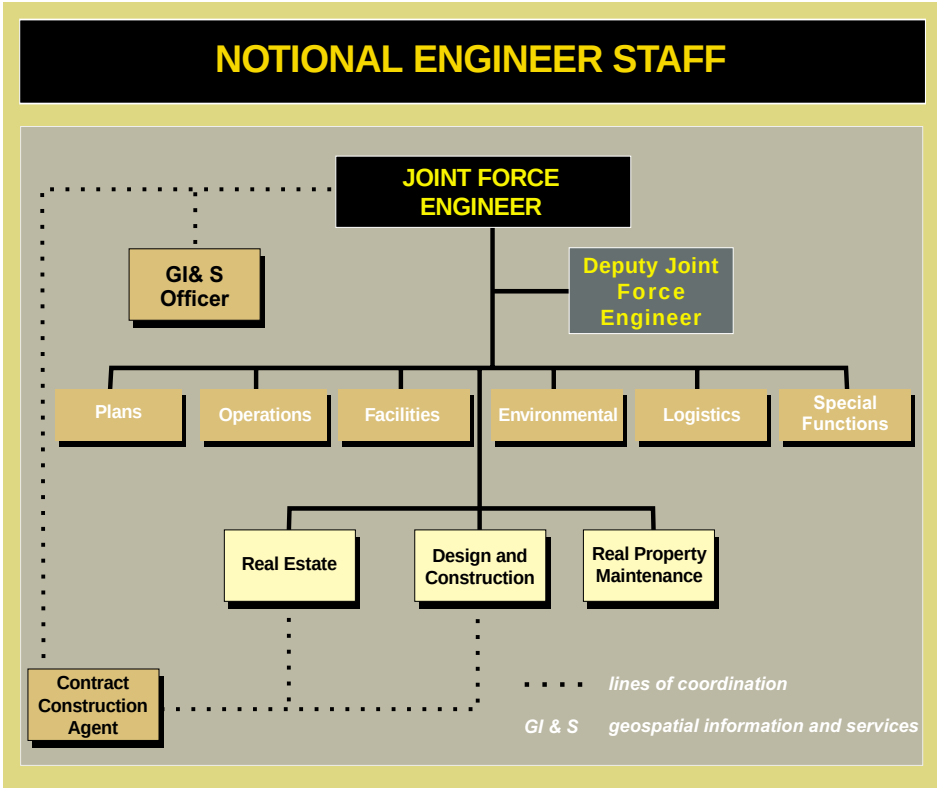


Figure II-2. Notional Engineer Staff

ENGINEER STAFF FUNCTIONS

- Develops and coordinates combat engineering, general engineering, and topographic 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 Civil Engineering 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.
- Coordinates topographic engineering requirements with the geospatial information and services officer.
- Plans and provides guidance for environmental considerations that may impact joint operations.

Figure II-3. Engineer Staff Functions

intelligence from both classified and open sources in addressing environmental considerations and considering potential collateral damage associated with targeting. *See Chapter III, "Planning," for additional information on engineer intelligence requirements and environmental considerations. See JP 2-0,* Doctrine for

Intelligence Support to Joint Operations, *JP 2-03*, Joint Tactics, Techniques, and Procedures for Geospatial Information and Services Support to Joint Operations, *and JP 3-60*, Doctrine for Joint Targeting, *for information on the intelligence cycle.*

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

- Topographic engineering support;
- EOD;
- Fire protection; and
- Support to NBC monitoring, reporting, decontamination, and recovery operations within Service limitations.

"A properly functioning staff extends the eyes, ears, and will of a commander by learning the commander's policies and working within them; keeping the commander informed of pertinent information; developing basic decisions into adequate plans; anticipating future needs and drafting tentative plans to meet them; translating plans into orders; transmitting orders to subordinate commands; ensuring compliance with these orders through constructive inspection and observation; and supplementing the commander's efforts to ensure unity of effort throughout the command."

***The Joint Staff Officer's Guide*, 1997**

4. Staff Placement Options

The JFC develops the staff based on mission requirements. The range of military operations in the modern battlespace requires that the JFC have a full understanding and visibility of the multitude of available capabilities. Regardless of the option or hybrid of options, the requirement for the staff engineer remains, as does the need for constant communication, liaison, and coordination throughout the entire staff. Inherent in the three following options, the combatant commander or subordinate JFC may establish a contingency engineering management organization when extensive coordination and project management are necessary. When established, the contingency engineering management organization is led by the combatant command or 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 the clearinghouse for engineering plans, reports, and external coordination. The contingency engineering management organization directly interfaces with the component engineer staffs and JFC. In handling topographic engineering requirements, the JFC may choose to organize topographic engineers within the J-2 staff.

See paragraph 6 of this chapter for additional information on contingency engineering management organizations.

a. **Special Staff.** When the engineer effort is a significant focus of the operation, the JFC may establish an engineer special staff element that reports directly to the JFC. This special staff option provides the greatest flexibility in orchestrating diverse engineer operations and allows for the greatest visibility of engineer capabilities, requirements, and responsibilities throughout the staff.

b. **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 to coordinate combat engineering requirements. During these operations, this option will provide the fastest exchange of information during crisis action planning and optimize the use of supporting capabilities.

c. **Logistics Directorate (J-4) Staff.** When the engineer effort predominantly supports force sustainment, engineer issues tend to revolve around missions that support logistic operations. During these operations the JFC may be best served by placing the engineer staff or cell as an element under the J-4 to facilitate the planning and coordination of these requirements.

5. Engineer Boards

Boards serve as the forum to address issues outside of daily operation and to ensure coordination at the leadership level. In the engineer arena, three typical boards are the Joint Facilities Utilization Board (JFUB), Joint Civil-Military Engineering Board (JCMEB), and Joint Environmental Management Board (JEMB). All three boards meet as necessary to address specific topics.

JP 4-04, Joint Doctrine for Civil Engineering Support, *provides additional information.*

a. **Joint Facilities Utilization Board.** The geographic combatant commander or subordinate JFC may establish a JFUB to assist in managing facilities. The JFUB is chaired by the combatant command or subordinate joint force J-4 or engineer, with members from the joint staff as required, components, and any other required special activities (e.g., legal and civil affairs). 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 JCMEB. Most of the JFUB's work is handled by the joint force engineer with assistance from other selected board members. Unresolved issues are forwarded to the JCMEB. The JFUB also provides administrative support and functions as the executive agency for the taskings of the JCMEB.

b. **Joint Civil-Military Engineering Board.** The JCMEB is a temporary board, activated by the geographic combatant commander, chaired by the combatant command J-4 or engineer, and staffed by personnel from the components and DOD agencies or activities in support of the combatant command. The JCMEB establishes policies, procedures, priorities, and overall direction for civil-military construction and engineering requirements in the theater. The board gauges mission impact from engineering activities and recommends actions as needed. A primary concern of the board is to deconflict requirements between the military and civilian portions of a joint operation. The JCMEB arbitrates issues referred to it by the JFUB. The JCMEB will coordinate its activities with the combatant command's engineering staff. Construction and engineering requirements that the JCMEB cannot satisfy from within the joint force resources will be elevated to the next appropriate level for support. The JCMEB also provides guidance on development of the Civil Engineer Support Plan (CESP) to an operation plan (OPLAN) and/or operation order (OPORD) and, if appropriate, assumes responsibility for preparation of the CESP.

See Chapter III, "Planning," subparagraph 2c for information on the CESP.

c. **Joint Environmental Management Board.** The geographic combatant commander or subordinate JFC may establish a JEMB to assist in managing environmental requirements. The JEMB is a temporary board, chaired by the combatant command or subordinate joint force J-4 or engineer, with members from the joint staff (as required), components, and any other required special

activities (e.g., legal, medical, and civil affairs). The board establishes policies, procedures, priorities, and the overall direction for environmental management requirements in the operational area. The JEMB will coordinate its activities with the combatant command or subordinate joint force engineering staff. The JEMB also provides guidance on development of Annex L, "Environmental Considerations," to an OPLAN or OPORD and, if appropriate, assumes responsibility for preparation of this annex.

See Chapter III, "Planning," subparagraph 2c and 3m for additional information on Annex L, "Environmental Considerations."

6. Contingency Engineering Management Organizations

Experiences in recent contingency operations have emphasized the importance of timely planning and preparation in providing essential engineer support requirements to the joint force. Combatant command and subordinate joint force engineer organizations should be tailored and trained in peacetime for operations across the range of military operations. The combatant commander or subordinate JFC may form a contingency engineering management organization as an option to augment the joint force staff, providing additional Service engineering expertise to support both deliberate and crisis action planning and provide construction management in contingency and wartime operations. The combatant commander may form a theater contingency engineering management (TCEM) cell, and similar organizations may be formed at subordinate levels of command (e.g., regional contingency engineering management (RCEM) cell and/or joint task force contingency engineering management (JTFCEM) cell). These contingency engineering management organizations should be staffed with expertise across the three engineer battlespace functions; combat engineering, general engineering, and topographic engineering. Service component engineer personnel should be assigned to these contingency engineering management organizations to facilitate coordination. The TCEM, RCEM, and JTFCEM organizations support OPLAN and CESP development as well as management of contingency engineering operations.

See JP 4-04, Joint Doctrine for Civil Engineering Support, *for detailed information on contingency engineering management organizations and concepts.*

7. Conclusion

The JFC establishes command and staff relationships to meet the demands of the mission. The options presented in this chapter are not all-inclusive, but provide a framework for understanding the responsibilities of the engineer staff and its relationships within joint commands. Regardless of the mission, command relationship, or placement of the engineer staff within the joint force staff, the JFC should organize the engineer forces to ensure unity of effort, centralized planning, and decentralized execution of engineer tasks to support mission requirements.

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CHAPTER III
PLANNING

"No one starts a war — or rather no one in his senses ought to do so — without first being clear in his mind what he intends to achieve in that war and how he intends to conduct it."

Major General Carl von Clausewitz
***On War*, 1832**

1. Strategic, Operational, and Tactical Planning

The challenges of planning successful engineer operations in support of joint operations within diverse theaters are vast and varied (see Figure III-1). The engineer staff must be involved in planning from the initial stage of the process. Understanding how engineers affect air, land, and maritime operations equips the planner with the background to form a comprehensive plan of engineer actions. This universal application of engineers is crucial at all levels of war. The

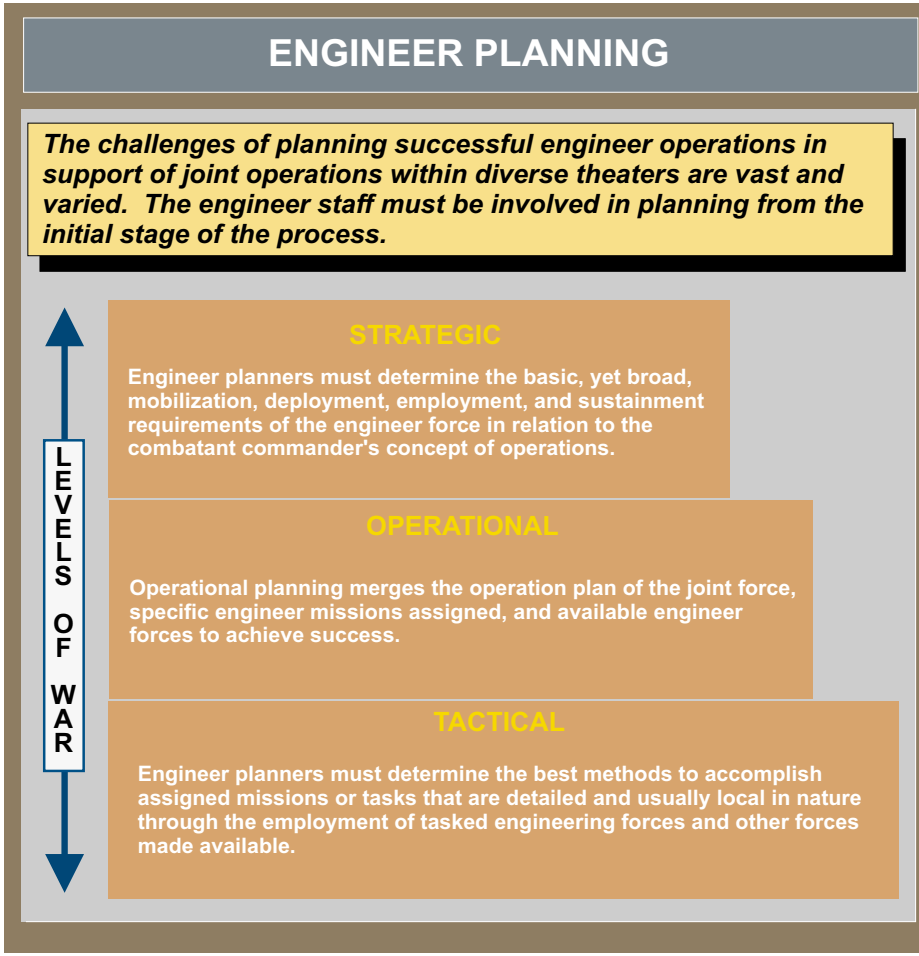

Figure III-1. Engineer Planning

omission of engineer considerations in any phase of an operation may adversely impact the entire plan.

a. **Strategic and Operational Planning.** The combatant commander's engineer planning concepts focus on the relationship of geography and force-projection infrastructure to the concept of operations. Engineer planners must determine the basic yet broad mobilization, deployment, employment, and sustainment requirements of the combatant commander's concept of operations. Operational planning merges the OPLAN of the joint force, specific engineer missions assigned, and available engineer forces to achieve success.

b. **Tactical Planning.** Tactical planning is normally accomplished by the commanders or planners of the unit or units specified to accomplish the task or mission. The Service components can also accomplish tactical planning. Engineer planners must determine the best methods to accomplish assigned missions or tasks that are detailed and usually local in nature through the employment of tasked engineering forces and other forces made available. The JFC should ensure that engineering forces are placed properly in this arrangement and employed to influence the joint force battlespace.

2. The Planning Process

The particular procedures used in joint planning depend on the time available to accomplish them. Engineering considerations are similar for both deliberate and crisis action planning. Engineering considerations in the deliberate planning steps encompass the same engineering considerations in the crisis action planning steps. A correlation of the crisis action planning steps is provided after each deliberate planning step. Engineer considerations are outlined in the following phases of the deliberate planning process.

The different methods of planning are described in JP 5-0, Doctrine for Planning Joint Operations, *and JP 5-00.2,* Joint Task Force Planning Guidance and Procedures.

a. **Initiation (Situation Development, Crisis Assessment, and COA Development).** During this phase, the joint force engineer assembles the resources required to support mission analysis and COA development tasks for the concept development phase.

b. **Concept Development (COA Development).** The supported commander and staff responsible for developing the plan accomplish this phase of planning.

AN UNUSUAL PLAN

The (2nd Marine) Division's breaching plan was elegantly simple, a factor that helped overcome the lack of time for planning and training. MG Keyes and his staff used an amphibious assault as a model, even though this particular assault was going to be conducted on land. Combat engineers laid out six lanes from six departure and penetration points that went through the berm along a 12-kilometer front. These were named like beaches: from left to right ran Red 1, Red 2, Blue 3, Blue 4, Green 5, and Green 6…each lane was marked about every kilometer by appropriately colored plastic garbage pails spray painted with lane numbers and phase lines.

SOURCE: ***US Marines in the Persian Gulf, 1990-1991***

- **Mission Analysis.** The end product of the mission analysis process is a restated engineer mission statement and the development, preparation, and issuance of planning guidance to the staff and subordinate commands. Development of an engineer 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:

  •• Terrain analysis in support of battlespace visualization;

  •• Infrastructure and facilities assessment;

  •• Availability of HNS;

  •• Digital mapping requirements;

  •• Capabilities of assigned engineer forces;

  •• Engineer requirements;

  •• Assessment of multinational engineer capabilities;

  •• Threat engineer capabilities; and

  •• Engineer end state.

  •• Environmentally sensitive areas.

- **Planning Guidance Development.** During this phase, 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 combatant commander's intent. This assessment is the linchpin of successful engineer integration into operations. During COA development, the engineer may consider the following.

  •• Options for joint force operational movement, maneuver, and protection.

  •• C2 options to best employ the engineer capabilities of the joint force.

  •• Recommendations on ISB, forward operating bases, forward logistic support sites, and avenues of approach.

  •• MSRs and available LOC facilities.

- **Staff Estimates.** As part of staff estimates, the engineer develops a detailed assessment of each COA and its

PREPLANNING TO RESTORE HOPE

In December 1992, the joint task force (JTF) engineer approached the JTF commander of Operation RESTORE HOPE in Somalia to obtain the commander's intent and guidance on facility and road construction. He presented multiple options with varied construction standards. Each option had an associated resource requirement affixed to the level of work and an expected completion date.

SOURCE: Operation RESTORE HOPE After-Action Report

Navy SEABEEs improving main supply routes.

supportability from an engineer perspective. At this point in planning the engineer considers the following.

•• Specific engineer tasks necessary to support each COA.

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

See JP 4-04, Joint Doctrine for Civil Engineering Support, *for more information on engineer planning factors.*

•• Engineer logistic requirements to support each COA.

•• Engineer actions and capabilities, plus the resources needed during transition or termination of operations.

- **Commander's Estimate.** During this phase of planning, the engineer participates in wargaming, analyzing, and comparing available COAs to produce a commander's estimate. At a minimum, the engineer evaluates the following.

•• Criteria for risk assessment.

•• Resource requirements.

•• Resources available.

•• Advantages and disadvantages in each of the engineer battlespace functions.

- **CINC's Strategic Concept.** During this step, the commander selects a COA, which is further expanded into the CINC's strategic concept. During this phase, 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.

- **Chairman of the Joint Chiefs of Staff (CJCS) Approval.** The strategic concept developed in the planning process is submitted to the Chairman of the Joint Chiefs of Staff for review and approval. If the concept is approved by the Chairman, the CINC's staff will advance the concept into the plan development phase.

c. **Plan Development (COA Development and Selection).** During plan development, a CJCS-approved concept is expanded into a complete OPLAN, operation plan in concept format (with or without time-phased force and deployment data (TPFDD)), or functional plan. The process is the same for all plan types. To support this phase, the engineer provides input for the appropriate annexes and appendices of the plan, as found in CJCS Manual (CJCSM) 3122.03, *Joint Operation Planning and Execution System Vol II: (Planning Formats and Guidance).* Engineers are responsible for preparing Annex D, "Logistics," of Appendix 6, "Civil Engineering Support Plan," as well as Annex L, "Environmental Considerations." In addition to the CESP and Annex L, the joint engineer staff usually provides input (depending on the mission and combatant commander's intent) to the annexes and appendices shown in Figure III-2. The following annexes and appendices require engineer input.

Refer to JP 4-04, Joint Doctrine for Civil Engineering Support, *for further information on the CESP and Annex L, "Environmental Considerations."*

- **"Task Organization," Annex A.** Engineers review Annex A to ensure sufficient capability to meet identified requirements. Additionally, planners provide input to the flow of the engineer force as detailed on the TPFDD.

- **"Air Base Operability" (ABO), Appendix 8, Annex C.** Engineer considerations may factor heavily into the overall concept of ABO, including the concepts of the five basic functions

OPERATION PLAN ANNEXES

SUBJECT	ANNEX	SUBJECT	ANNEX
Task Organization	A	Command, Control, and Communications	K
Intelligence	B	Environmental Considerations	L
Operations App 8, Air Base Operability App 13, EOD App 15, Force Protection	C	Geospatial Information and Services	M
Logistics App 5, (CESP)	D	Space Operations	N
Personnel	E	Host-Nation Support	P
Public Affairs	F	Medical Services	Q
Civil Affairs	G	Special Technical Operations	S
Meteorological	H	Execution Checklist	X
Command Relationships	J	Distribution	Z

CESP Civil Engineering Support Plan EOD Explosive Ordnance Disposal

Figure III-2. Operation Plan Annexes

to defend (installations), survive (provide expedient protection), recover (assess damage, effect repairs), generate (work-arounds for damaged systems), and support (the recovery effort).

- **"Explosive Ordnance Disposal," Appendix 13, Annex C.** This appendix should provide an outline of expected EOD operations in support of the plan. EOD personnel assist in the identification and removal of unexploded ordnance to support mission requirements and/or return facilities to a usable status.

- **"Force Protection," Appendix 15 to Annex C.** The combatant commander may require the joint force engineer to provide a list of the forces available to support the protection plan. Based on the commander's intent, activities of the enemy, and the predominant threat, the joint force engineer may provide appropriate assistance, including the following: facility hardening, revetments, berms, and installation security improvements (barriers, perimeter fencing, monitors, and cameras).

- **"Civil Affairs," Annex G.** Engineers should focus on areas affecting dislocated civilians, government stability, and the degree of destruction or degradation of civilian infrastructure. Engineers play a key role in providing shelter (tent cities) and performing essential repairs to facilities and utilities (water, sanitation, and power production). Engineering personnel can also help identify local indigenous resources available to assist in civil-military operations.

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

- **"Operations," Annex C.** Although not included in CJCSM 3122.03, *Joint Operation Planning and Execution System Vol II: (Planning Formats and Guidance)*, engineers should seriously consider preparing an engineer appendix to Annex C. Major operational engineering considerations may affect the success of a joint operation. Emphasis should focus on the overall priority of engineer effort by phase as well as any unique C2 considerations and support relationships between combat engineers and supporting theater-level engineers.

- **Development of Time-Phased Force and Deployment Data.** Additionally, engineers should be involved in the development of the OPLAN TPFDD, one of the most time-consuming and intensely managed aspects of plan development. Engineer participation in developing the TPFDD is critical as it ensures that:

  •• Engineer capabilities (units) arrive in the operational area in a manner that supports the desired shaping of the battlespace; and

  •• Facilities required to support force projection and joint reception, staging, onward movement, and integration (JRSOI) are in place and available to deploying units.

  JP 4-01.8, Joint Tactics, Techniques, and Procedures for Reception, Staging,

TASK FORCE CASTLE

Operation UPHOLD DEMOCRACY in Haiti required one of the largest OCONUS [outside the continental United States] deployments of engineer forces since the end of the Gulf War. The 20th Engineer Brigade from Fort Bragg, North Carolina, served as the headquarters for Task Force Castle, a joint engineer task force of over 2500 personnel. Task Force Castle spent almost two months in Haiti providing force bed-down, survivability, mobility, and general engineering support to a joint and combined force of over 20,000 soldiers, airmen, and Marines. The XVIII Airborne Corps was given overall authority for planning the intervention into Haiti. During the XVIII Airborne planning process, OPLAN [operation plan] X, a forced-entry operation was being parallel planned with OPLAN Y, a permissive-entry operation planned by the 10th Mountain Division with the 41st Engineer Battalion as the lead engineer element. On 11 September 1994 the 20th Engineer Brigade received an execution order for OPLAN Z, a merging of OPLANs X and Y. While the conditions for the two operations differed significantly, many of the engineering specific issues remained the same, including:

- **The military engineer end state.**
- **Size of the engineer force.**
- **Upgrading and maintaining lines of communications.**
- **Where the force would live.**
- **Transition responsibilities.**

The flow of engineers into the theater was decentralized. Elements of the 41st Engineer Battalion conducted air assault operations into Haiti off the aircraft carrier USS *Eisenhower*. The battalion conducted an air assault into the international airport and port facility to clear and secure these facilities for follow-on forces. Engineer sweep teams cleared the main runway, apron, and taxiway, while an element of the 1st Brigade Combat Team, with sappers, cleared the port facility. After these missions were accomplished, engineers began force protection missions and construction of foxholes, fighting positions, berms, and wire obstacles. Since there was no opposing force, engineer focus soon transitioned to base camp development and force bed-down in the joint operations area.

SOURCE: Task Force Castle, *Engineer Magazine*, April 1995

Onward Movement, and Integration, *provides guidelines for planning and executing JRSOI.*

d. **Plan Review (COA Selection and Execution Planning).** During this phase, the Chairman of the Joint Chiefs of Staff conducts a final review of the OPLAN submitted by the supported commander. The review is also intended to identify unresolved shortfalls in force and resource capabilities. From an engineering perspective, this may include those facilities required to support force projection into the theater.

e. **Supporting Plans (COA Selection, Execution Planning, and Execution).** During this final phase of the deliberate planning process, the supported commander directs the completion and submission of supporting plans. As required by the CINC's task assignment, component commanders, JTF commanders, supporting commanders, or other agencies develop supporting plans. Many of the engineer considerations discussed above apply to and should be accounted for by subordinate components.

f. Engineers should review the entire plan for adequacy, feasibility, acceptability, and consistency with joint doctrine.

See CJCSM 3141.01, Procedures for Review of Operation Plans, *for additional information.*

3. Planning Considerations

During joint operations, engineer planners should consider such things as geospatial information, intelligence requirements, topographic engineer support, construction support (including construction safety requirements and safety criteria), countermine operations, force protection, HN forces, multinational operations, interagency operations, contractor support, materiel acquisition, operational phases, environmental considerations, and funding and resource management.

a. **Geospatial Information.** Requirements for geospatial information are determined and validated by the GI&S officer during deliberate and crisis action planning processes. Geospatial information, the foundation for battlespace visualization, is required for many military functions such as navigation, mission planning, mission rehearsal, targeting, and analysis. Engineers significantly aid in battlespace visualization, particularly through theater topographic assets. When coupled with threat analysis, environmental effects, weather, terrain, the friendly situation, and the logistic situation, geospatial information may lead to identification and location of operational centers of gravity (both friendly and enemy) and a more accurate view of the battlespace. Accurate visualization of the area in which joint forces conduct operations allows commanders to plan for branches to current operations. Engineer analysis contributes to:

- Development of maneuver options;
- Selection of high-payoff targets;
- Acquisition of precise, deep-target information; and
- Development of a common operational picture through terrain visualization.

See CJCSI 3901.01A, Requirements for Geospatial Information and Services, *and JP 2-03,* Joint Tactics, Techniques, and Procedures for Geospatial Information and Services Support to Joint Operations, *for additional information.*

"I directed the 6th Marine Regiment to prepare to conduct the breach. We would do a one-regiment breach, with each battalion, in turn, cutting two lanes through the barrier. We moved the 6th Marines into a sterile area and started to construct an exact replica of the barrier line we would have to breach. We gathered all the intelligence we could on the area. We sent people back to [US Central Command] Headquarters, and we even sent the Division Engineer back to the Defense Intelligence Agency in Washington for anything they could find."

LtGen William M. Keyes, USMC
CG, 2nd Marine Division
Operations DESERT SHIELD and DESERT STORM
Interview, November 1991

b. **Intelligence Requirements.** Engineer intelligence requirements need to be integrated into the joint force intelligence collection plan. The intelligence required varies with the size of the force, staff level, engineer unit, and mission. The basic principles for engineer intelligence are liaison with other engineer technical information and intelligence-gathering elements, brevity, accuracy, and timeliness. Some key engineer intelligence requirements are shown in Figure III-3.

c. **Topographic Engineer Support.** Joint operations may be conducted in areas that have limited up-to-date topographic coverage from NIMA, US Geological Survey, and other civilian, allied, and HN sources. When providing topographic support to the joint force, the engineer should coordinate the following with the GI&S officer.

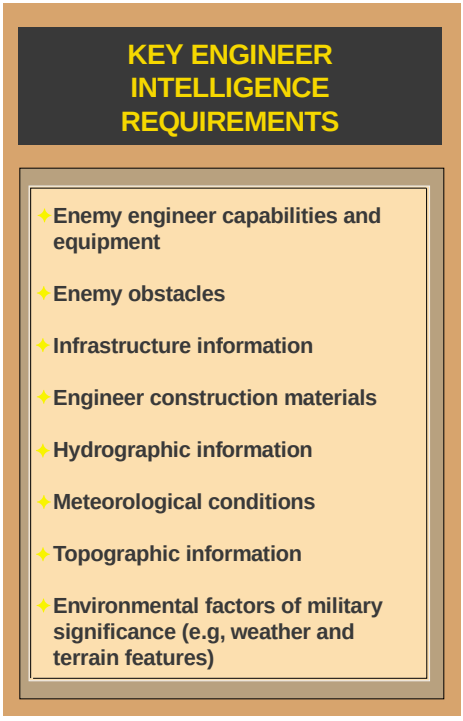

Figure III-3. Key Engineer Intelligence Requirements

- Evaluating the availability of standard and nonstandard map products in the operational area. If shortfalls exist, the engineer and the GI&S officer should define specific requirements and coordinate the collection and creation of necessary data to build the joint force topographic database.

- Coordinating with the GI&S officer for early collection of terrain information in the operational area through reconnaissance, topographic survey, and satellite imagery.

- Requesting digital geospatial information from NIMA immediately after mission requirements are established in a contingency. NIMA produces a variety of digital geospatial data sets. During peacetime, combatant commands 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.

- Ensuring that terrain analysis and topographic reproduction capabilities are available to the joint force early in the operational area or through split-basing capabilities from continental United States locations.

- Establishing a topographic product storage and distribution capability in the operational area, in conjunction with the J-2 and J-4.

- Establishing special topographic-product procedures with special operations forces and other deployed forces.

Navy SEABEEs constructing base camp facilities in support of deployed forces in Kosovo.

d. **Construction Support.** Engineers are often required to establish some type of bare-base infrastructure that supports deployed forces or dislocated civilians with minimal life support and a protected, healthy, and safe environment.

- Problems in a contingency-operation atmosphere may include the following.
  - •• Sanitary conditions may be compromised.
  - •• Infrastructure may be degraded.
  - •• Airfields and ports may not be operating at full capacity due to damage.
  - •• Civil government may lapse.
- When providing construction support to a joint force, the engineer planner should consider the following.
  - •• Determining the status, safety, and availability of existing infrastructure facilities, utilities, airfields, ports, roads, and construction materials in the operational area.
  - •• Estimating minimum engineer construction standards for life support, safety, and force protection, including the need for base-camp packaging. Construction standards are as follows. **Initial Standard** — Characterized by austere facilities requiring minimal engineer effort. Intended for immediate austere operational use by units upon arrival in theater for a limited time ranging up to 6 months (depending on the specific facility). May require replacement by more substantial or durable facilities during the course of operations. **Temporary Standard** — Characterized by minimum facilities. Intended to increase efficiency of operations for use extending to 24 months. Provides for sustained operations. Replaces initial standard in some cases where mission requirements dictate. Temporary standard construction can be used from the start of an operation if directed by a combatant commander.

Refer to JP 4-04, Joint Doctrine for Civil Engineering Support, *for detailed information on construction standards.*

•• Defining the construction end state with the JFC.

•• Determining what construction US or HN military engineers or civilian contractors will conduct, based on deployment time lines and threat level.

•• Ensuring that the joint force has adequate construction-management capability to support the operational area.

•• Establishing real estate acquisition policies and programs in support of the operational area.

•• Coordinating with J-4 to ensure that required construction materials are procured and shipped in a timely manner to meet initial deployed force-protection and life-support needs.

•• Ensuring that construction safety requirements and safety criteria (e.g., explosive safety distances, and airfield clearances) are addressed in the planning process.

e. **Countermine Operations.** The engineer should consider the following when providing countermine support to the joint force. These considerations and procedures should be included with established rules of engagement.

- At the strategic and operational levels, the combatant command engineer should be concerned with enemy barriers, obstacles, and mines that may adversely impact the deployment and employment of the joint force in the operational area. For example, the combatant command engineer, working with the J-2, J-3, and J-4, should recommend alternatives and/or actions to alleviate or mitigate the threat posed by enemy mining or other adverse actions against key APODs, SPODs, and LOCs.

- Working closely with the J-2 to determine the land mine threat for the operational area.

- Publishing mine-recognition handbooks, and land mine recognition and warning posters for deploying forces.

- Exploiting all sources of intelligence to identify mined areas in the operational area.

Military engineers provide force protection enhancements in contingency operations.

- Ensuring that deployed forces are trained to identify, mark, and report encountered land mines.

- Conducting land-mine detection, marking, and removal training for forces conducting countermine missions.

- Establishing, disseminating, and enforcing route and area land-mine clearance and marking procedures for the operational area.

See JP 3-15, Joint Doctrine for Barriers, Obstacles, and Mine Warfare, *for additional information.*

f. **Force Protection.** Commanders and staff planners always consider force protection. The HN may provide security forces, US forces (including combat support (CS) and combat service support (CSS) personnel) may augment security forces, or a combination of the two may occur. If the latter occurs, all of the involved units and agencies will have to closely coordinate their mission plans. Some types of military operations other than war (MOOTW) may indicate a low threat level; however, any threat is a significant concern to deployed forces. Hostile elements, with initiative and in their own environment, can inflict damage or disrupt operations with minimal effort. A major concern is the protection of engineering personnel and construction equipment. Therefore, planners must consider physical and personnel security at every level of planning. Engineers have unique equipment and personnel capabilities that can be used to support deployed force protection efforts across the range of military operations. Engineers construct protective facilities, bunkers, emplacements, vehicle barriers, fences, and other structures needed to protect the force. When providing force protection construction support to the joint force, engineer planners should consider the following.

- Establishing the required level of protection needed in the operational area, based on the expected threat, in coordination with the JFC.

- Developing force protection construction standards for operating and life-support bases, including the need for security fencing, lighting, obstacles, and guard posts.

- Ensuring that early entry forces have adequate force protection construction materials, materials handling equipment, and holding areas. Service component engineers should review these materials annually to ensure the theater stockage level for force protection is sufficient to meet initial entry requirements.

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

- Delineating force protection construction responsibilities between engineer units and supported units.

- Developing force protection construction standards for the joint force. The joint rear area coordinator (JRAC) may establish the requirement for subordinate elements to meet force protection standards for installations spread across many countries. The joint force engineer and staff could assist the JRAC in establishing force protection construction standards.

CJCSM 3122.03, Joint Operation Planning and Execution System Vol II: (Planning Formats and Guidance), *Appendix 15 to Annex C, "Force Protection," and Appendix 6 to Annex D, "Civil Engineering Support Plan," provide additional guidance.*

g. **HN Forces.** Doctrine, operational competence, training, experience, types and quality of equipment, and types of units can vary substantially among HN military forces. To facilitate matching missions with capabilities, JFCs implement measures to assess the capabilities, strengths, and weaknesses of HN forces. Where HN engineer forces have unique or special capabilities, they should be appropriately integrated into operations. Specific planning considerations for coordinating HN plans and operations include:

- Considering the need for interpreters and communications interoperability;
- Obtaining available information concerning threat mine and obstacle data, construction materials, soils data, and facilities; and
- Providing engineer liaison officers to the HN where and when appropriate.

h. **Multinational Operations.** Close cooperation is ensured when the United States and its allies preplan engineering activities that collectively support the commander's intent. Specific planning considerations for coordinating multinational engineer plans and operations include the following.

- Establishing multinational engineer structure and logistic requirements.
- Establishing engineer staff links through the joint engineer staff.
- Establishing funding policies and agreements to finance projects.
- Identifying standards to be achieved in the construction of facilities.
- Providing engineer liaison officers where and when appropriate.
- Developing multinational command relationships that will assist the JFC in leveraging engineer capabilities throughout the operational area.

JP 3-16, Joint Doctrine for Multinational Operations, *provides basic information on planning considerations for combined operations.*

During Operation UPHOLD DEMOCRACY in Haiti, a Canadian-American Engineer Battalion, called the "Can-Am Engineer Battalion" was formed under the UN flag. In that unit the United States provided the battalion-level command and control and the horizontal construction capabilities while the Canadians provided the vertical construction capability. This battalion did most of the bed-down construction at multiple base camps around the country.

Operation UPHOLD DEMOCRACY

i. **Interagency Operations.** Many interagency organizations will participate or lead activities in certain contingencies. JFCs should assure coordination of engineer assets with these agencies to create unity of effort and synergy and to avoid duplication of effort. For example, during consequence management engineers might provide support in the cleanup within Service limitations, which requires close coordination with other USG agencies.

JP 3-08, Interagency Coordination During Joint Operations, *provides in-depth information regarding planning considerations for interagency involvement in joint operations.*

j. **Contractor Support.** The challenge for engineer planners is to achieve the optimal mix of engineering capabilities, which may include contractor support. Some planning considerations influencing the use of contractors include the following.

- Duration, scope of work, security, and stability within the operational area.
- Availability of local resources (labor and construction materials).
- Impacts on intratheater lift and port facilities.
- Availability of funding.
- Impact on local area political and economic stabilization.
- Impact of force limitation imposed by force caps which could limit the number of military engineering forces.

A WELL-ORCHESTRATED EVENT: JOINT FORCE ENGINEERING SUPPORT

Operation RESTORE HOPE in Somalia demonstrated how well joint engineer capabilities can be used to meet joint force requirements. Early planning identified a large military engineer requirement for both combat and construction support missions. Planners decided to use a mix of engineer capability from the US Army, Navy, Air Force, and Marine Corps. Time-phasing of this support was well orchestrated based on available lift and mission requirements.

- **Air Force RED HORSE airfield repair teams had been maintaining airfields throughout Somalia since 16 August 1992.**
- **A vertical construction detachment from the 40th Naval Mobile Construction Battalion (NMCB 40) (SEABEE) opened up the Mogadishu airfield and constructed troop bed-down and logistic support facilities throughout Mogadishu on D+1.**
- **On D+5, a company of combat engineers from the 1st Marine Combat Engineer Battalion (1CEB), 1st Marine Division, supported the expansion of Marine operations in Mogadishu by clearing obstacles and sweeping for mines. The battalion then supported Marine lodgment efforts in Baidoa, Baledogle, and Kismayo and began upgrading the road from Baidoa to Bardera.**
- **Elements of the Marine 7th Engineer Support Battalion (7th ESB) arrived offshore on D+5. The battalion augmented SEABEE horizontal construction capability and constructed and operated redeployment facilities.**

On D+7, horizontal construction equipment from the 1st Naval Mobile Construction Battalion (NMCB 1) arrived along with command and control elements from the 30th Naval Construction Regiment (30th NCR). NMCB 1 repaired airfields and constructed base camp facilities at outlying humanitarian relief centers, and opened up main supply routes out of Mogadishu. Joint engineer forces also executed civic action projects as personnel, equipment, and construction materiel resources allowed. Work included carpentry, electrical wiring, plumbing, and water-well refurbishing projects.

SOURCE: Operation RESTORE HOPE After-Action Report

Refer to JP 4-04, Joint Doctrine for Civil Engineering Support, *for detailed information on planning considerations for use of contractors.*

k. **Materiel Acquisition.** Engineers require a variety of materiel and need to incorporate the most cost-effective acquisition strategy that meets the JFC's intent. Materiel may be obtained from many sources, either local or imported. Engineer planners should determine sources of engineer materiel and incorporate an acquisition strategy into the plan. Planning may include timetables for turning over materials and contract services to the HN, USG organizations, or IOs.

l. **Operational Phases.** The conduct of current operations sets the stage for future operations. Engineers need to consider follow-on phases throughout the planning process in order to have sufficient force structure, facilities, and materials in place to meet future operational requirements. In order to meet the commander's objectives and shape the battlespace for the JFC, engineer effort normally starts before decisive actions begin. During the planning and execution phase, commanders must understand that redeployment can be a significant engineer challenge, particularly when terminating overseas contingencies. Engineers focus on constructing or repairing redeployment facilities and staging areas, to include wash racks and equipment-holding and customs-inspection facilities. JFCs should identify posthostilities requirements as early as possible to best accomplish engineer missions and simultaneously redeploy assets no longer needed in accomplishment of the mission.

m. **Environmental Considerations.** Successful planning and execution of joint engineering operations and exercises 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 operations and exercise planning. An environmental site survey should be conducted prior to deployment whenever possible to document current environmental conditions. 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, to include medical, logistic, operations, intelligence, legal, civil affairs, and other joint staff members as appropriate. Coordination with other DOD agencies (such as Defense Logistics Agency) and other USG departments (such as the Departments of State and Energy) may also be necessary. In the event other nations are involved in the operations or exercises, coordination with appropriate allied and coalition partner counterpart staff agencies must also be considered. Requirements related to environmental considerations may be found in numerous sources, which include but are not limited to the following.

- Provisions of US environmental law applicable overseas.
- Executive orders.
- DOD Directives (DODDs), regulations, and policies.
- HN laws.
- SOFAs.
- International treaties, protocols, and conventions.
- Specific examples include the Overseas Environmental Baseline Guidance Document; Final Governing Standards;

Air Force engineers perform drum sampling — environmental considerations may include measures to protect the environment and safeguard human health.

Executive Order 12088, *Federal Compliance with Pollution Control Standards*; Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*; and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.

- **Environmental Planning.** Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, and DODD 6050.7, *Environmental Effects Abroad of Major Department of Defense Actions*, provide policy guidance regarding environmental planning when major federal actions have significant effect on the environment outside the geographic territory of the United States and its possessions. 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 DOD Instruction 4715.9, *Environmental Planning and Analysis*. In cases of emergency, or where national security interests are involved, either DOD actions may be exempted from environmental planning requirements, or applicable requirements may be modified. Legal counsel should be consulted to determine applicable requirements.

"The American people will continue to expect us to win in any engagement, but they also expect us to be more efficient in protecting lives and resources while accomplishing the mission successfully. Commanders will be expected to reduce the cost and adverse effects of military operations, from environmental disruptions in training to collateral damage in combat."

Joint Vision 2010

- **Natural and Cultural Resources.** Joint operations have the potential to adversely affect natural and cultural resources. As required by law (or 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 operational area, whether overseas or in the United States, so that appropriate action can be taken to minimize the potential damage to these resources.

Refer to JP 4-04, Joint Doctrine for Civil Engineering Support, *for additional information on environmental considerations.*

n. **Funding and Resource Management.** A lack of knowledge of funding authorities, interpretations, and references can preclude provision of timely engineering support. The first critical step in initiating construction operations is understanding the necessary authorities and references; **without statutory authorization and appropriation of funds, the Department of Defense is not authorized to undertake construction or expend funds**. Comptrollers, legal personnel, and engineers should be familiar with peacetime construction authorities and procedures. Personnel dealing with contingency and wartime construction must know and apply proper funding authorities and Service procedures. The importance of understanding the funding process cannot be overemphasized as the funding authority may dictate materials, methods, and approval procedure. Joint force engineer personnel should pay particular attention to funding authorities associated with the following.

- Emergency Military Construction (US Code (USC) Title 10, Section 2803).
- Contingency Construction (USC Title 10, Section 2804).
- Unspecified Minor Construction (USC Title 10, Section 2805).
- Construction Authority in the Event of a Declaration of War or National Emergency (USC Title 10, Section 2808).
- Restoration or Replacement of Damaged or Destroyed Facilities (USC Title 10, Section 2854).
- Humanitarian Assistance (USC Title 10, Section 2551).
- Foreign Assistance (USC Title 22, Sections 2292 and 2318).
- DOD Emergency, Contingency, and Other Unprogrammed Construction Projects (DODD 4270.36).

JP 4-04, Joint Doctrine for Civil Engineering Support, *provides detailed information on construction funding and resource management authority and policy.*

o. **Military Operations Other Than War.** MOOTW are generally unified operations that integrate joint, interagency, and multinational operations to achieve the strategic end state. Effective engineer liaison with all involved military units and civilian agencies is critical to the successful conduct of MOOTW. While many of the key planning considerations for high- to mid-intensity combat still apply to the engineer planner (e.g., the need to locate a water source and provide purified water), in MOOTW the requirement will most likely be much greater; not only to sustain the force, but also to support humanitarian needs. Some considerations for MOOTW are unique, such as determining routes, road clearing, bridge construction, and repair requirements to permit the flow of supplies in support of foreign humanitarian assistance or disaster relief operations. Regardless of the type of operation,

the unique aspects of the operation should be considered early in the planning process.

4. Conclusion

Involvement of the engineer staff in all aspects of planning is an absolute requirement. Successful engineer preparation of the theater depends upon the ready availability of units, equipment, and materiel. Engineers must be involved early in the planning of all phases of joint operations.

"Lieutenant General Johnston, the JTF commander during Operation RESTORE HOPE in Somalia, established the standards for the area of operations and the end state for engineer activities. This end state became the benchmark for all US unilateral activities within the theater. The end state not only served as the initial negotiation point for the transfer of responsibilities from the US to the UN, but it also became the operational date for initiation of the retrograde of US personnel and equipment from the region."

Operation RESTORE HOPE
After-Action Report

CHAPTER IV
OPERATIONS

"Joint force commanders synchronize the actions of air, land, sea, space, and special operations forces to achieve strategic and operational objectives through integrated, joint campaigns and major operations. The goal is to increase the total effectiveness of the joint force, not necessarily to involve all forces or to involve all forces equally."

JP 3-0, *Doctrine for Joint Operations*

1. Engineering Functions

Engineer operations enhance the commander's ability to conduct operations by maximizing force projection, sustaining the force, and enhancing the ability to use key terrain, roads, airfields, seaports, and LOCs. Engineer capabilities enhance the JFC's capability to move, maneuver, and achieve objectives by efficiently using resources through combat engineering, general engineering, and topographic engineering.

The power to maneuver, whether strategically or tactically, is essential to success. The side which, from any cause, loses the power of maneuver in strategic combinations will be at a disadvantage in the decisive battles. If it further loses the power of tactical maneuver, final defeat is inevitable.

***Note on Field Fortifications*, 1914**

a. **Combat Engineering.** Operational movement, maneuver, and force protection require the full spectrum of combat engineer capabilities. Combat engineering facilitates mobility, countermobility, and survivability operations in both offensive and defensive postures.

- Examples of combat engineering include the following.
  - •• Combined arms breaching, bridging, and diving operations to overcome manmade and natural obstacles.
  - •• Construction of protective positions to enhance the protection of the joint force.
  - •• Emplacement of obstacles to deny mobility to enemy forces.
  - •• Shaping the battlespace and enhancing the effects of joint fires.
  - •• Constructing combat trails and forward arming and refueling points (FARPs) to enhance the mobility of the joint force.
  - •• Destruction of military infrastructure, equipment assets, and munitions to deny them to the enemy should friendly forces need to withdraw before hostilities are over. (Destruction should be necessary, proportional, and not present harm to noncombatants. Military infrastructure selected for destruction should be evaluated for importance to future operations.)
  - •• Support for force protection efforts by constructing berms and other methods of improving cover and concealment for key facilities beyond the supported unit's capabilities.
- **Mobility.** Mobility enables the JFC to maneuver forces into advantageous positions. Mobility is enhanced through combinations of counterobstacle efforts (including countermine), gap crossing

Army engineers reinforce a damaged timber trestle bridge with an armored vehicle launched bridge and . . .

. . . Navy SEABEEs assemble a Bailey bridge in Bosnia.

(assault bridging, both standard and nonstandard, fixed, and float bridging), forward aviation engineering, construction and maintenance of combat roads and trails, and engineer reconnaissance. At the operational level, the commander relies on mobility to mass at the critical time, achieve surprise, and maintain momentum.

JP 3-15, Joint Doctrine for Barriers, Obstacles, and Mine Warfare, *details specific counterobstacle operations used to enhance mobility.*

- **Countermobility.** Countermobility shapes manmade and natural terrain with obstacle systems to support the JFC's concept of operations. Countermobility adds depth to the battle, in space and time, by attacking the enemy's ability to maneuver its forces. With its movement disrupted, turned, fixed, or blocked, the enemy is vulnerable to US forces,

ENGINEERS AND OPERATIONAL MOBILITY

Operation DESERT STORM provides an excellent example of operational mobility. As it became apparent that Saddam Hussein's forces were content to occupy Kuwait and brace for the liberating attack, CINC [combatant commander] planners formulated the offensive plans for the sweep north, which included two Army corps. The end around Kuwait required the displacement of XVIII Airborne Corps from its defensive positions in Central Saudi Arabia to the northwest on the Iraqi border. Marshalling areas to upload track and road enhancements allowed for the rapid displacement of the corps into tactical assembly areas without providing Iraqi forces with even a hint of the coalition's intentions. Engineers aided in the breach of the elaborate defensive system Hussein's forces had emplaced, thereby allowing the tactical engineers to remain integrated with the maneuver force.

SOURCE: Operation DESERT STORM After-Action Report

providing time for target acquisition by direct and indirect fire systems. By exercising obstacle C2 and focusing on obstacle emplacement authority, engineers ensure that obstacles are integrated with the JFC's scheme of maneuver and fire to create a decisive battlefield effect. The engineer must be part of the JTCB to prevent destruction of key infrastructure essential to future operations, and provide guidance concerning emplacement of obstacles, barriers, and mines. JP 3-15, *Joint Doctrine for Barriers, Obstacles, and Mine Warfare*, identifies many specific operations used to limit or hamper the enemy's ability to maneuver. For land operations, these include: land mines, demolition obstacles, flame field expedients, and special munitions (e.g., stand-off land attack missile and Hornet).

- **Survivability.** Engineers provide support for cover, concealment, camouflage, and deception efforts beyond the supported unit's capabilities to counter enemy intelligence operations and to protect the force from the effects of enemy fires. In joint operations, force protection is a principal concern of leadership at all command levels. Regardless of the scenario, commanders can employ engineers to assist in safeguarding the force. Engineers provide survivability support to maneuver forces, to include building bunkers, protective obstacles, protective berms, and vehicle fighting positions.

"It is certain that in future wars, even more than in the past, endeavors will be made by every possible means to prevent or delay the march of the enemy's troops by throwing obstacles in the way and by cutting such lines of communications as they might use."

Douglas MacArthur (1880-1964)

b. **General Engineering.** General engineering encompasses the construction and repair of LOCs, MSRs, airfields, and logistic facilities to support joint military operations. General engineering may also be performed in direct support of combat operations, e.g., battle damage repair. These operations include both horizontal and vertical construction and may include use of both expedient repair methods and more deliberate construction methods characterized by the application of design criteria, advanced planning, and preparation, depending on the

ASSET PROTECTION IN SOMALIA

A 19 member RED HORSE team was deployed to Mogadishu, Somalia, to construct bin-type revetments to provide splinter protection for millions of dollars worth of Air Force ground support equipment and Army aviation assets. A total of 12,636 linear feet (approximately 2.4 miles) of revetment materials were installed. Revetments are primarily installed to protect fighter aircraft. However, in this case the majority of the revetments were used to protect Army aviation assets such as Blackhawk and Cobra attack helicopters.

SOURCE: *Air Force Civil Engineer Magazine*, November 1993

mission requirements. General engineering tasks are usually resource and time-intensive, demanding a high degree of preplanning in order to meet operational requirements.

JP 4-04, Joint Doctrine for Civil Engineering Support, *contains additional information about general engineering.*

- **General Engineering Tasks.** Engineer units identify, assess, upgrade, repair, and construct facilities required for force projection, sustainment, and JRSOI. During deployment and conduct of operations, either one or all Service engineer units provide specialized capabilities such as the following.

•• Construction and repair of airfields and ports.

•• Construction and maintenance of LOCs.

•• Erection of bare base facilities.

•• Power generation and distribution.

•• Construction of fuels and water supply facilities.

•• Facilities engineering and management.

•• Real estate management.

Marine engineers construct expedient roadway.

•• Baseline environmental survey and environmental support.

•• Fire protection.

•• Water well-drilling.

•• Underwater construction.

•• Explosive ordnance disposal.

•• Construction and operation of sanitary waste treatment facilities.

Refer to Appendix A, "Engineer Organizations," for specific information regarding Service engineer capabilities.

- **Construction Contracting.** During any type of military operation, engineer requirements will be numerous, while military engineers will be a limited commodity. Both HN and US civilian contractors are an effective and essential option for the JFC in order to accomplish rear area general engineering and construction. Civilian contractors are a powerful force multiplier, allowing military engineers to concentrate on engineering missions in high-threat areas.

Air Force fire fighters provide aviation and structural fire fighting services.

•• The DOD construction agents (see DODD 4270.5, *Military Construction Responsibilities*) are USACE, NAVFACENGCOM, or other such approved DOD activity. Their responsibilities include design, award, and management of construction contracts for projects associated with the peacetime military construction program. Overseas, USACE, NAVFACENGCOM, and the Air Force are assigned specific geographical areas under DODD 4270.5, *Military Construction Responsibilities*.

•• The CINC may also use USACE and NAVFACENGCOM 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 CINC will usually designate a CCA for support in a contingency. USACE and NAVFACENGCOM also provide facilities planning, contract administration, and technical engineering support to JFCs (e.g., advanced base master planning, topographic engineering, force protection engineering, and cold-weather mobility).

•• Contracting engineer support through civil augmentation programs such as the Army's LOGCAP, the AFCAP, and the Navy's CONCAP can play a significant role in mission accomplishment. Civil augmentation contracts provide the JFC

with additional options and flexibility in achieving timely engineer and logistic support.

•• Regardless of the type of operation, carefully planned, supported, and executed engineer support using a balanced mix of engineer capabilities will enhance the success of the mission.

- **Real Estate.** Real estate operations involve the acquisition, management, and disposal of land and facilities to support joint operations. The JFC determines what real estate is needed to satisfy operational requirements. 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 Department of Defense, the Secretaries of the Military Departments are authorized to acquire by lease in foreign countries structures and real property relating to structures that are needed for urgent military purposes (see Title 10, USC 2675). Real estate planning should be initiated as contingency plans are developed to identify land and facility requirements needed in support of joint operations. Real estate acquisition requires special contracting procedures that are performed by USACE, NAVFACENGCOM, or a designated executive agent. Deployment of real estate personnel is essential early in an operation to ensure that needed land and facilities are acquired in a timely manner.

  Refer to JP 4-04, Joint Doctrine for Civil Engineering Support*, for additional information on construction contracting support and real estate support.*

- **Force Protection.** Engineering plays an important role in force protection operations, helping protect the force from a variety of threats — including crimes of opportunity against US personnel and property, deliberate environmental contamination, terrorist acts, and weapons of mass destruction. Engineers analyze existing terrain and advise on its optimal use for force protection. Engineers also 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.

c. **Topographic Engineering.** Topographic engineering provides commanders with terrain visualization, which improves

ERECTING AN AIR BASE

On 25 November 1990, RED HORSE and Prime BEEF personnel went to work at Al Karj Air Base, Saudi Arabia. The engineers built a pad 12 inches thick, compacting more than 200,000 cubic yards of red clay to serve as a foundation for a tent city. Eventually, 630 personnel tents, four kitchens, a gymnasium, twenty-one latrines, and twenty-six shower/shave units were erected or constructed. They constructed a sanitary system, and a power plant of seventeen 750-kw turbine generators, assembled an air-transportable hospital, and built six K-span structures. Al Karj was ready for aircraft in early January, and by the beginning of the war, the base was home to 4,900 personnel.

SOURCE: ***Gulf War Air Power Survey Vol. III***

situational awareness. Topographic units provide operational and tactical terrain analysis, terrain visualization, digitized terrain products, nonstandard map products, and baseline survey data to combat, CS, and CSS forces in all phases of operations throughout the operational area. Examples of information that can be obtained are shown in Figure IV-1.

2. Engineer Operations in Wartime

a. **Theater Preparation.** Engineers assist in preparing the theater by providing intelligence support, necessary facility and real estate acquisition, and preplanned theater access.

- **Intelligence Preparation of the Battlespace (IPB).** Engineers play a major role in the IPB process by anticipating and providing terrain analysis products of likely contingency areas. Engineers assess available infrastructure for possible general engineering requirements, including airfields, MSRs, ports, utilities, logistic facilities, and local sources of construction material and equipment. Engineer reconnaissance and topographic operations provide current battlespace information that assists the commander in planning and conducting tactical operations. Topographic engineering operations also contribute to

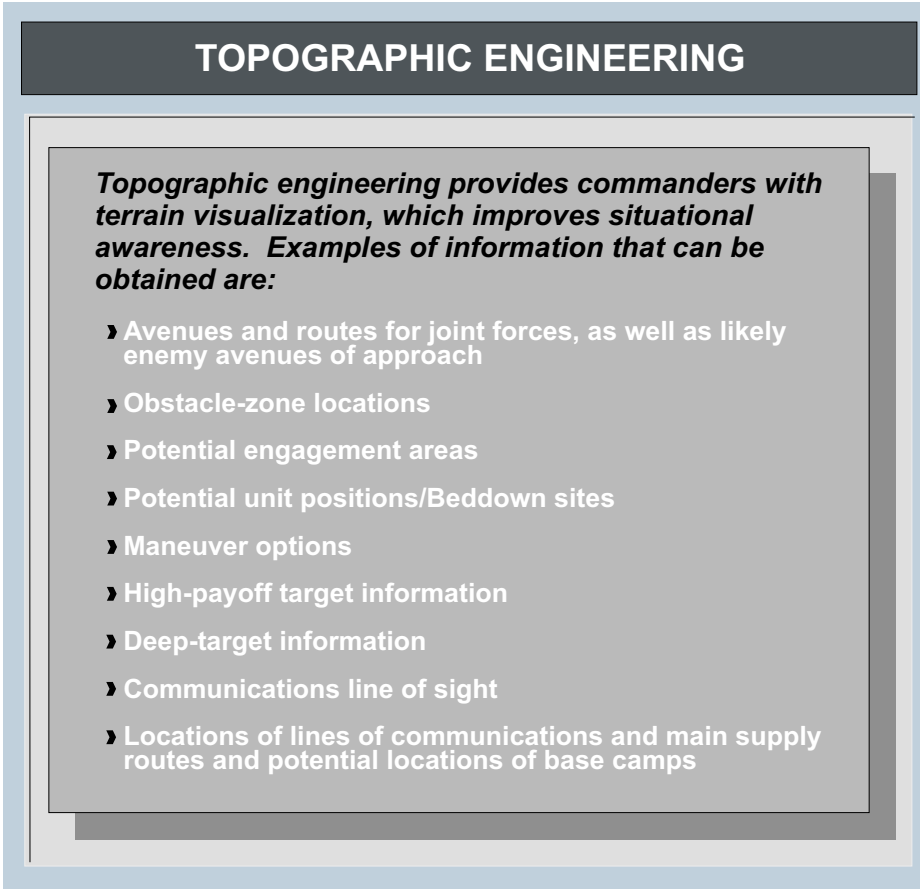

Figure IV-1. Topographic Engineering

IPB by assisting the JFC in identifying potential avenues of approach and priority targeting information.

- **Acquisition of Real Property.** Force projection requires infrastructure such as airfields, medical structures, ports, roads and bridges, water sources, electrical power, using either adequate preexisting infrastructures or rehabilitating and/or constructing new facilities, and acquiring land as required. Facilities are fundamental to JRSOI, logistic sustainment, and some combat operations. If the HN infrastructure does not support initial or sustained operations, engineers will construct, improve, and maintain required facilities. If local governments are capable of maintaining or improving existing infrastructure, agreements may be developed for their support. Facility acquisitions should emphasize the use of existing assets over new construction. To the maximum extent possible, facility requirements should be met from these categories in the following priority order: (1) US-owned, -occupied, or -leased facilities; (2) US-owned facility substitutes pre-positioned in theater; (3) HN, allied and coalition support where an agreement exists for the HN, allied or coalition 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 continental United States; and (6) construction of facilities that are considered shortfall after an assessment of the availability of existing assets.

  See CJCSM 3122.03, Joint Operation Planning and Execution System Vol II: (Planning Formats and Guidance), *Appendix 6, "Civil Engineering Support Plan," to Annex D, "Logistics."*

- **Theater Access.** The CINC is responsible for planning, coordinating, and constructing facilities within the area of responsibility. Engineers support the CINC's strategy through use of deployments for training, exercises, military construction, and HN construction that focus on preparing potential future battlespace. Examples of these types of engineer operations include water well drilling, pre-positioned war reserve materiel site construction, airfield upgrades and

SUPPORTING THE OBJECTIVE

One regiment, four battalions, one tailored NCFSU [naval construction force support unit], two CBUs [construction battalion unit], and one UCT [underwater construction team] deployed in support of Navy and Marine forces during Desert Shield/Desert Storm (1990-1991). The SEABEEs constructed 4,750 buildings (some K-span), aircraft hangers, six million square feet of aircraft parking aprons, 14 galleys to feed 75,000 people, and a 40,000-man enemy POW [prisoner of war] camp. They also maintained 200 miles of unpaved desert four-lane divided highway as main supply routes, erected fences and steel security towers, installed major electrical distribution systems and sanitation facilities, constructed thousands of meters of concrete decks and walls and fabricated mock artillery pieces and tank turrets in support of the commander's objectives.

SOURCE: *Engineer Magazine*, 1994

expansions, road construction, and port facilities construction.

b. **Warfighting Operations.** A basic understanding of the capabilities and strengths of individual Service and multinational engineer forces enhances mission success, as engineers play a significant role in each phase of a warfighting operation (see Figure IV-2). Engineers contribute to the following warfighting operations.

- **Permissive Entry.** After initially clearing beaches, ports, roads, and airfields of obstacles, engineers continue to improve these areas to facilitate entry of follow-on forces and a rapid buildup of combat support throughput. Engineers improve the areas by upgrading road and egress systems, constructing expeditionary ammunition depots and material staging yards, developing fuel storage farms, and making other improvements to support the sustainability of combat operations.

- **Forcible Entry.** The role of the combat engineer in an opposed entry environment is to keep the offense moving forward. The JFC will be faced with natural and manmade obstacles intended to restrict or halt movement that allow the enemy to mass its forces and repulse the assault. Engineers facilitate insertion of assault forces and prepare the onward movement to the objective by clearing beaches, roads, and airfields of mines and obstacles. Limited

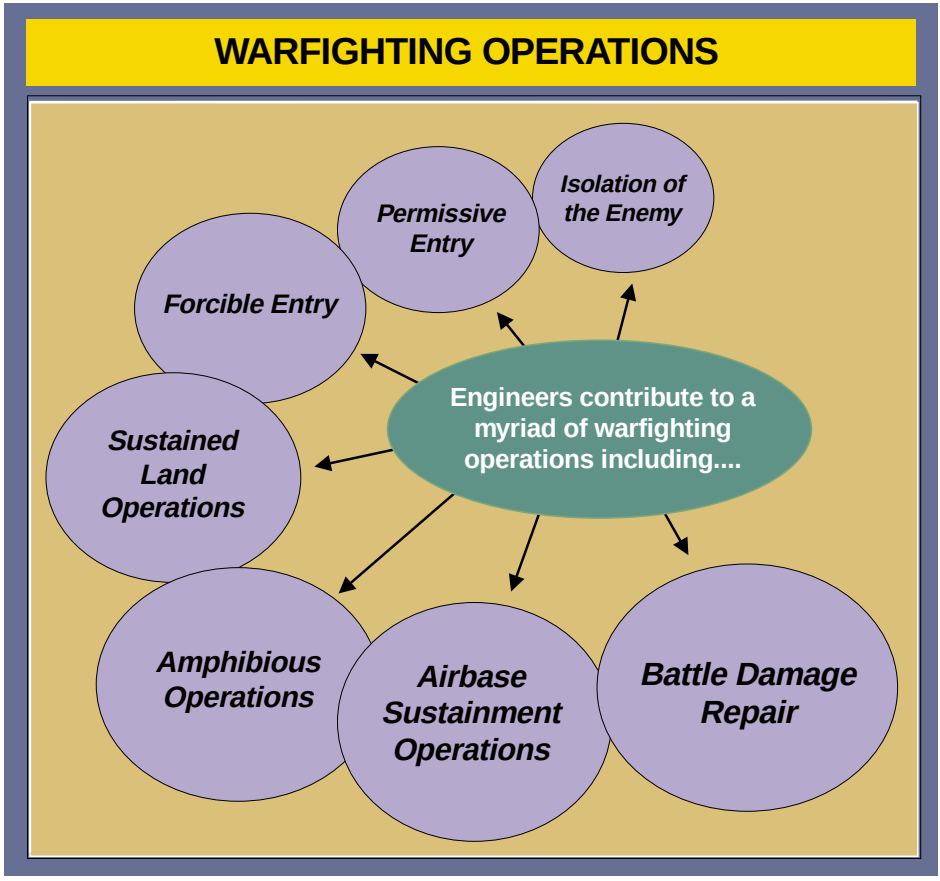

Figure IV-2. Warfighting Operations

construction may be performed both to enhance beach egress during an amphibious assault, and to support the arrival of initial combat and combat support elements through airfield repair.

- **Sustained Land Operations.** Prolonged and sustained land operations require continuous and simultaneous employment of all three engineer battlespace functions (combat engineering, general engineering, and topographic engineering) to support the joint force. Engineers increase rates of advance, modify terrain, participate in deception activities, increase force survivability, and ensure sustainability of combat operations.

- **Amphibious Operations.** The amphibious operation, an attack launched from the sea by Navy and landing forces, embarked in ships or craft involving a landing on a hostile or potentially hostile shore, is a decisive tool of force projection. Engineers provide terrain products and analysis during operation planning, including location suitability evaluations and level-of-effort estimates for various amphibious scenarios and sites. Imagery and maps can be provided by intelligence units, and hydrographic surveys can be provided by Navy special operations forces (SOF) and selected Marine reconnaissance assets. Navy SOF clear and breach natural and manmade obstacles from the three and one-half fathom curve (a depth of 21 feet) to the high-water mark. Combat engineers clear and breach natural and manmade obstacles from the high-water mark to the objective area. Engineers are critical in developing and maintaining beach support areas and beach throughput and enhancing JRSOI. Engineers construct and maintain helicopter landing zones, FARPs, casualty evacuation stations, enemy prisoner of war holding facilities, and multiclass supply dumps. Engineers continue supporting force projection from the sea by sustaining the logistic operations ashore.

- **Joint Logistics Over-the-Shore (JLOTS) Operations.** Specialized engineers support JLOTS operations by constructing elevated causeway systems and further improving beaches and port facilities to increase cargo and personnel throughput. Engineers also support sea-delivered bulk fuel and water systems

Navy SEABEEs place airfield matting for helicopter apron during Operation DESERT STORM.

Army engineers install culvert in El Salvador.

such as the offshore petroleum discharge system (OPDS) and amphibious assault fuel system.

- **Airbase Sustainment Operations.** Engineers are essential to ensuring the continuous operation of airfields in the warfighting environment. Engineers construct, operate, and maintain forward-deployed airbase facilities; ensure uninterrupted utility system support; support NBC defense operations within Service limitations; and provide crash fire rescue and recovery, postattack munitions clearance, and FARPs. Critical to airbase operations is the ability to continue air operations soon after attack by conventional or NBC weapons. Engineers are the focal point for these airbase recovery operations, providing battle damage repair (including rapid runway repair).

- **Expeditionary Airfield Construction.** Use of expeditionary airfield systems enhances an operational commander's ability to conduct aircraft operations by providing flexible, rapid response capability to support the warfighter's forward operating base requirements. Engineers support the installation of expeditionary airfield systems that include: AM-2 matting; airfield lighting; minimal operating lighting systems and field marking lighting systems; aircraft terminal guidance systems; and aircraft arresting gear. Use of one or more of these systems provides the operational commander with the ability to conduct and support flight operations from existing airfields, highways, parking lots, roof tops, and open fields. Engineers can install expeditionary airfield systems to provide a fully operational airfield. Engineers can also place AM-2 matting to repair battle damaged aircraft operating surfaces.

- **Battle Damage Repair.** Engineer support is the focal point of recovery operations after hostile actions. The major engineer tasks of battle damage repair include rubble clearance, fire protection services, electrical power production and restoration, and infrastructure repair. Engineers assess and repair those facilities deemed mission-essential by the JFC for continuing force projection. Repair of airfields, fueling and electrical systems,

MSRs, defense emplacements, and key C2 facilities are some of the high-priority projects.

- **Destruction of Military Infrastructure.** Engineers provide support for destruction of military infrastructure, equipment assets, and munitions in order to deny them to the enemy should friendly forces need to withdraw before hostilities are over. (Destruction should be necessary, proportional, and should not present harm to noncombatants. Military infrastructure selected for destruction should be evaluated for importance to future operations.)

3. Engineer Support to Military Operations Other Than War

Often MOOTW occur in areas of the world that lack sufficient infrastructure to support joint forces, requiring much of the force's sustainment system to be brought to the operational area. Engineer versatility provides the JFC with capabilities to support the joint force and conduct engineer operations that contribute directly to the economic and political stability of a region faced with natural or manmade disasters, internal conflict, or crisis. The joint force engineer advises the JFC to ensure that engineer missions receive the right mix of support at the right time. Engineer forces and construction materials may be in high demand during these situations and must be carefully prioritized and managed.

JP 3-07, Joint Doctrine for Military Operations Other Than War, *describes a wide variety of military operations associated with MOOTW.*

a. Engineers play a significant role in **foreign humanitarian assistance**, **disaster relief,** and **humanitarian and civic assistance**. In these types of MOOTW, important engineer capabilities that directly support the JFC's mission include repair of key infrastructure (roads and utility systems), construction of shelters for dislocated civilians, construction of basic sanitation facilities, construction of rudimentary surface transportation systems and public facilities, and drilling of water wells. 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.

b. In missions such as **noncombatant evacuation operations**, **enforcement of**

Navy SEABEEs clear route to access crash site of civilian airliner on Guam.

ENGINEERING A NEW ERA

On 9 December 1992, an amphibious landing of US Marines in Mogadishu signaled the beginning of Operation RESTORE HOPE. It also ushered in a new era in US military engineering operations — support of humanitarian relief. US Central Command led the execution of Operation RESTORE HOPE. US forces in Somalia provided a secure environment for civilian relief workers to distribute aid. Engineering operations, e.g., construction, road improvements, etc., played a significant role in Operation RESTORE HOPE.

SOURCE: Joint Task Force for Operation RESTORE HOPE, Center for Naval Analysis, CRM 93-114, March 1994

exclusion zones, **enforcement of sanctions**, and various types of **peace operations**, engineers may be required to provide support in the form of infrastructure and base camp construction for combat forces, road improvements for rapid troop movement, force protection for joint forces and civilian personnel, and mobility and countermobility efforts.

c. In **combatting terrorism**, engineers provide direct antiterrorism engineering to reduce vulnerability of friendly assets (both personnel and infrastructure) and provide logistic engineering support, in the form of base camp infrastructure construction, to the primary counterterrorism units. Additional operational assistance can be provided in the form of topographic engineering support and construction of operation rehearsal areas and facilities.

d. The remaining MOOTW missions discussed in JP 3-07, *Joint Doctrine for Military Operations Other Than War*, have a limited engineer role due to their short duration, small "footprint," or minimal engineering tasks involved with the operation. Engineer tasking in these types of operations may consist of topographic support, construction of operation rehearsal and training sites, and engineer training provided to HN forces involved in the operations. As with all operations, in particular those conducted in hostile environments, force protection must be continuously reviewed to ensure adequate protection of joint forces. Examples of limited engineering MOOTW include the following.

HOW IMPORTANT IS PREPARATION?

Army engineers built six 500-man base camps in Somalia during Operation RESTORE HOPE. Facilities in general were both semipermanent and permanent. One of the considerations was providing force sustainment facilities for follow-on UN peacekeeping forces in addition to current demands. This included well drilling, showers, latrines, contracted laundry, etc. However, initial units deployed with minimal Class IV and little engineer equipment due to aircraft limitations. In addition, there was limited Class IV material on pre-positioned ships. This limited the timely construction of support facilities and created force-protection problems due to inadequate barrier materials.

SOURCE: Operation RESTORE HOPE After-Action Report

OPERATION SEA SIGNAL, GUANTANAMO BAY CUBA, 1994

Two SEABEE Air Detachments worked closely with an Air Force RED HORSE unit, Army Logistics Task Force 64 personnel, an Air Force Prime BEEF unit, and Marine engineers to construct migrant camps, security, and sanitation facilities for more than 40,000 Cuban and Haitian refugees.

SOURCE: *Engineer Magazine*, 1994

- Freedom of navigation.
- Arms control.
- DOD support to counterdrug operations.
- Protection of shipping.
- Strikes and raids.
- Recovery operations.
- Nation assistance and support to counterinsurgency.
- Show-of-force operations.

e. **Domestic Support Operations (DSO).** The predominant form of DSO for the Department of Defense is **military support to civil authorities**, specifically disaster response under the Federal Response Plan (FRP) managed by the Federal Emergency Management Agency (FEMA). When a disaster exceeds the capabilities of state and local authorities, the Governor will request assistance from the President of the United States. When the President directs federal assistance, the Director of FEMA will implement the FRP committing the unique capabilities of 12 emergency support functions (ESFs) to support FEMA during a federal disaster response. DOD involvement in disaster relief begins with a Presidential declaration. FEMA designates a Federal coordinating officer to coordinate on-scene Federal effort at a Federal disaster field office. Requests best suited for the military are forwarded to the Secretary of the Army as the DOD executive agent. The Secretary of the Army has designated the Director of Military Support (DOMS) as the executing agent. At the direction of the DOMS, the supported CINC appoints a defense coordinating officer (DCO) to coordinate all DOD support (except for support provided by USACE as the lead planning and operating agent for ESF 3 – *Public Works and Engineering under the FRP*). In turn, the DOMS coordinates the request with the Chairman of the Joint Chiefs of Staff and the Office of the Secretary of Defense and then directs the supported CINC to provide the requested support. Relationships are shown in Figure IV-3.

For further information, refer to JP 3.07.7, Joint Tactics, Techniques, and Procedures for Domestic Support Operations.

- Most DOD support is focused on response operations, with a declining level of support to recovery operations. The key DOD objectives are to take immediate actions to save lives and property, assist in stabilizing the disaster area, and withdraw as quickly as possible. Federal response and recovery under the FRP focuses on two basic areas — infrastructure (engineer dominant) and human services (engineer support). Engineers are part of the primary effort in major disaster response operations. Engineer operations focus on the infrastructure response and recovery missions. Engineers should be among the first to deploy as the completion of

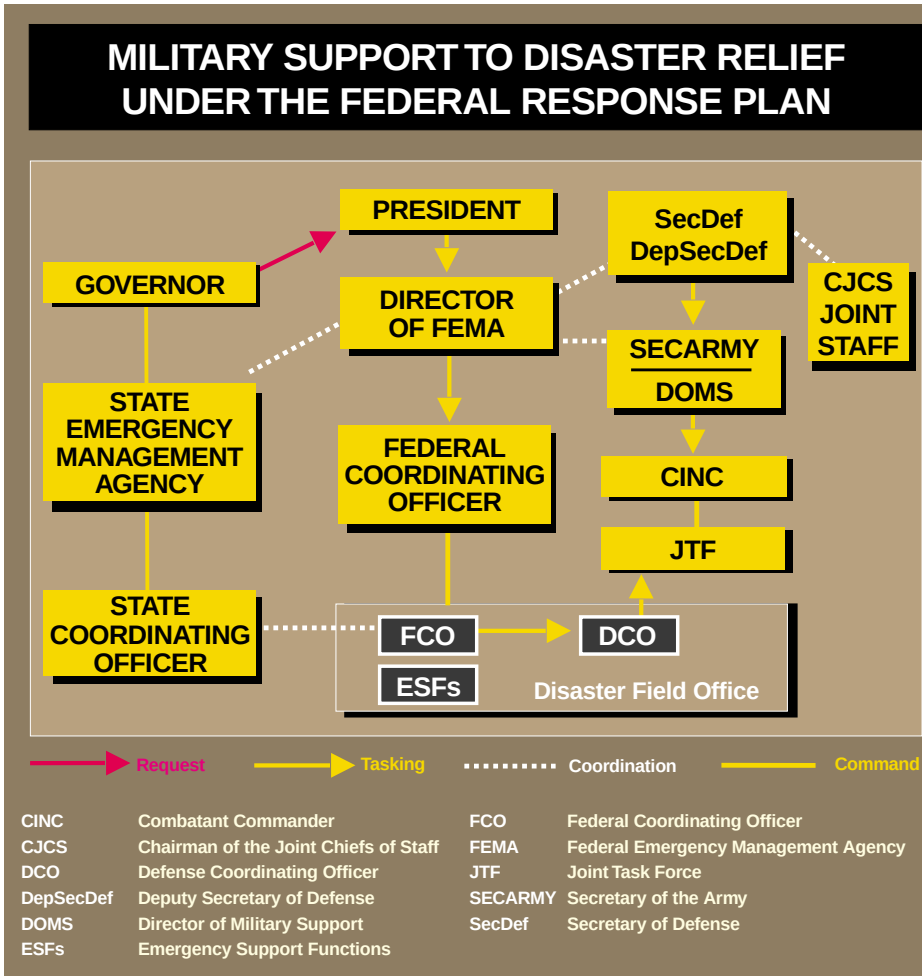

Figure IV-3. Military Support to Disaster Relief Under the Federal Response Plan

engineer emergency response missions are required in order for other response organizations to execute their missions.

- In disaster response and recovery operations, engineer operations are part of the critical support provided by USACE and the JTF. Relationships are shown in Figure IV-4. Upon activation of ESF 3 by the FEMA, USACE deploys an Emergency Response and Recovery Office (ERRO) to commence planning and execution of ESF 3 tasking from FEMA. Under the FRP, USACE's 249th Engineer Battalion (Prime Power) can conduct power assessments and install generators to provide emergency power. Contractors can clear debris, build temporary shelters, conduct emergency repairs to public facilities, and also install generators to provide emergency power.

- The JTF engineers may conduct immediate response missions as follows.

  •• Emergency debris clearance from critical transportation facilities.

  •• Emergency repairs to public facilities.

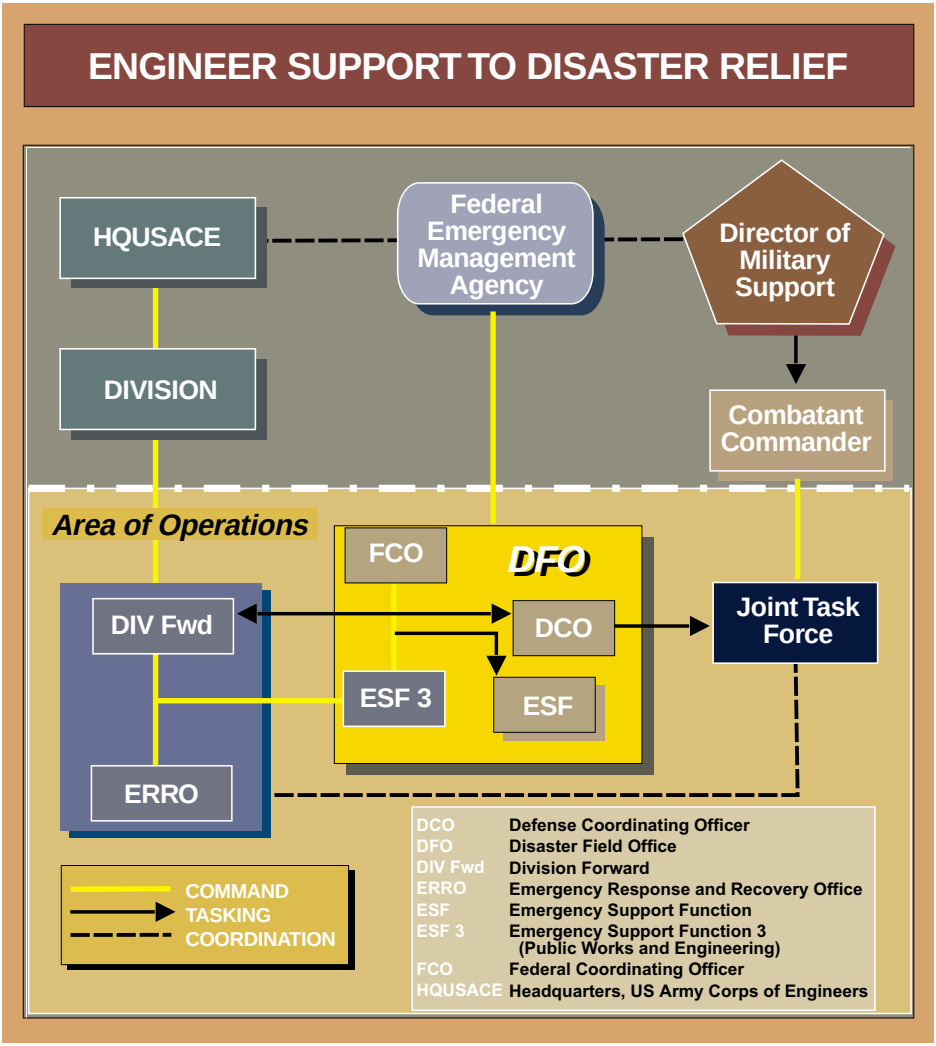

Figure IV-4. Engineer Support to Disaster Relief

•• Emergency power for critical public facilities.

- The major infrastructure recovery missions for the engineers are as follows.

•• Perform emergency debris removal from roads and transportation facilities.

•• Clear, reduce, and dispose of debris.

•• Provide temporary housing.

•• Provide temporary roofing for housing.

- Under standard FRP procedures, USACE provides requests for JTF engineer support to the DCO and subsequently provides ESF 3 missions for task force engineer units to execute. However, in order to coordinate and effectively manage engineer activities, the USACE commander should have a more direct linkage to JTF engineers.

The most effective way to assure unity of effort between USACE, its contractors, and JTF engineers is for the executing USACE Commander of the ERRO to coordinate assignment of potential ESF 3 missions for the JTF with the JTF engineer and the DCO.

4. Posthostilities Operations

Military engineer operations support the transition to posthostilities operations (PHO) and may become the focal point for these operations. 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 for disposal of hazardous waste. Environmental related support operations may be required during PHO. In addition, engineers may be tasked to provide support to the HN such as infrastructure repair and improvement to support a more rapid transition to civilian control. The magnitude of engineer support to foreign governments is determined by US interests and objectives in the stabilization of the region.

See JP 4-04, Joint Doctrine for Civil Engineering Support, *for additional information.*

"Commanders and staffs must work with the local civilian leadership early in the process to establish work priorities. Local fire, police, water, sewage, electrical, and telephone service agencies all play critical roles in reestablishing order and control. Be sure to also consult relief agencies such as the Red Cross, Salvation Army and United Way to help identify priorities."

***Engineer Magazine*, April 1994**
Lessons Learned: Operations Other Than War

5. Specialized Engineer Functions

Service component engineers have unique capabilities above and beyond what is considered typical engineering.

Appendix A, "Engineer Organizations," provides details on the functions and capabilities of Service engineer units.

6. Conclusion

Engineers are an integral and essential part of the joint force, executing diverse engineer operations across the entire battlespace and range of military operations.

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APPENDIX A
ENGINEER ORGANIZATIONS

1. Introduction

Each branch of the military organizes, trains, equips, and provides engineering units in support of JFC requirements and a wide variety of operational missions. While each Service can conduct independent engineering operations in virtually any environment, often times engineers are called upon to participate in joint and multinational operations in concert with HN engineers, contractors, and other organizations. Therefore, a clearer understanding of Service engineer units and capabilities allows commanders to tailor the right force for the operation. Commanders should also appreciate joint, multinational, and interagency engineer capabilities in order to integrate operational planning and execution of engineer support. This appendix provides a brief description of the engineer capabilities resident within the Services and other potential supporting agencies.

Additional information on engineer capabilities is provided in JP 4-04, Joint Doctrine for Civil Engineering Support.

2. Army Capabilities

a. Army engineer units are organized on a variety of levels to support both combat engineering, general engineering, and topographic engineering requirements. Army engineers operate as an integral member of the combined-arms team in peace and war to provide a full range of engineering capabilities. Engineers execute mobility, countermobility, and survivability missions and provide general engineering and topographic engineering throughout the operational area.

- Types of engineer units include engineer combat battalions (wheeled, mechanized, airborne, and light). These all have the capability of: fighting as infantry when required; providing C2 and staff supervision for attached and assigned units; constructing tactical obstacles, defensive positions, fixed and floating bridges; and repairing command posts (CPs), LOCs, tactical routes, culverts, fords and other horizontal and vertical construction related tasks. They can also provide engineer support in river crossing operations, assist in assaulting fortified positions, and conduct breaching operations. The airborne and air assault engineer battalions also have the unique capability to employ air-dropable rapid runway repair kits.

- Combat heavy battalions are capable of constructing, rehabilitating, repairing, maintaining and modifying landing strips, airfields, CPs, MSRs, supply installations, building structures, bridges, and other related structures as required. They can also perform repairs and limited reconstruction on railroads and water and sewage facilities.

- The combat heavy battalion's capability can be expanded significantly with the attachments of specialized personnel and equipment. Such an attachment could be a construction support company which provides the assets for bituminous mixing and paving, quarrying and crushing, and major horizontal construction projects such as highways, storage facilities, and airfields. Other attachments could include a pipeline construction support company and a port opening company.

- The engineer prime-power company generates electrical power and provides advice and technical assistance on all

aspects of electrical power and distribution systems. It has a limited electrical engineering capability (design and analysis), provides electrical surveys, and can operate, maintain, and perform minor repairs to other electrical power-production equipment, to include HN fixed plants.

- A combat support equipment (CSE) company supports combat operations by accomplishing general engineering tasks. CSEs are capable of constructing, rehabilitating, maintaining, repairing, and modifying landing strips, MSRs, CPs, airfields, and LOCs.

- Some of the other specialized units include bridging companies (multi-role bridge, assault float bridge , and medium girder bridge), dump truck companies and port opening companies. Smaller specialized teams are organized to support such functions as engineer diving operations, firefighting, quarry operations, utilities, well drilling, and topographic engineering.

For further details, see Army FM-5-100, Engineer Operations.

b. Army engineering units have specialized capabilities in the following areas.

- Topographic engineering, including terrain and digital imagery analysis.

- Rear-area operations (to include infantry combat missions) within the limitations of organic weapons and equipment. While combat engineer units have the capability to fight as infantry, the JFC should carefully weigh the gain in infantry strength against the loss in engineer support.

- Facilities engineering teams to assist in real estate acquisition, design, and construction support.

- Pipeline construction companies to construct and rehabilitate pipeline systems.

- Railroad and railroad support systems repair and construction management.

c. Engineering technical and contract support is provided by a variety of supporting organizations. USACE provides a broad range of engineering service support to the Military Departments, Federal agencies, state governments, and local authorities. The services range from wetlands and waterways management to large-scale civil construction projects and disaster relief. USACE also 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 the Topographic Engineering Center. USACE can also provide a fixed and deployable tele-engineering capability that provide both secure and nonsecure real time video, audio, and data transfer of information.

3. Navy Capabilities

a. The Naval Construction Force, organized primarily as Navy construction engineer (SEABEE) units, performs both generalized and specialized construction missions in support of the Navy and Marine Corps component commanders. SEABEE units provide construction support for the Navy component commander in the establishment of forward logistic sites and advanced logistics support sites. SEABEE units possess general engineering capabilities

employable across the range of military operations. Naval mobile construction battalions (NMCBs) have extensive heavy horizontal and vertical construction capabilities. NMCBs can be tasked to construct roads and bridging for supply routes, construct or extend airfield pavements, establish ammunition supply points, build expeditionary airfields and advanced bases, and erect all types of force beddown facilities. SEABEE units are trained in force protection operations (to include work party security) and in limited defensive combat. SEABEEs also provide battalion- and regimental-level C2 to facilitate the proper utilization of SEABEE forces in the operational area. Operationally, SEABEE units are task tailorable and routinely operate as detachments. This flexible C2 allows SEABEEs to respond with the right level of engineering expertise at the right time in the right place. The foundation of SEABEE tailorability begins with the NMCB air detachment, which is a team of approximately 90 SEABEEs ready to deploy to provide engineering support in 48 hours. SEABEEs are expeditionary in nature and are self-sustaining in the field, requiring only sustainment supplies and class IV materials for project execution. SEABEEs also possess specialized capabilities to include water well drilling, quarry operations, and concrete and asphalt paving operations.

b. Navy engineer units have specialized capabilities for performing engineering work at the water and shore interface in support of amphibious operations or other beach operations. Amphibious construction battalions possess the capability to operate and maintain causeway barge ferries for ship-to-shore logistics operations, erect the elevated causeway, modular, install OPDS, install the amphibious assault bulk fuel/water system and provide construction, engineering, camp services and defense for the naval support element during assault echelon, assault follow-on echelon, maritime pre-positioning force, Navy logistics over-the-shore and JLOTS operations. Underwater construction teams provide construction diving expertise to facilitate port opening or closing operations as well as beach and port surveys.

c. The NCF provides general engineering support to the Marine Corps. NCF units are necessary to reinforce and augment the Marine Corps' limited general engineering capability. The normal employment of the NCF is as a major subordinate element within the MAGTF to maximize engineering capabilities available to the MAGTF commander. SEABEEs are an essential support element to any sized MAGTF and routinely deploy and exercise with Marine Corps units. The NCF constructs and maintains base facilities, repairs battle damaged facilities, accomplishes disaster control and recovery efforts, and conducts limited defensive operations as required by the circumstances of the deployment situation.

d. Engineering technical and contract support is provided by a variety of supporting organizations. NAVFACENGCOM and subordinate engineering field divisions and activities provide engineering planning, design engineering, project management, construction, and operations and maintenance for shore-based and ocean facilities. In particular, NAVFACENGCOM has mobile utilities support equipment teams, which provide temporary or short term utility support. Typical missions include disaster recovery, utility plant repair support, pier side ship support, and emergency operations. The officer-in-charge of construction or resident officer-in-charge of construction provides the ability to award and administer contracts and provide real estate support for contingencies. Technical engineering support for environmental issues and military engineer augmentation for JFC staffs are available through reserve environmental engineering units and the Naval Reserve Contingency Engineering Program. The Naval Facilities Engineering Service Center provides a variety

of technical expertise in amphibious delivery systems and ocean and deep ocean facilities.

4. Air Force Capabilities

a. Air Force engineer units, organized as Prime BEEF or RED HORSE units, provide support ranging from expeditionary civil to general engineering across the range of military operations. The primary mission of Air Force engineers is to provide mission-ready base systems for the projection of air power for both in-garrison and deployed locations. Both units have limited combat engineering capabilities centered on the defense of deployed forces, force protection, camouflage, survivability, and base denial. Air Force engineering units can deploy either as part of an AEF, or as detached units operating in support of specific missions and operational taskings. Prime BEEF forces are organized and deployed according to unit type codes (UTCs) designated "lead," "follow," and "special," and are tailorable to meet special deployment taskings. UTC lead teams deploy with necessary command, control, and communications to conduct independent engineer, fire protection, readiness (NBC and force protection), and EOD operations. Follow UTC teams augment lead teams or provide support to limited deployments. All Prime BEEF UTCs are rapidly deployable via airlift with team kits to support initial beddown taskings. Sustainment supplies and project materials can be procured from pre-positioned stockpiles, war reserve materiel depots, or contract sources. RED HORSE squadrons are organized and deployed for austere, independent operation into four echelons to operate on a hub-and-spoke concept. The concept is to deploy the entire squadron, including augmentees to a single area of responsibility with the capability of the hub supporting two spokes simultaneously. RED HORSE capabilities include all of the functions of Prime BEEF teams, plus water well drilling, quarry operations, heavy horizontal and vertical construction, and water purification. RED HORSE 1, Advance Team, deploys within 12 to 16 hours to prepare sites for main body arrival. They establish liaison with HN and allied military forces, conduct site survey, design base layout, establish communications, and test soil and water supply. RED HORSE 2 provides limited horizontal and vertical construction capability, RED HORSE 3 provides heavy horizontal and light vertical construction capabilities, and RED HORSE 4 provides heavy vertical and light horizontal construction capabilities, each provide engineering and support forces and command elements. Their priority tasks include airfield obstruction clearance, installation of aircraft arresting systems, construction of sewage lagoons, construction of ammunition storage sites, road construction, installation of airfield lighting, and hardening of shelters. Support forces include medical, vehicle maintenance, services, and logistics.

b. Air Force engineer units have specialized capabilities to support all aspects of airfield operations ranging from early entry operations to war damage repair. Specialized functions include the following.

- En route base opening and operational support for strategic airlift.
- Installation, operation, and maintenance of deployable airfield lighting systems.
- Installation, operation, and maintenance of mobile aircraft arresting systems.
- Design and construction of runways, taxiways, and parking aprons, including associated facilities.
- Automatic building machine (k-span), tension fabric structure, and inflatable building operations.
- Specialized shelter support and power generation for deployable aerospace

command, control, and communication systems.

c. Engineering technical and contract support for Air Force mobility forces are provided by a variety of other supporting organizations separate from Prime BEEF and RED HORSE units. The Air Force Civil Engineering Support Agency (AFCESA) provides technical support and training, and administers the AFCAP. Additionally, AFCESA provides specialized teams to assess pavement and runway conditions along with teams to conduct in-field maintenance and repair specialized power generation equipment. The Air Force Center for Environmental Excellence provides full range environmental program support, base planning, and contract services.

5. Marine Corps Capabilities

a. The Marine Corps is an expeditionary force-in-readiness. By its very expeditionary nature the Marine Corps must be light to travel quickly anywhere around the world on short notice. Marine Corps engineers, by nature of their organization and mission, focus on expeditionary engineering support to the MAGTF. Each MAGTF contains task-organized elements from each of the following engineer organizations.

- A combat engineer battalion (CEB) enhances the mobility, countermobility, and survivability of the Marine division through close combat engineering support. The CEB also provides limited general engineering support to the Marine Division.

- A Marine wing support group (MWSG) provides essential aviation ground support requirements to each Marine aircraft wing. The MWSG contains four Marine wing support squadrons, each task-organized to provide all essential ground support and engineer support requirements to aid designated fixed-wing or rotary-wing components of a Marine aviation combat air station.

- An engineer support battalion (ESB) increases the combat effectiveness of the MAGTF by accomplishing general engineering missions. ESB is organic to the force service support group, but supports the entire MAGTF. The majority of the MEF's heavy equipment, utilities, and construction capabilities are resident in the ESB.

b. **Specialized Capabilities.** The Marine engineers have the unique capability of being completely integrated with their combat elements under the MAGTF concept of operations. The forward-deployed MAGTF enables rapid response with heavy equipment and a broad range of initial operational capability. However, the force is designed for limited duration and focused taskings, not overall control of the theater. Marine engineers provide the following specialized capabilities.

- Fixed and float bridging and rafting.

- Mobile electric power.

- Production and storage of potable water.

- EOD.

- Bulk fuel storage (up to 600,000 gallons) and dispensing systems.

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APPENDIX B
REFERENCES

The development of JP 3-34 is based upon the following primary references.

1. Joint Publications

a. JP 0-2, *Unified Action Armed Forces (UNAAF)*.

b. JP 1-02, *Department of Defense Dictionary for Military and Associated Terms*.

c. JP 2-0, *Doctrine for Intelligence Support to Joint Operations*.

d. JP 2-01, *Joint Intelligence Support to Military Operations*.

e. JP 2-01.1, *Joint Tactics, Techniques, and Procedures for Intelligence Support to Targeting*.

f. JP 2-03, *Joint Tactics, Techniques, and Procedures for Geospatial Information and Services Support to Joint Operations*.

g. JP 3-0, *Doctrine for Joint Operations*.

h. JP 3-07, *Joint Doctrine for Military Operations Other Than War*.

i. JP 3-07.2, *Joint Tactics, Techniques, and Procedures for Antiterrorism*.

j. JP 3-07.3, *Joint Tactics, Techniques, and Procedures for Peace Operations*.

k. JP 3-07.6, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance*.

l. JP 3-07.7. *Joint Tactics, Techniques, and Procedures for Domestic Support Operations*.

m. JP 3-08, *Interagency Coordination During Joint Operations, Vol. I and II*.

n. JP 3-15, *Joint Doctrine for Barriers, Obstacles, and Mine Warfare*.

o. JP 3-16, *Joint Doctrine for Multinational Operations*.

p. JP 3-33, *Joint Force Capabilities*.

q. JP 3-35, *Joint Doctrine for Deployment and Redeployment Operations*.

r. JP 3-57, *Joint Doctrine for Civil-Military Operations* (under development).

s. JP 3-57.1, *Joint Doctrine for Civil Affairs* (under development).

t. JP 3-58, *Joint Doctrine for Military Deception*.

u. JP 3-60, *Doctrine for Joint Targeting*.

v. JP 4-0, *Doctrine for Logistic Support to Joint Operations*.

w. JP 4-01.6, *Joint Tactics, Techniques, and Procedures for Joint Logistics Over-the-Shore (JLOTS)*.

x. JP 4-01.8, *Joint Tactics, Techniques, and Procedures for Reception, Staging, Onward Movement, and Integration*.

y. JP 4-04, *Joint Doctrine for Civil Engineering Support*.

z. JP 5-0, *Doctrine for Planning Joint Operations*.

aa. JP 5-00.2, *Joint Task Force Planning Guidance and Procedures*.

bb. JP 6-0, *Doctrine for C4 Systems Support to Joint Operations*.

cc. JP 6-02, *Joint Doctrine for Employment of Operational/Tactical C4 Systems*.

2. Service Publications

a. AFDD 1, *Air Force Basic Doctrine*.

b. AFDD 2, *Organization and Employment of Aerospace Forces*.

c. AFDD 2-1, *Air Warfare*.

d. AFDD 2-3, *Military Operations Other Than War*.

e. AFDD 2-4, *Combat Support*.

f. AFDD 2-4.3, *Civil Engineering*.

g. AFDD 2-4.4, *Bases, Infrastructure and Facilities*.

h. *Prime BEEF Implementation Guide*.

i. Air Force Handbook 10-222, Volumes 1-6.

j. Air Force Environmental Handbook for Contingency Operations.

k. FM 5-33, *Terrain Analysis*.

l. FM 5-71-2, *Armored Task-Force Engineer Combat Operations*.

m. FM 5-71-100, *Division Engineer Combat Operations*.

n. FM 5-100, *Engineer Operations*.

o. FM 5-100-15, *Corps Engineering Operations*.

p. FM 5-101, *Mobility*.

q. FM 5-103, *Survivability*.

r. FM 5-104, *General Engineering*.

s. FM 5-105, *Topographic Operations*.

t. FM 5-114, *Engineer Operations Short of War*.

u. FM 5-116, *Engineer Operations: Echelons Above Corps*.

v. FM 5-170, *Engineer Reconnaissance*.

w. FM 5-490, *Engineer Diving Operations*.

x. FM 6-20-10, *TTP for the Targeting Process*.

y. FM 20-32, *Mine/Countermine Operations*.

z. FM 20-400, *Military Environmental Protection*.

aa. FM 34-3, *Intelligence Analysis*.

bb. FM 34-130, *Intelligence Preparation of the Battlefield*.

cc. FM 41-10, *Civil Affairs Operations*.

dd. FM 90-7, *Combined Arms Obstacle Integration*.

ee. FM 90-13-1, *Combined Arms Breaching Operations*.

ff. MCWP 3-17, *MAGTF Engineer Operations*.

gg. MCWP 3-17.1, *River Crossing Operations*.

hh. MCWP 3-17.2, *MAGTF EOD Operations*.

ii. MCWP 3-17.3, *MAGTF Breaching Operations*.

jj. MCWP 3-17.4, *Engineer Reconnaissance*.

kk. Naval Warfare Pub 4-04, *Naval Civil Engineering Operations*.

ll. Naval Warfare Pub 4-04.1/Marine Corps Warfare Pub 4-25.2, *Seabee Operations in the MAGTF*.

mm. Naval Warfare Pub 4-04.2, *Naval Civil Engineering Operations for the Component Commanders*.

nn. Naval Warfare Pub 4-11, *Environmental Protection*.

oo. NAVFAC P315, *Naval Construction Force Manual*.

3. Executive Orders, Directives, Instructions and Manuals

a. Executive Order 12088, *Federal Compliance with Pollution Control Standards*.

b. Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*.

c. Executive Order 12656, *Assignment of Emergency Preparedness Responsibilities*.

d. DOD Directive 2000.13, *Civil Affairs*.

e. DOD Directive 3025.1, *Military Support to Civil Authorities*.

f. DOD Directive 4270.36, *DOD Emergency, Contingency, and Other Unprogrammed Construction Projects*.

g. DOD Directive 4270.5, *Military Construction Responsibilities*, as amended by the Office of the Assistant Secretary of Defense (Acquisition and Logistics) letter of 20 March 1986.

h. DOD Instruction 4715.9, *Environmental Planning and Analysis*.

i. DOD Directive 5100.46, *Foreign Disaster Relief*.

j. DOD Directive 6050.7, *Environmental Effects Abroad of Major Department of Defense Actions*.

k. DOD Directive 6050.16, *Policy for Establishing and Implementing Environmental Standards at Overseas Installations*.

l. Joint Staff Instruction 3820.01B, *Environmental Engineering Effects of DOD Actions*.

m. CJCSI 3901.01A, *Requirements for Geospatial Information and Services*.

n. CJCSM 3122.03, *Joint Operation Planning and Execution System Vol. II: (Planning Formats and Guidance)*.

o. CJCSM 3141.01, *Procedures for Review of Operation Plans*.

p. Overseas Environmental Baseline Guidance Document (OEBGD).

q. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes.

r. Federal Response Plan.

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APPENDIX C
ADMINISTRATIVE INSTRUCTIONS

1. User Comments

Users in the field are highly encouraged to submit comments on this publication to: Commander, United States Joint Forces Command, Joint Warfighting Center Code JW100, 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. Change Recommendations

a. Recommendations for urgent changes to this publication should be submitted:

TO: CSA WASHINGTON DC//DAMO-SSP//
INFO: JOINT STAFF WASHINGTON DC//J7-JDD//

Routine changes should be submitted to the Director for Operational Plans and Interoperability (J-7), JDD, 7000 Joint Staff Pentagon, Washington, DC 20318-7000.

b. When a Joint Staff directorate submits a proposal to the Chairman of the Joint Chiefs of Staff 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 Military Services and other organizations are requested to notify the Director, J-7, Joint Staff, when changes to source documents reflected in this publication are initiated.

c. Record of Changes:

CHANGE NUMBER	COPY NUMBER	DATE OF CHANGE	DATE ENTERED	POSTED BY	REMARKS

4. Distribution

a. Additional copies of this publication can be obtained through Service publication centers.

b. Only approved pubs and test pubs are releasable outside the combatant commands, Services, and Joint Staff. Release of any classified joint publication to foreign governments or foreign nationals must be requested through the local embassy (Defense Attaché Office) to DIA Foreign Liaison Office, PSS, Room 1A674, Pentagon, Washington, DC 20301-7400.

c. Additional copies should be obtained from the Military Service assigned administrative support responsibility by DOD Directive 5100.3, 1 November 1988, *Support of the Headquarters of Unified, Specified, and Subordinate Joint Commands*.

Army:	US Army AG Publication Center SL 1655 Woodson Road Attn: Joint Publications St. Louis, MO 63114-6181
Air Force:	Air Force Publications Distribution Center 2800 Eastern Boulevard Baltimore, MD 21220-2896
Navy:	CO, Naval Inventory Control Point 700 Robbins Avenue Bldg 1, Customer Service Philadelphia, PA 19111-5099
Marine Corps:	Commander (Attn: Publications) 814 Radford Blvd, Suite 20321 Albany, GA 31704-0321
Coast Guard:	Commandant (G-OPD), US Coast Guard 2100 2nd Street, SW Washington, DC 20593-0001
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GLOSSARY

PART I — ABBREVIATIONS AND ACRONYMS

ABCS	Army Battle Command System
ABO	air base operability
AEF	air expeditionary force
AFCAP	Air Force Contract Augmentation Program
AFCESA	Air Force Civil Engineering Support Agency
APOD	aerial port of debarkation
BII	Base Information Infrastructure
C2	command and control
C4	command, control, communications, and computers
CCA	contract construction agent (DOD)
CEB	combat engineer battalion
CESP	Civil Engineering Support Plan
CINC	commander of a combatant command
CJCS	Chairman of the Joint Chiefs of Staff
CJCSM	Chairman of the Joint Chiefs of Staff Manual
COA	course of action
CONCAP	Construction Capabilities Contract (Navy)
CP	command post
CS	combat support
CSE	combat support equipment
CSS	combat service support
DCO	defense coordinating officer
DOD	Department of Defense
DODD	Department of Defense Directive
DOMS	Director of Military Support
DSO	domestic support operations
EOD	explosive ordnance disposal
ERRO	Emergency Response and Recovery Office
ESB	engineer support battalion
ESF	emergency support function
FARP	forward arming and refueling point
FEMA	Federal Emergency Management Agency
FRP	Federal Response Plan (USG)
GCCS	Global Command and Control System
GCCS-A	Army Global Command and Control System
GI&S	geospatial information and services

HF	high frequency
HN	host nation
HNS	host-nation support
IO	international organization
IPB	intelligence preparation of the battlespace
ISB	intermediate staging base
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
JEMB	Joint Environmental Management Board
JFACC	joint force air component commander
JFC	joint force commander
JFSOCC	joint force special operations component commander
JFUB	Joint Facilities Utilization Board
JLOTS	joint logistics over-the-shore
JOPES	Joint Operation Planning and Execution System
JP	joint publication
JRAC	joint rear area coordinator
JRSOI	joint reception, staging, onward movement and integration
JTCB	Joint Targeting Coordination Board
JTF	joint task force
JTFCEM	joint task force contingency engineering management
LOC	line of communications
LOGCAP	Logistics Civilian Augmentation Program (Army)
MAGTF	Marine air-ground task force
MEF	Marine expeditionary force
MOOTW	military operations other than war
MSR	main supply route
MWSG	Marine wing support group
NAVFACENGCOM	Naval Facilities Engineering Command
NBC	nuclear, biological, and chemical
NCF	Naval Construction Force
NGO	nongovernmental organization
NIMA	National Imagery and Mapping Agency
NIPRNET	Unclassified but Sensitive Internet Protocol Router Network
NMCB	naval mobile construction battalion
OPCON	operational control
OPDS	offshore petroleum discharge system
OPLAN	operation plan
OPORD	operation order

PHO	posthostilities operations
Prime BEEF	Prime Base Engineer Emergency Force
PVO	private voluntary organization
RCEM	regional contingency engineering management
SEABEE	Navy construction engineer
SIPRNET	SECRET Internet Protocol Router Network
SOF	special operations forces
SOFA	status-of-forces agreement
SPOD	seaport of debarkation
TACON	tactical control
TCEM	theater contingency engineering management
TPFDD	time-phased force and deployment data
UHF	ultra high frequency
USACE	United States Army Corps of Engineers
USC	United States Code
USG	United States Government
UTC	unit type code
VHF	very high frequency

base development (less force beddown). The acquisition, development, expansion, improvement, and construction and/or replacement of the facilities and resources of an area or location either to support forces employed in military operations or deployed in accordance with strategic plans. (JP 1-02)

battlespace. The environment, factors, and conditions which must be understood to successfully apply combat power, protect the force, or complete the mission. This includes the air, land, sea, space, and the included enemy and friendly forces, facilities, weather, terrain, the electromagnetic spectrum, and the information environment within the operational areas and areas of interest. (JP 1-02)

civil engineering. Those combat support and combat service support activities that identify, design, construct, lease or provide facilities, and which operate, maintain, and perform war damage repair and other engineering functions in support of military operations. (JP 1-02)

combat engineering. Those engineering tasks that assist the tactical and/or operational commander to "shape" the battlespace by enhancing mobility, creating the space and time necessary to generate mass and speed while protecting the force and denying mobility and key terrain to the enemy. These tasks include breaching, bridging, and emplacement of obstacles to deny mobility to the enemy. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

contingency engineering management organization. An organization that may be formed by the combatant commander, or subordinate joint force commander to augment the combatant command, or subordinate joint force staffs to provide additional Service engineering expertise to support both deliberate and crisis action planning and to provide construction management in contingency and wartime operations. The combatant commander may form a theater contingency engineering management cell, and similar organizations may be formed at subordinate levels of command (e.g., regional contingency engineering management cell and/or joint task force contingency engineering management cell). These organizations should be staffed with expertise in combat engineering, general engineering, and topographic engineering. (This term and its definition are approved for inclusion in the next edition of 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. The primary purpose of countermobility operations is to slow or divert the enemy, to increase time for target acquisition, and to increase weapons effectiveness. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

DOD 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)

environmental considerations. The spectrum of environmental media,

resources, or programs that may impact on, or are affected by, the planning and execution of military operations. Factors may include, but are not limited to, environmental compliance, pollution prevention, conservation, protection of historical and cultural sites, and protection of flora and fauna. (JP 1-02)

exercise. A military maneuver or simulated wartime operation involving planning, preparation, and execution. It is carried out for the purpose of training and evaluation. It may be a combined, joint, or single-Service exercise, depending on participating organizations. (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. (JP 1-02)

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)

final governing standards. A comprehensive set of country-specific substantive environmental provisions, typically technical limitations on effluent, discharges, etc., or a specific management practice. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

force beddown. The provision of expedient facilities for troop support to provide a platform for the projection of force. These facilities may include modular or kit-type facility substitutes. (JP 1-02)

forward aviation combat engineering. A mobility operation in which engineers perform tasks in support of forward aviation ground facilities. Tasks include reconnaissance; construction of low altitude parachute extraction zones, landing strips, and airstrips; and providing berms, revetments, and trenches for forward arming and refueling points. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

general engineering. Encompasses the construction and repair of lines of communications, main supply routes, airfields, and logistic facilities to support joint military operations and may be performed in direct support of combat operations, such as battle damage repair. These operations include both horizontal and vertical construction, and may include use of both expedient repair methods and more deliberate construction methods characterized by the application of design criteria, advanced planning, and preparation, depending on the mission requirements. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

infrastructure. A term generally applicable to all fixed and permanent installations, fabrications, or facilities for the support and control of military forces. (JP 1-02)

joint operations. A general term to describe military actions conducted by joint forces, or by Service forces in relationships (e.g., support, coordinating authority), which, of themselves, do not create joint forces. (JP 1-02)

mobility. A quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfill their primary mission. (JP 1-02)

operation. A military action or the carrying out of a strategic, tactical, service, training, or administrative military mission; the process of carrying on combat, including

movement, supply, attack, defense and maneuvers needed to gain the objectives of any battle or campaign. (JP 1-02)

operational environment. A composite of the conditions, circumstances, and influences which affect the employment of military forces and bear on the decisions of the unit commander. Some examples are: a. permissive environment—operational environment in which host country military and law enforcement agencies have control and the intent and capability to assist operations that a unit intends to conduct. b. uncertain environment—operational environment in which host government forces, whether opposed to or receptive to operations that a unit intends to conduct, do not have totally effective control of the territory and population in the intended area of operations. c. hostile environment—operational environment in which hostile forces have control and the intent and capability to effectively oppose or react to the operations a unit intends to conduct. (JP 1-02)

operational level of war. The level of war at which campaigns and major operations are planned, conducted, and sustained to accomplish strategic objectives within theaters or areas of operations. Activities at this level link tactics and strategy by establishing operational objectives needed to accomplish the strategic objectives, sequencing events to achieve the operational objectives, initiating actions, and applying resources to bring about and sustain these events. These activities imply a broader dimension of time or space than do tactics; they ensure the logistic and administrative support of tactical forces, and provide the means by which tactical successes are exploited to achieve strategic objectives. (JP 1-02)

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. Contains procedures for use by the Department of Defense to establish the final governing standards for a particular geographic area or to provide standards for environmental compliance where no final governing standards have been established. Also called OEBGD. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

real property. Lands, buildings, structures, utilities systems, improvements, and appurtenances, thereto. Includes equipment attached to and made part of buildings and structures (such as heating systems), but not movable equipment (such as plant equipment). (JP 1-02)

RED HORSE. Air Force units wartime-structured to provide a heavy engineer capability. They have a responsibility across the operational area, are not tied to a specific base, and are not responsible for base operation and maintenance. These units are mobile, rapidly deployable, and largely self-sufficient for limited periods of time. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

strategic level of war. The level of war at which a nation, often as a member of a group of nations, determines national or multinational (alliance or coalition) security objectives and guidance, and develops and uses national resources to accomplish these objectives. Activities at this level establish national and multinational military objectives; sequence initiatives; define

limits and assess risks for the use of military and other instruments of national power; develop global plans or theater war plans to achieve these objectives; and provide military forces and other capabilities in accordance with strategic plans. (JP 1-02)

survivability. Concept which includes all aspects of protecting personnel, weapons, and supplies while simultaneously deceiving the enemy. Survivability tactics include building a good defense; employing frequent movement; using concealment, deception, and camouflage; and constructing fighting and protective positions for both individuals and equipment. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

sustainment. The provision of personnel, logistic, and other support required to maintain and prolong operations or combat until successful accomplishment or revision of the mission or of the national objective. (JP 1-02)

tactical level of war. The level of war at which battles and engagements are planned and executed to accomplish military objectives assigned to tactical units or task forces. Activities at this level focus on the ordered arrangement and maneuver of combat elements in relation to each other and to the enemy to achieve combat objectives. (JP 1-02)

topographic engineering. Those engineering tasks that provide geospatial information and services to commanders and staffs across the range of military operations. These tasks include terrain analyses, terrain visualization, digitized terrain products, nonstandard map products, and baseline survey data. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

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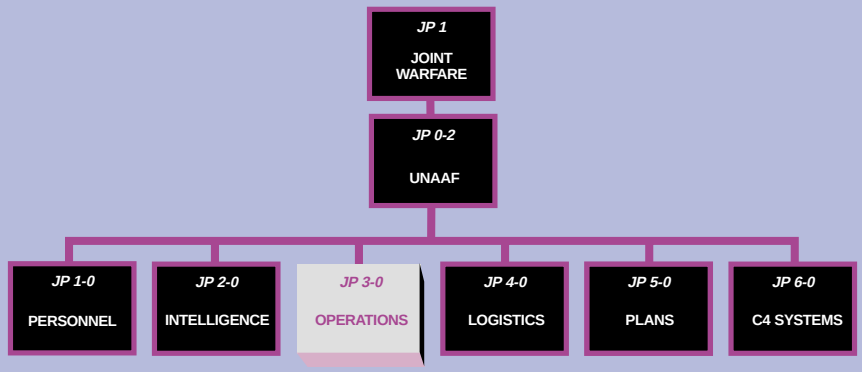
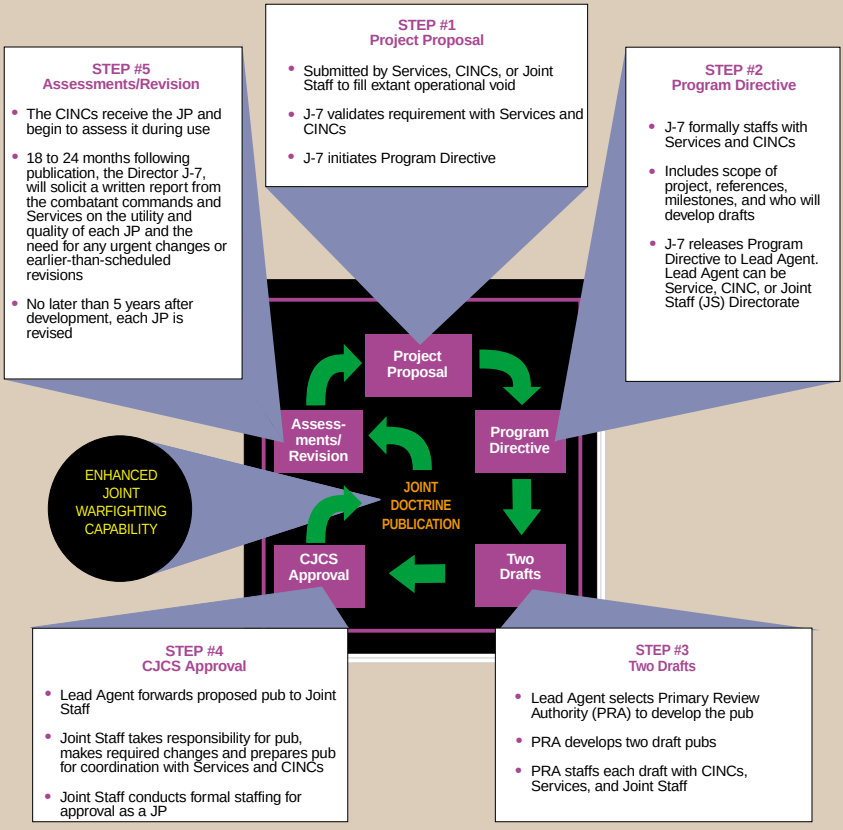
JOINT DOCTRINE PUBLICATIONS HIERARCHY



All joint doctrine and tactics, techniques, and procedures 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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